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Climate Threat to Agriculture and Food Supply: Implications for Adaptation and Resilience

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Abstract
Climate change is not only the reason behind most contemporary economic problems, but also a growing national security threat. The rising inflationary pressures in the food sector are one of these problems, and stable food prices are a necessity for economic development, stability and social cohesion in societies. This study assesses the effects of climate change on agriculture and food security using primary data collected from 100 farmers in Jawhar, Somalia. Utilizing a descriptive research approach, primary data was collected and analysed to understand local perceptions and impacts. The findings reveal a high level of farmer awareness regarding climate change, with direct observations of irregular rainfall and increased temperatures. These climatic shifts have profoundly impacted agricultural productivity, leading to significant declines in crop yields, critical water scarcity for irrigation, and a subsequent loss of agricultural income. A direct correlation was found between these factors and heightened food insecurity within the community. The study concludes that Jawhar's farming communities are highly vulnerable to climate shocks and lack sufficient institutional and governmental support, relying heavily on non-governmental organizations for assistance. These findings underscore the urgent need for tailored, sustainable, and government-backed adaptation strategies to build long-term resilience in the face of climate change.

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1. Introduction

Climate change, fuelled by natural cycles and human activity, gravely imperils global development. Increased greenhouse gases drive global warming, causing extreme weather, affecting crops, soil water, and increasing diseases. This leads to low, unpredictable yields, making farmers, especially in Africa, highly vulnerable (Bello, *et al*. 2012) [1]. Africa's rain-fed, agrarian economies are profoundly impacted by climate variability, poverty (Adam & Kulmie, 2024) [52]., and limited technology (Ibrahim, *et al*. 2024) [37]. Somalia exemplifies this, battling irregular rainfall, rising temperatures, and rapid desertification. Agricultural areas face floods and ecosystem destruction, displacing communities. Such environmental threats cause devastating crop failures, exacerbating hunger and poverty (Erdogan, *et al*. 2024) [2]. Many Somali farmers are abandoning agriculture (Abdi-Soojeede, 2018) [3]. Therefore, studying climate change's impact on agricultural communities is crucial.

Climate change is a growing national security threat, significantly impacting natural resources, ecosystems, and biodiversity. As a result, it's expected to cause food insecurity, human migration, and economic and social depression, potentially leading to environmental crises that undermine national development (Enete, 2014) [4]. Climate change poses a significant threat to communities, particularly in Somalia due to its geography and climate-sensitive agriculture. Moreover, local farmers in Somalia face significant challenges such as unstable weather, water scarcity, pests, and limited access to essential resources like seeds and fertilizers (Abdi-Soojeede, 2018) [3]. Said & Bashir (2023) [7] and Abdullahi and Arısoy (2022) [5] found that farmers' reliance on traditional practices and a lack of technical support from government and institutions limit their ability to adapt to climate change, leading to insufficient agricultural production. These issues significantly harm rural and farming communities, thus, addressing them is vital for a sustainable economy.

Somalia, a fragile nation with social instability and humanitarian crises, is highly susceptible to climate change, leading to increased food shortage, hunger, malnutrition, and food crisis, population displacement, and resource conflicts (Ahmed, *et al*. 2024) [9]. More interestingly, Omar *et al* (2025) [10] study on climate variability in Somalia found that rainfall positively impacts livestock and food production, while rising temperatures negatively affect livestock productivity. Other studies on climate change have been conducted, and primarily focused on its effects on conflict, migration dynamics, and pastoralists (Amir, 2024; Ahmed *et al*., 2024; Mohamed *et al*., 2025) [11, 9, 10]. However, this study emphasizes the need for improved climate adaptation strategies to enhance agricultural resilience, while specifically explores the climate threat to agriculture and food security, with a focus on farmers in Jawhar district of Somalia.

2. Literature Review

2.1. Understanding Climate Change Perceptions

Climate change, despite its environmental, social, and economic significance, is not easily identified by the public using their usual observation and inference tools. Climate is a phenomenon that describes average weather conditions or their typical range for a region, and in the meteorological sense. It refers to systematic, gradual changes in average conditions, embedded in random fluctuations expected for both stable and changing climates (Weber, 2010) [15]. Recent studies on climate change risk perception are on the rise, primarily examining awareness, adaptation, and responses. Crucially, assessing farmers' perceptions alongside hydrometeorological observations is vital for enhancing climate change impact assessments and developing effective mitigation and adaptation strategies (Shrestha *et al*., 2022) [14].

