

The Demography of Smallholder Maize Farmers for Climate Change Adaptation in Tanzania

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Abstract

Climate change causes tremendous impact on the environment and agricultural production, including that of maize. In response, farmers deploy numerous strategies to mitigate the negative impacts of climate change. However, despite numerous studies addressing this issue, the demography of farmers (age, sex, education), and the way these factors affect climate change adaptations, have received scant attention. This article examines the influence of socio-demographic factors on the choices and practices of climate change adaptation among smallholder maize farmers in Chemba District, Tanzania. The data were collected from 270 maize farmers, 8 key informant interviews, 4 group discussions, and field observation. The study findings show that most maize farmers (99.6%) were negatively impacted by climate change; and they adopted drought resistant seeds, industrial fertilizers and pesticides to reduce such impacts. However, irrigation farming and destocking were invisible. Age, sex, marital status, and education affected the adoption of climate change adaptations. Furthermore, sociological factors (perceptions/attitudes about strategies), and motivation from successful farmers and extension officers were found to influence adaptation and adoption of strategies. Hence, the demography of farmers and social features were key to the choice and use of climate change adaptation strategies. Consequently, demographic factors should be taken into consideration when enforcing climate change interventions.

Key words: *climate change, adaptation, demography, small-holder farmers*

1. Introduction

Farmers' adaptation strategies are measures that they take, individually or collectively, to address climate change impacts, such as tree planting, soil conservation, and migration (Abebaw, 2025). These strategies reflect farmers' use of their assets to adapt, based on their perception of climate change and its impact on their livelihoods. The Intergovernmental Panel on Climate Change (IPCC) has emphasized that climate change undermines efforts to achieve global food security, with maize being among the most vulnerable staple crops due to its sensitivity to heat and water stress (Ariningsih et al., 2026). Climate change poses increasingly formidable challenges to agricultural systems globally, with smallholder farmers

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who are responsible for a substantial share of food production, bearing disproportionate burdens (Mugisho et al., 2024). This disproportion is a result of their reliance on rain-fed agriculture, limited access to productive resources, and often-marginal socio-economic conditions (Mnukwa et al., 2025). Studies – such as by Akpa et al. (2024), Shabani and Pauline (2023), and Teshome et al. (2021) – reveal that even with adaptive measures in place, staple crop yields (e.g., maize, soy, wheat, rice, cassava, sorghum) could still decline significantly. The projected reductions are up to 120 calories per person/day for each 1°C global temperature rise. Adaptation might offset only about 23 % of such losses by 2050; and approximately 34% by 2100 (Hultgren et al., 2025). This sobering scenario underscores the urgency of understanding the determinants enabling or affecting effective adaptation among smallholder farmers.

Smallholder farmers are therefore adopting – or are encouraged to adopt – more multiple climate change adaptation strategies to reduce risks and improve yields (Adeoye et al., 2026). Mulwa et al. (2017) posited that using multiple climate change adaptation strategies in developing countries enhances crop yields, which in turn generate additional income for farmers (Teklewold et al., 2019). Despite growing national and international efforts to build climate resilience, multiple factors – such as weather information, experience with drought, education level, family size, ownership of livestock, and access to credit – have influenced the decision-making process of farm households regarding the adoption of adaptation strategies (Gwambene & Saria, 2024). In Dodoma Region, for example, farmers change crop varieties, plant crops at different times (staggered planting), use fertilizer/pesticides, and cultivate drought-tolerant crops as adaptation strategies. However, the impact of such interventions has not been as effective as anticipated due to insufficient funding, inadequate technological know-how, inadequate institutional capacity, lack of understanding of climate change issues (Jones & Boyd, 2011; Gifford et al., 2011), and low level of scientific adaptation strategies, among other reasons. In Tanzania, poor or low crop yields and income losses are some of the impacts of this ineffectiveness or poor performance (Kihupi et al., 2015; Mrianga, 2015, Mligo et al., 2022).

While there is a growing body of knowledge linking climate change impacts and population (Baradyana et al., 2025; Deuster, 2023), climate change and adaptation strategies (onsite/off-site) and governance, and the linkage between demographic features (age, sex, education) of individuals/communities, adopters are less noticeable in the literature. Although environmental Malthusianism and demographic transition theorists like Merchant (2022) account for the population-environment nexus, or how population threatens the environment, and opt for optimistic perspectives that every population/fertility growth will encounter counteracting mortality control (Anderson & Hans-Peter, 2015), no socio-

demographic features would consider them as 'capabilities', i.e., the potential for choice and practice of climate change adaptation strategies. This knowledge gap affects the effectiveness of climate change adaptation interventions by smallholder maize farmers.

By situating itself in the capability approach by Amartya Sen (Comim et al., 2008), this article aims to depict the demographic and socio-economic factors affecting/influencing farmers' choices in adopting climate change strategies in Tanzania. Specifically, the article analyses how and/or why demographic (sex, age, marital status) and socio-economic factors (income, cost, farm size ownership, education) are human capabilities that make it easier or difficult to adopt and practice certain climate change adaptation strategies, especially in semi-arid areas of Tanzania. This analysis is significant today because of the potentials of agriculture to Tanzania's economy' and to hence people's livelihoods (Gwambene & Saria, 2024). Moreover, the analysis is more significant today when the world's population has increased to over 8.2bn people (Linard & De Longueville, 2024); an increase that heightens the demand for food, and hence increased crop production.

The article is structured into six sections. The introduction establishes the foundation and background of the problem. The second section situates the theoretical scholarship of the problem. Section three narrates the materials and methods employed to achieve the study objectives. Section four presents and discusses the results, while section five concludes the article.

2. The Capability Approach in Climate Change Adaptation Discourses

The article is situated in the capability approach (CA) by Amartya Sen. The theoretical foundations of CA can be traced back to the scholarships of Karl Marx and Aristotle, who emphasised that wellbeing and development are not only affected by income and expenditure factors, but also by the capacity to do things or activities (Robeyns, 2005). The CA by Amartya Sen emphasises the importance of individual capabilities and freedoms in assessing well-being and development (Comim et al., 2008). This approach has been applied to various fields, including climate adaptation strategies. The CA has been used to assess the vulnerability of communities to climate change on the one side, and measures to adapt or mitigate the impacts on the other. According to Cappelli (2023), vulnerability to climate change is both socially and economically rooted. Socially, it manifests through structural inequalities (culture, values, governance) that affect access to resources and capabilities due to power differentials. On the other hand, economic inequalities and social relations foster climate change vulnerability. Therefore, the CA provides a perspective and framework to comprehend the impact of climate change on human wellbeing. In climate change, vulnerability refers to the extent to which individuals or community groups are susceptible to both direct and indirect impacts of climate change (Wasito, 2023).

Mastrorillo et al. (2016) discuss the interplay of climatic stressors and local livelihoods, demonstrating that the CA provides a nuanced lens to identify who is most vulnerable, and why. They suggest that capabilities (such as education and healthcare) significantly influence adaptive capacities. They further argue that traditional economic metrics fail to capture the complexities of vulnerability. By applying the CA, policymakers can better recognize the diverse needs of communities, thereby leading to more inclusive adaptation strategies. The CA also emphasises agency; suggesting the ability of individuals to act upon their environment. Puig et al. (2025) highlight how community-led initiatives enhance adaptive capacity. They argue that when local populations are empowered to make decisions, they can tailor adaptation strategies to their specific contexts, and so improve resilience.

Concerning implementing climate adaptation strategies, adoption at individual or community level is affected by several constraints such as participation level, resources availability, accountability, and government transparency (Maeda et al., 2025). Regarding gender inequalities founded within cultural processes and socialization, men are viewed to possess differed capabilities from women to cope and adapt to climate change. Furthermore, gender inequality that reduces women’s access to water resources increases their burden of climate change-induced consequences such as water shortages (Anjum & Aziz, 2025). In this article, the application of Amartya Sen’s CA to climate adaptation strategies in Tanzania provides a comprehensive framework for understanding the socio-demographic and economic capabilities influencing adoption of climate change adaptation strategies among smallholder farmers. The climate change adaptation strategies and capabilities of interest in this article are illustrated in Figure 1.