Previously, Weber, (2010) [15] noted that climate change is a major concern for communities, and organizations, affecting their long-term strategic decisions; adding that climate perceptions and beliefs can influence individual and household decisions, particularly adaption and mitigation efforts. Howe, *et al*. (2019) [16] climate change perceptions influence individual and societal responses to the crisis, as humans are unable to directly perceive changing weather conditions and extreme events like heatwaves, floods, and wildfires. Public perceptions are shaped by several key elements: weather and related events, economic conditions, sociopolitical developments, and the influence of media (Whitmarsh & Capstick, 2018) [17]. Crucially, an individual's worldviews and ideology also play a significant role (Whitmarsh & Capstick, 2018) [17]. Therefore, climate change perceptions vary across nations and have fluctuated over time (Capstick, *et al*. 2015) [18].

2.2. Categories of Climate Change Beliefs

Additionally, Steg (2023) [19] revealed that climate change beliefs are a significant factor motivating people to engage in climate actions. These beliefs can be categorized into three types: real, human-caused, and negative consequences. People are more likely to engage in mitigation and adaptation actions when they perceive climate change as real, human-caused, and threatening. Stronger climate change perceptions also increase the likelihood of specific climate hazards. People worldwide strongly believe in the reality and negative consequences of climate change, leading to growing concern. Efforts to increase perceptions have weak effects, and stronger climate change beliefs promote both mitigation and adaptation behaviours (Van Valkengoed, *et al*. 2021) [20]. From this perspective, perceptual studies offer crucial insights into the understanding and impacts of climate change, especially concerning farmers, agriculture, and food security. Frondel, *et al*. (2017) [21] analysed the determinants of individual risk perception associated with three types of natural hazards: heat waves, storms, and floods, focusing on the role of objective risk measures and experience with these natural hazards, which are likely to be affected by climate change. The results suggest that personal experience with adverse events and personal damage are strong drivers of individual risk perception.

2.3. Link Between Perception and Mitigation/Adaptation Behaviours

Perception studies on climate change assert that awareness of its risks directly encourages adaptation and prevention measures, ultimately fostering sustainable living. This underscores that awareness, as a knowledge resource, is essential for building resilient communities (Yadav, 2025) [25]. Theoretically, a deficit in awareness and knowledge is posited to result in inaction regarding climate risk. For instance, Frondel *et al*. (2017) [21] found that while most European citizens acknowledge global climate change and anticipate its negative consequences, they perceive it as a distant threat. This belief in short-term immunity contributes to a lack of immediate action. However, promoting public awareness of climate risk is a primary factor for community prevention, adaptation, and resilience, aligning with community-based climate risk management (CBCRM) approaches. This highlights how local community awareness is central to CBCRM, as localized climate action demanding region-specific solutions aligned with global goals are crucial for addressing the climate crisis (Yadav, 2025) [25].

2.4. Factors Influencing Climate Change Perception

The adaptation of farmers to climate change is driven by a complex interplay of factors directly impacting their choices and capabilities. Their demographics and socio-economic situation, including age, education, and farm size, heavily influence available resources and willingness to adopt new practices (Dang, *et al*. 2019) [28]. Importantly, access to resources, services, and technologies, such as credit, vital

climate information, extension support, and irrigation, empowers farmers to implement adaptive measures.

Institutional and political frameworks, including government policies and market access, either facilitate or constrain their adaptive decisions. Furthermore, social and cultural norms within farming communities shape collective responses and the acceptance of innovative approaches (Menike & Arachchi, 2016) [29]. However, Sharma (2022) [13] stresses that farmers have started considering erratic rainfall, increasing temperatures and water shortfall as most important threats to agriculture which calls for adaptation strategies and resilient farming practices to ensure food security. Finally, a farmer's cognitive and psychological state, particularly their personal belief in climate change and perception of its risks, is fundamental to their decision to adapt and build resilience. Figure 1, depicted blew, illustrates factors that influence farmers adaptation to climate change, marking adaptive capacity at cereal point, while institutional and political, technologies resources and serves, demographic and socioeconomic, social and cultural, and cognitive and psychological are surrounding factors.