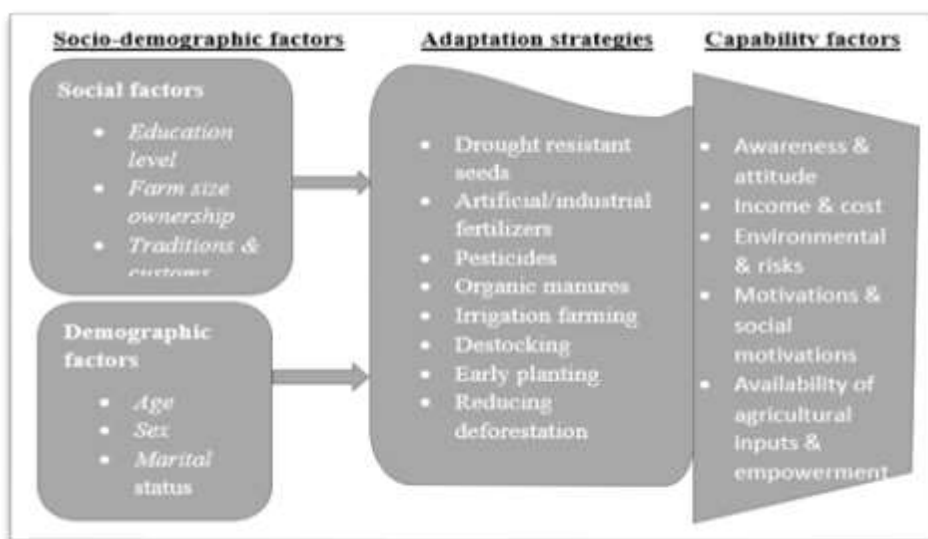


Figure 1: Situating Demography in a Capability Approach Lens

3. Materials and Methods

The article is based on a descriptive and explanatory study that aimed to find out why and how maize farmers adopt certain climate change adaptation strategies. It also explains the capabilities of smallholder farmers to adopt climate change adaptation strategies. This design fits the purpose of the study because it provides technical and scientific merits of understanding a phenomenon currently occurring, and which can easily be predicted in future occurrences (Kothari, 2017). The study was conducted in Chemba District Council, Dodoma Region, Tanzania. Two villages (Babayu and Kidoka) were selected for the study (Figure 2). The district comprises 4 divisions, 26 wards, and 114 villages (CDC, 2017). It is located between 06°10'32"S and 35°44'19"E (Ndwata et al., 2022). Chemba District is one of the notable maize crop cultivation areas, accounting for about 20% of all the maize produced in Tanzania (Mariki, 2017). Maize is one of the primary crops grown annually in Chemba because it is a staple crop, followed by other crops such as sorghum and millet (Fundikira et al., 2025). Most people in Chemba depend largely on agriculture and livestock keeping for their wellbeing. However, the district is greatly vulnerable to the impacts of climate change.

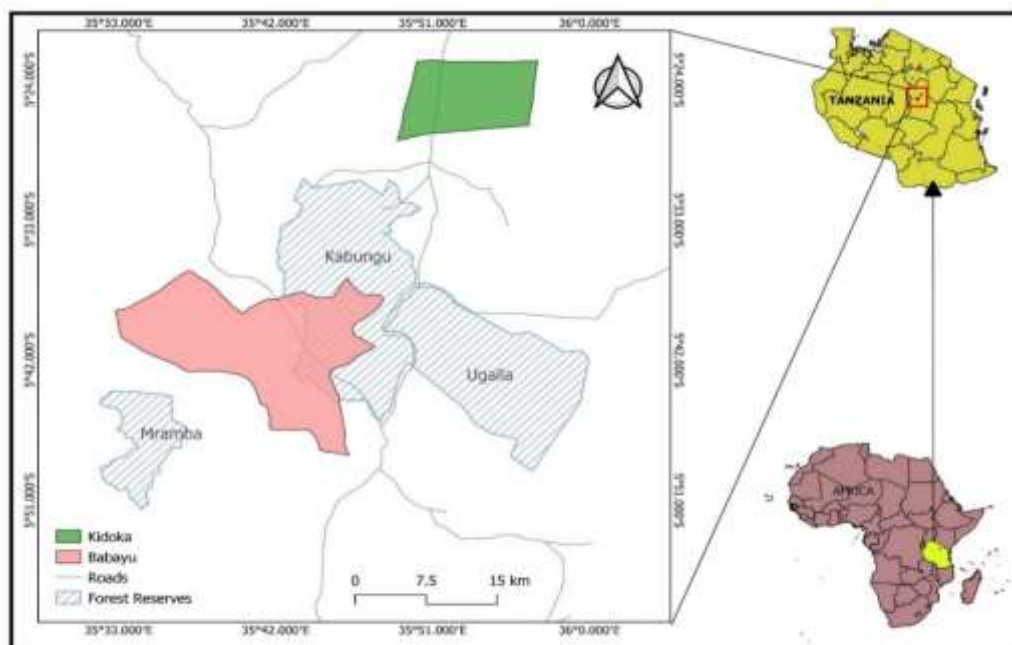


Figure 2: Location of the Study Villages

The sampling frame included ward executive officers, agriculture officers, village executive officers, smallholder maize farmers, and representatives of community-based organizations (CBOs) in Babayu and Kidoka villages. The respondents for the sample were chosen using a simple random sampling technique, which was

chosen to reduce bias by ensuring that each individual respondent had an equal chance of inclusion in the sample (Creswell, 2014; Kothari, 2017). Purposive sampling was also used to select key informants for the study. A total of 270 respondents were randomly drawn from the two villages (160 in Kidoka, and 110 in Babayu). The procedure for determining the sample size involved several steps. First, it was necessary to get the number of households from the village registers: Babayu village had 1025 households, while Kidoka had 1056 households, making a total of 2081 households. Second, the study adopted Israel's (2010) formula to calculate the sample size. A 0.05 precision level (e) was adopted to calculate the sample size. The following formula from Israel (2010), and the adopted variables of interest were used to calculate the sample size:

$$n = \frac{N}{1 + Ne^2}$$

Whereby: N stands for the total number of households (for both villages); n represents the sample size of the study; and e is the level of precision (0.05, in this study); and $n = 270$.

Third, the sample size was distributed to respective villages by using the following formula for non-biased sample distribution:

$$n = \frac{Np_i}{p}$$

Whereby: n is the sample distribution; N is the sample size; p_i is the household of a particular village; and p is the total household for all villages. Therefore, $N = 270$, and $p = 2081$.

The population of Babayu village was 1025. In this case, a sample size distribution for Babayu village was $n = 270 \times 1025 / 2081 = 110$; and the population for Kidoka village was 1056; hence the sample size was $n = 270 \times 1056 / 2081 = 160$.

Both quantitative and qualitative methods were used to collect and analyse the data. The quantitative data were collected through household surveys using a questionnaire comprising both open-ended and closed-ended questions. The questionnaires were administered to the heads of household of smallholder farmers to minimize non-responses (Odhiambo, 2021). Usually questionnaires have numerous merits, including enabling a structured format of collecting data; and they are the best to engage a large sample size (Bryman, 2016). The qualitative data were obtained through focus group discussions (FGDs) to acquire in-depth information on climate change and adaptation strategies (Mwale, 2019). Four (4) groups (two in each village) – consisting of five to ten maize farmers aged 18 years and above – were purposively formed from the selected villages to discuss factors influencing the ability to adopt climate change adaptation strategies in maize

production. FGDs were used because they are best in capturing detailed information, feelings and respondents' perceptions (Creswell, 2014). Additionally, semi-structured interviews were administered to key informants, who included 2 ward executive officers (WEOs), 2 village executive officers (VEOs), 1 district agricultural officer, 2 extension officers, and 1 representative of the village government committee. The key informants interviews (KIIs) provided detailed information based on their knowledge and experience of climate change adaptation strategies. The results from these two sources (FGDs and KIIs) helped to complement and triangulate data from the questionnaire survey.

The Statistical Package for Social Science (SPSS V-21) software was used to organize and analyse the data from the questionnaire surveys. The questionnaire data were analysed using descriptive statistics (frequencies, percentages, multiple responses, and cross-tabulations). The qualitative data from FGDs and KIIs were analysed using content analysis. The content analysis followed the procedure described by Bengtsson (2016), including data transcription, re-checking and comparing the final list of identified themes with the original text, coding, and categorization into themes or sub-themes using specific classification and clustering approaches. These steps reduced the number of categories by considering similarities or differences, while retaining the original meaning of the text.

4. Results and Discussion

4.1 Demography of Smallholder Maize Farmers in Chemba District

Demography is currently a vital consideration in climate change mitigation and adaptation strategies. It is also used to determine the current and future environmental resources consumption (Wolfgang & Erich, 2015). Human lifestyles, behaviours and education affect—or may reduce—rates of GHGs emissions (Sharygin, 2013). For example, education and consumer choices affect use of friendly modes of transport (Pronello & Camusso, 2011). Table 1 summarises the demographic and socio-economic characteristics of smallholder maize farmers in Kidoka and Babayu villages. Specifically, gender distribution, age, marital status, and educational attainment levels present critical insights into the adaptive potential and constraints faced by these agricultural communities.