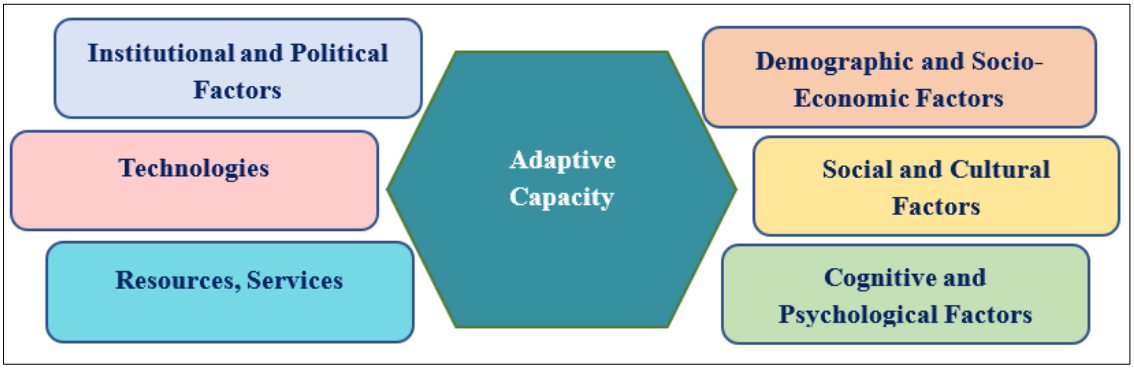

Fig 1: illustrated factors influence farmers' adaptation to climate change

2.5. Impacts of Climate Change on Farmers

The severity of the negative impacts of climate change on agriculture is predicted to increase further due to the increase in global warming. Agriculture is a crucial part of the economy, providing food security and employment. However, climate variability and change have negatively impacted this sector, with the situation expected to worsen in the future. The temperature and rainfall have a negative effect on agricultural production in Kenya (Ochieng, *et al*. 2016) [30]. Prioritizing adaptation measures at national, community, and farm levels and implementing policies to prevent environmental destruction will help address these challenges. Another study by Enete, (2014) [4] reveals a shift in seasonal rainfall patterns in Enugu State, Nigeria, indicating climate change, affecting traditional crops and causing significant yield decreases, necessitating farmers in Enugu to adapt to climate-adapted species. In Somalia, Climate change is causing displacement, transforming migration patterns into forced displacement (Amir, 2024) [11].

2.6. Adaption and Resilience to Climate change

Climate change impacts are already felt, and adaptation is a priority for human development. Adaptation to Climate Change presents a framework for resilience, transition, and transformation, illustrating the diversity of contexts where adaptation is unfolding (Pelling, 2010) [44]. Adaptation and resilience are crucial in addressing climate change, especially in vulnerable sectors like agriculture. Adaptation involves adjusting to climate changes, adopting new farming practices, using climate-resilient technologies, and accessing information. Resilience refers to individuals, communities, and systems' capacity to absorb disturbances and maintain function in the face of climate impacts. Building resilience relies on strong awareness of climate risks, robust socio-economic conditions, effective policy frameworks, responsive governance and climate-smart agriculture. These factors empower communities and farmers to prepare for and recover from climate shocks, fostering sustainable living. Climate-Smart Agriculture (CSA) aims to address food security and rural livelihoods while minimizing environmental impacts; however, small-scale farmers are often overlooked in implementing new practices and technologies (Azadi, *et al*. 2021) [33].

Hussien & Kulmie (2024) [39] suggests enhancing water conservation, land management, and sustainable agriculture through drought-resistant crops, early warning systems, and livelihoods, while also promoting community engagement and climate-smart adaptation plans. Uddin *et al*. (2014) [32] studied Bangladeshi agriculturalists' adaptation to climate change, revealing irrigation as the most effective coping strategy, but water scarcity, land scarcity, and unpredictable weather were significant constraints. The government's role in adaptation and coping is to create a supportive environment to address these constraints. They achieve this by implementing policies and regulations to manage resources, investing in infrastructure and technology like irrigation systems and weather forecasting, and providing support and information through extension services and financial aid (Ward, 2010) [35]. This multi-faceted approach helps communities effectively navigate climate-related challenges. Feinstein & Mach, 2020) [34] highlights that education can effectively aid climate change adaptation through improving general education and accelerating social and policy change through research-based adaptation learning support.

2.7. Policy and Governance for Climate Challenges

Dang, *et al*. (2019) [28] noted that institutional and political factors play crucial role in promoting awareness, prevention and adaption of climate threats to agricultural communities. Particularly policy and governance are crucial for addressing climate challenges, focusing on decentralized decision-making, community participation, and local knowledge integration; therefore, tailored frameworks, financial support,

and inclusive practices empower communities, while policy coherence at local, national, and international levels scales solutions (Helling, *et al*. 2005) [26]. Amir, 2024) [11] highlights gaps in legal frameworks and calls for integrated policies to protect effected people's livelihoods. Governance innovations have emerged in recent years to promote climate change mitigation and adaptation, involving multiple actors at various levels (Wolfram, *et al*. 2019) [40].