The predominantly male farming population in both villages (Kidoka: 61%; Babayu: 57%) suggests potential gender-based disparities in access to resources and decision-making processes in relation to adaptation strategies. This aligns with broader findings on gendered vulnerabilities in climate change contexts (Mnukwa et al., 2025). The significant representation of farmers within the 21–40 age group—64% in Kidoka; and 62% in Babayu—indicates a relatively youthful and potentially more dynamic workforce, which could be more receptive to adopting novel climate-smart agricultural practices.

Table 1: Socio-Demographic Characteristics of the Respondents

Socio-demographic variable		Kidoka Village	Babayu Village
Sex	Male	98 (61%)	63 (57%)
	Female	62 (39%)	47 (33%)
Age	15-20	3 (2%)	4 (4%)
	21-40	102 (64%)	68 (62%)
	41-60	43 (27%)	23 (21%)
	61+	12 (7%)	15 (7%)
Marital Status	Single	19 (12%)	28 (25%)
	Married	134 (84%)	66 (60%)
	Divorced	7 (4%)	16 (15%)
Education	Informal	31 (19%)	42 (38%)
	Primary	101 (63%)	40 (36%)
	Secondary	19 (12%)	24 (23%)
	Tertiary	9 (6%)	4 (3%)

Source: Field data, 2024

A young population is a capital/capability for the adoption of modern and risk-oriented adaptation strategies. On the contrary, Mwadzingeni et al. (2022) indicate that old farmers are more enlightened about traditional or indigenous knowledge of climate change and various livelihood options to adapt. Such farmers have experiences of the past and present climatic conditions that can positively be used in influencing their adaptation to climate change. This experience makes them risk-averse compared to younger farmers. Hence, age compositions affect climate change adaptation by influencing different choices, decisions, and practices of adapting to climate change between the young and older persons (Arragaw & Woldeamlak, 2017). Thus, age is an asset or capital which needs to be considered in climate actions.

Educational level is another demographic feature significant for climate change actions. Education entails the knowledge, skills, or how one is informed about something. Consequently, the education composition of farmers impacts behaviour, attitudes, and practices on adaptation. The results in Table 2 show that primary school graduates in Kidoka village were 63%, and for Babayu the percentage was 36%. Secondary school graduates were 12% in Kidoka, and 23% in Babayu. For tertiary graduates, the percentage was 6% in Kidoka, and only 3% in Babayu village. These results depict low educational capability or capacity for handling climate change impacts. Higher education levels entail higher ability in analysing things before making decisions, and therefore this could explain the slight differences in adopters with informal and tertiary education. Baradyana et al. (2025) argued that education is a pivotal factor influencing adaptation because individuals with higher educational attainment demonstrate greater access to resources and a better understanding of adaptive strategies than those with lower education levels.

Table 2: Climate Change Adaptation Strategies and Socio-Demographic Characteristics of Respondents

	Drought Resistance Seeds (%)	Artificial Fertilizers (%)	Pesticides (%)	Organic Manure (%)	Irrigation Farming (%)	Destocking (%)	Early Planting (%)	Reducing Deforestation (%)	Total (%)
Age	18-40	29	10	21	27	0.5	11	0.9	100
	41-60	33	11	23	10	3	20	-	100
	61+	21	14	7	38	5	14	1	100
Sex	Male	32	13	21	8	2	22	1.6	100
	Female	28	9	21	25	3	14	-	100
Marital status	Single	23	13	26	9	4	21	2	100
	Married	39	12	21	11	2	15	1	100
	Divorced	22	14	9	33	9	13	-	100
Education	Informal	19	20	19	8	7	1	25	100
	Primary	34	12	19	10	5	-	20	100
	Secondary	28	9	30	6	4	3	18	100
	Tertiary	36	21	23	5	2	-	13	100
Farm size (acres)	0.25-1.5	32	20	11	18	4	-	15	100
	1.6-2.5	28	17	18	11	9	4	11	100
	2.6-3.5	35	19	21	9	3	1	12	100
	3.6+	33	21	20	3	10	-	13	100

Regarding marital status, 84% and 60% of the respondents in Kidoka and Babayu villages, respectively, were married. Only 12% in Kidoka and 25% in Babayu villages were single. Marriage status and structure impact what adaptation practice to adopt. Married families adopt modern and higher yielding practices because of the probability of having children, and the insurance of food availability. However, single, separated, or divorced families have less motivation to adopt higher yields or use of fertilizers because of lesser responsibilities. These findings confirm the results by Sedegah et al. (2020), who noted that marital status is a paramount factor that forces farmers to produce more and practice different coping and adaptation strategies to climate change, so as to increase food production for family livelihood. Therefore, marriage status (married, single, separated/divorces) are relationship-based capabilities, or important capital in the advocacy or design of climate actions.

4.2 Demography for Climate Change Adaptation Strategies in Chemba District

In line with Amatya Sen, the results from Chemba District indicate that smallholder maize farmers have various socio-demographic capabilities that influence their adoption and practice of climate change adaptation strategies. These capabilities are endogenic (internal) and exogenic (external) to farmers themselves. Table 2 presents the socio-demographic factors influencing the choice and practice of climate adaptation strategies by smallholder maize farmers in Tanzania.

Moreover, Table 2 indicates that using drought-resistant seeds is the most preferred adaptation strategy across some households, especially those of married couples and those with tertiary education. Married couples have large families, therefore food production entails food security within a household. Hence, marriage is a household capability that necessitates using drought resistant seeds to achieve higher production and food sustenance. A study by Awotide et al. (2023) on ex-post impact assessment after the adoption of drought tolerance seeds in Nigeria, noted that the influence was triggered by increased production, which in turn reduced food insecurity significantly by 7.00%. Likewise, Willy et al. (2021) revealed that the association between drought-tolerant seeds and food security in Kenya influenced the adoption of drought-TEGO hybrid varieties in the study area.

Education level implies quick/relevant understanding and knowledge towards adaptation strategies'. Table 2 shows that farmers whose decisions to adopt certain adaptation strategies were influenced by their education levels. About 36% of those who chose to use drought-resistant seeds had tertiary education, 28% had secondary education, and 34% had primary education. In addition, education positively influenced the adoption of artificial fertilizers and pesticides; but had less influence on the choices of organic manure, irrigation farming, destocking, and reduction of deforestation. Less preference on irrigation farming by the small maize farmers was linked to its less visibility and low investment by the government in Tanzania (Teku, 2025). In other words, it shows that farmers have low capability to adopt irrigation farming.

Kolapo et al. (2025) and Oyetunde-Usman and Shee (2023) noted that educational status can predict farmers' adoption decisions of drought-tolerant maize varieties in Nigeria. In Ethiopia, Abebaw (2025) found that when education was well applied, it became the key factor that determined intra-household adoption of chemical fertilizers. In addition, regardless of farm size, most farmers adopted drought-resistant seeds as an adaptation strategy. This means that farm size does not influence adaptation decision, which is contrary to the finding by Fahad and Jing (2018): that farmers' willingness to pay for agricultural insurance, as an adaptation measure, was highly dependent on plot size. This disparity could be attributed to the nature of climate in the study area (semi-arid), which usually receives less rainfall compared to other areas in the country. Kabote et al. (2024) and Hamagu et al. (2024) observed that drought-resistant seeds were the most preferred ones in central Tanzania and Kishapu District, respectively.

The other preferred adaptation strategy is the application of organic manure, especially for maize farmers aged above 60, and divorcees. This age group does not have capital to acquire artificial fertilizers. Another attributing factor is the tradition of using organic manure in farming since such farmers believe that manure enhances soil health, improves water retention, and increases crop yields; thereby making farming more resilient to climate variability and extreme weather events than artificial fertilizers. Again, with longer experience in agricultural management and observed benefits of organic matter in improving soil fertility, older farmers have also been found to prefer organic manure (Shah et al., 2025). In addition, the use of organic fertilizers has been emphasized to farmers because it is opined to improve tolerance against drought, salinity, heat, and heavy metal (HM) stresses (Liu et al., 2025). Consequently, age, sex, marriage status, and education levels are important social capitals/capabilities to consider in promoting the use of organic manure.

The use of pesticides and artificial fertilizers, together with early planting, were moderately preferred adaptation strategies. Pesticides and artificial fertilizers were preferred because they combat increased crop diseases and pests caused by changing weather patterns and extreme temperatures. Likewise, Pérez-Lucas et al. (2024) noted the increased use of pesticides to improve crop performance and resilience to environmental pressures caused by climate change.

Also, the study findings revealed that destocking and reducing deforestation were not among preferred adaptation strategies across all the socio-demographic factors, with less than 10% of the participants reporting it. Destocking implies reducing the size of the herd and number of animals one has. This is not favoured because animals are considered a sign of wealth, and reducing the number/size denotes poverty. This implies that any climate change adaptation efforts must understand the feelings, sentiments, and culture of adopters.