3. Methodology

A descriptive research approach (Atmowardoyo, 2018) [43] was used in this study to examine the effects of climate risk on agriculture and food security in the Jawhar district of Somalia. It allows for an assessment of the current state of a phenomenon without manipulating variables. The study aimed to describe the perceptions of farmers regarding climate change risks and their impacts on agricultural practices and livelihoods. By using this approach, the researchers were able to collect primary data from farmers and using data to address their experiences with erratic rainfall, extreme weather, and rising temperatures. This method is suitable for documenting the views of the farming community and highlighting their readiness to engage in adaptation and mitigation efforts. The researchers gathered information directly from 100 farmers by asking them questions through a survey. Once all the surveys were completed, the numerical data was processed and analyzed using a specialized software system of SPSS (Statistical Package for the Social Sciences) (Pallant, 2013) [45]. This software helped the researchers to find patterns and draw conclusions from the farmers' responses. The demographic profile of the farmers, their perceptions of climate change, and the impacts on agriculture were all presented in a series of tables that included counts and percentages for each response. These tables were used to visually represent the survey results and support the study's conclusions.

4. Findings and Discussions

4.1. Demographic Profile of Farmers

Table 1 below indicates that the demographic profile of the surveyed farmers reveals a predominance of male respondents, accounting for 84% of the sample, while females represent 16%. Regarding age distribution, more than half of the farmers (55%) are below 30 years old, indicating a relatively young farming population. The remaining respondents are distributed as follows: 25% are aged between 31 and 40 years, and 20% are above 40 years. In terms of educational attainment, most of the farmers (60%) have no formal education, highlighting potential challenges related to literacy and access to formal agricultural training. Primary education is attained by 20% of respondents, while secondary and university education levels are equally represented at 10% each. This educational profile suggests that capacity-building and tailored training programs could be essential for enhancing farming practices and adapting to climate challenges within this community. The gender imbalance reflects Somalia's patriarchal agricultural structure, where women often lack land rights and access to resources despite their role in food production (Food and Agriculture Organization of the United Nations, 2023) [22]. The young farming population signals potential for innovation but requires targeted training, especially filling the education gap. Low literacy rates (60% unschooled) hinder adoption of climate-smart practices, as seen in similar contexts like Kenya's ASALs, where training programs failed due to illiteracy (Alliance for a Green Revolution in Africa, 2022) [6].

Table 1: Demographic Profile of Farmers

Category	Subgroup	Count	Percentage (%)
Gender	Male	84	84%
	Female	16	16%
Age Group	Below 30	55	55%
	31–40	25	25%
	Above 40	20	20%
Education Level	No Formal Education	60	60%
	Primary Education	20	20%
	Secondary Education	10	10%
	University	10	10%

4.2. Farmers Perceptions Towards Climate Change Risk

Farmers' perceptions of climate change risks are crucial in their decision-making process, as they influence their agricultural practices and livelihoods. These perceptions are shaped by factors like personal experience, education, access to information, and trust in scientific data. They influence whether farmers will adopt new adaptation strategies or technologies to protect their crops and income. Table 2 demonstrates data on the loss of agricultural income due to climate change. Among the surveyed farmers, majority have been significantly affected. Specifically, 34% of respondents reported a significant impact, while 24% experienced a very significant impact on their agricultural income. Additionally, 20% noted a moderate impact, and 16% reported slight impact. Only a small proportion, 6%, indicated that climate change had no impact on their agricultural income. These findings highlight the considerable economic challenges faced by farmers in adapting to changing climatic conditions, emphasizing the need for targeted interventions to support income resilience in the agricultural sector. Income losses align with Somalia's recurring climate shocks. The 2022–2023 drought, caused a 40–60% drop in agro-pastoral incomes nationally (World Bank, 2022) [41], forcing farmers into debt or asset sales. Comparable losses were documented in Ethiopia's Somali Region, where 70% of households sold livestock to survive (Food Security and Nutrition Analysis Unit, 2023) [23].