4.3 Socio-economic Factors and Maize Farmers' Adoption of Climate Change Strategies

Efforts to empower farmers to better adapt with the cause and/or effects of climate change are old, contextual, and sometimes global. Farmers, including maize farmers, are rich in methods, tools, and techniques of climate change adaptation. Their choices/decisions to adopt or practise appropriate and effective strategies are influenced by various socio-economic factors. The data in Figure 3 from Chemba District illustrate the socio-economic factors influencing the adaptation strategies to climate change impacts.

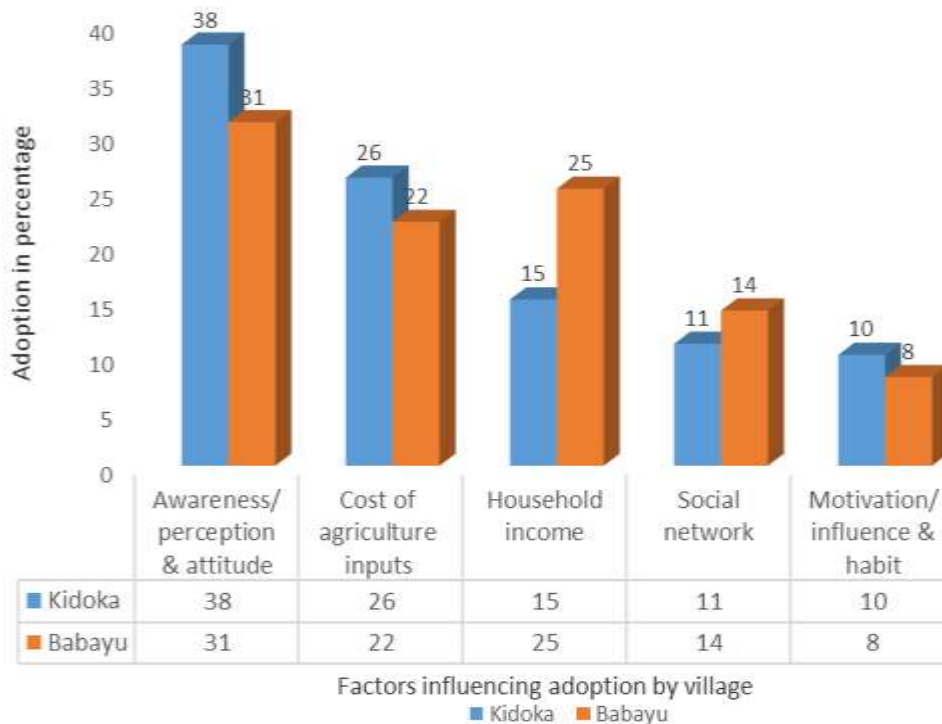


Figure 3: Socio-Economic Factors Influencing Adoption of Climate Change Adaptation Strategies by Maize Farmers in Kidoka and Babayu Villages

Figure 3 indicates that farmers' adaptation strategies in both study villages are influenced by the level of awareness, perceptions, and attitudes towards the benefits of the chosen adaptation strategies. Awareness and attitudes play crucial roles in shaping individual and community responses to climate change adaptation strategies. Increased awareness is often considered necessary in the first stages of the adaptation process to manage climate change impacts (Ricart et al., 2023). This is supported by Anzum et al. (2023), who also found that small holder farmers' adaptation can be influenced by understanding climate change

risks, and the significance of adopting climate change adaptation strategies. On a similar note, studies such as by Blennow (2012), Vulturius et al. (2018), Hengst-Ehrhart (2019), and Mortreux et al. (2020): all argued that attitudes towards risk and farmer's perception might facilitate or hinder the adaptation process. For instance, in Pakistan, Fahad and Wang (2020) identified farmers implementing changes in crops and farm diversification as they adapted to climate change, although their perception of climate change was treated as one of the explanatory factors. Similarly, Naicker et al. (2025) reported that smallholder farmers' adaptation strategies to climate variability are influenced by awareness, resource access, household perception of climate change, awareness of climate-related risks, and perceived impacts of climatic events.

Furthermore, the data in Figure 3 indicate that farmers failed to apply the adaptation strategies due to low levels of income. It was observed that most farmers were able to obtain a monthly income of TZS200,000 (USD77) as the maximum earning from agricultural activities. This low income led to some farmers not being able to access adaptation strategies like affording drought-resistant seeds. During FGDs in Babayu Village, a male farmer, aged 56 years, made the following comment:

I would like to buy drought-resistant and short-term seeds; however, the price is high ... I cannot afford it, so I am using local seeds even though I am aware that I will not harvest as much as if I managed to buy drought-resistance seeds (Babayu Village, March 2022).

This statement indicates that low income limits farmers' ability to adapt to climate change. These findings corroborate the findings by IPCC (2020): that the constraints and limits to adaptation in Africa result from the state of poverty and wellbeing of the people. Similarly, Kabote et al. (2024) are of the opinion that, in Tanzania, poverty is the principal limiting factor towards farmers' adaptive capacity.

Social network is another factor that influences farmers' choice of adaptation strategies in Chemba District. Social network (relationships, associations, clan hoods) facilitates the flow of climate-related information, knowledge, and resources among farmers. In Babayu Village, this was noted by 14% of the respondents, and in Kidoka by 11%. Farmers' choices are often shaped by access to information and essential resources; and also by observing peers who have successfully implemented adaptive strategies. Interviews with the representatives from CBOs revealed that peer knowledge and skills influence adoption by maize farmers. One of the participants gave the following comment:

"...some of the maize producers say that I decided to adopt the use of drought tolerant seeds because I was influenced by a friend who is also my neighbour at the farm ...he has been using these seeds for the past three years, and I found he managed to increase farm harvest ...then I decided to adopt as well."

Limitations in these areas can hinder farmers' ability to adopt effective adaptation measures. Pauline's (2023) study observed the same – that available farm inputs determine farmers' choice towards varieties of adaptation strategies. However, Kihupi et al. (2015) had a different opinion: they claimed that smallholder farmers would like to increase maize yield, but their efforts are constrained by inadequate agricultural inputs like improved seeds and fertilizers, as well as the lack of purchasing power due to unaffordable price of the inputs.

Furthermore, motivation plays a crucial role in driving individuals towards climate change adaptation. The study findings revealed that some farmers adopted the adaptation strategies due to motivation from peer farmers in the study villages. The participants who reported motivation as impactful in Babayu village were 8%, and in Kidoka they were 10%. In this regard, the following comment was made in an interview with one extension officer in the study villages:

“When farmers see the success of climate change adaptation practices through Field Farmers' School (FFS) ('Shamba Darasa' in Kiswahili) demonstrations, they gain confidence to try them out on their own farms...because they can see the results with their own eyes. This has been a powerful tool in motivating farmers to adopt new strategies to cope with changing weather patterns.”

What such a comment implies is that sometimes farmers adopt climate change adaptation strategies when they are motivated/influenced by others who are applying certain strategies and achieving positive results; or are motivated by agricultural extension officers through FFSs. Unfortunately, motivation or inspiration from FFSs or extension officers in Africa has not been very effective. A report by the IPCC (2020) on the evidence of global adaptation capacity, proclaims that there is a low global adaptation capacity among smallholder farmers due to low or lack of motivation/influence from external forces. Purwanti et al. (2023) add that perceived risks of climate change significantly influence motivation to adapt to strategies or farming practices.

5. Conclusion and Recommendations

The article has analysed the socio-demographic factors affecting/influencing farmers' choices in adopting climate change strategies in Tanzania. It has initially analysed the climate change adaptation strategies adopted by maize farmers to adapt against climate change impacts. Also, the article has shown that demographic and socio-economic features of farmers (i.e., age, sex, marital status, education, etc.) influence what, how, and when to adopt a particular strategy. Because of these factors, farmers adopt different strategies that include using drought-resistant seeds, applying artificial or industrial fertilizers, destocking, using pesticides, doing early planting, and using organic manure. The findings also show that elderly maize farmers prefer and practice traditional and long-lived strategies like using organic manure because of their long-standing experiences and resistance to new strategies.

The younger and middle-age populations mostly used artificial fertilizers, pesticides, and high yielding seeds. On the one hand, these results highlight the necessity to consider the *demography of adopters and adapters* when devising or advocating for climate change interventions. On the other hand, demographic features of adapters/adopters become *capabilities of climate change adaptations* once they are considered, nurtured or integrated in the implementation; otherwise they become obstacles to the *climatology of adaptation* once they are ignored. Therefore, it is recommended that the government, agencies and institutions responsible with climate change interventions should seriously take on board demographic characteristics of adopters/adapters when planning and/or implementing climate change adaptations initiatives.

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