Table 2: Loss of Agricultural Income Due to Climate Change

Impact Level	Response	Percentage
Significant Impact	34	34%
Very Significant Impact	24	24%
Moderate Impact	20	20%
Slight Impact	16	16%
No Impact	6	6%

Still, Climate change awareness and its impacts are crucial for farmers to adopt new farming practices. Awareness doesn't guarantee action, but it's often a prerequisite for considering changes like crop varieties, planting times, and soil and water conservation techniques. Farmers' perception of risks like increased droughts or floods drives them to seek and implement adaptive strategies. Table3, shows that a high-level awareness of climate change exists among the farmers, with 90% having heard about the phenomenon. An even greater proportion, 95%, believe that climate change is affecting their community, reflecting strong recognition of its local impacts. Furthermore, 97% of respondents reported having noticed climate-related changes in weather patterns or environmental conditions over the past 5 to 10 years. These findings demonstrate a widespread awareness and concern about climate change within the farming community, highlighting their readiness to engage in adaptation and mitigation efforts. However, awareness rarely translates to adaptive capacity without technical support. In South Sudan, 85% of farmers recognized climate shifts but lacked resources to respond (John, 2024) [27]

Table 3: Climate Change Awareness and Perceived Impacts Among Farmers

Question	Response	Count (n)	Percentage (%)
Heard about climate change?	Yes	90	90%
	No	10	10%
Perceived risk on community?	Yes	95	95%
	No	5	5%
Experienced impacts (past 5–10 years)?	Yes	97	97%
	No	3	3%

Table 4 states that farmers' observations of changes in weather patterns over the past 5 to 10 years reveal significant shifts attributed to climate change. Increased temperature was identified as a very significant change by 45% of respondents, with an additional 35% noting it as a significant change, and 20% as moderate. Decreased or irregular rainfall showed even stronger impact perceptions, with 55% describing it as a very significant change, 25% significant, and 20% moderate. Prolonged droughts were similarly recognized, with 45% indicating a very significant change, 35% significant, and 20% moderate. These results underscore widespread recognition of critical climatic variations affecting agricultural conditions, which likely contribute to the challenges farmers face in crop production and water management. Jowhar's Shabelle River Basin has warmed 1.8°C since 1980 (FEWS NET, 2023) [42], reducing river flow and intensifying droughts. Similar rainfall declines in Somalia's "Gu" season (2020–2023) caused 70% crop failure in riverine areas (FSNAU, 2023) [23].

Table 4: Observed Changes in Weather Patterns (Past 5–10 Years)

Weather Pattern Change	Impact Level	Count (n)	Percentage (%)
Increased Temperature	Very Significant Change	45	45%
	Significant Change	35	35%
	Moderate Change	20	20%
Decreased/Irregular Rainfall	Very Significant Change	55	55%
	Significant Change	25	25%
	Moderate Change	20	20%
Prolonged Droughts	Very Significant Change	45	45%
	Significant Change	35	35%
	Moderate Change	20	20%

4.3. Farmers View on Climate threat on Agriculture and Food Security: Impacts and Resilience Analysis

Climate change is posing a threat to farmers' livelihoods and food security, causing erratic rainfall, extreme weather events, and rising temperatures. These changes affect crop yields, soil health, and water availability, causing income loss and poverty. Farmers are adopting new agricultural methods to adapt. Table 5 indicates that the perceived impacts of climate change on various agricultural aspects are substantial among the surveyed farmers. A majority (65%) reported a very significant impact on overall crop yield, with the remaining 35% indicating a significant impact. Water scarcity for irrigation is viewed as an even more critical issue, with 70% of respondents describing its impact as very significant and 30% as significant. Similarly, loss of agricultural income due to climate change was reported as very significant by 68% of farmers, and significant by 32%. These findings highlight the profound effects climate change is having on agricultural productivity and livelihoods, underscoring the urgent need for effective adaptation strategies to mitigate these impacts. Water scarcity is acute in Jowhar, where 90% of agriculture depends on flood recession

farming. Reduced river flow in the Shabelle basin has significantly decreased sorghum and maize yields, with the 2024 Deyr harvest estimated at 44% below the long-term average (Food and Agriculture Organization of the United Nations; Ministry of Agriculture, Federal Government of Somalia, 2023; 2025) [24, 36]. Similarly, in Kenya's Tana River Basin, erratic rainfall and flow variability have led to substantial maize yield declines (Ondiek, *et al*. 2024 [31]; International Water Management Institute, 2019 [38]).

Table 5: Perceived Impact of Climate Change on Agriculture

Impact Area	Impact Level	Counts	Percentage (%)
Overall Crop Yield	Very Significant Impact	65	65%
	Significant Impact	35	35%
Water Scarcity for Irrigation	Very Significant Impact	70	70%
	Significant Impact	30	30%
Loss of Agricultural Income	Very Significant Impact	68	68%
	Significant Impact	32	32%

According to Table 6, the overwhelms majority of farmers (97%) reported that climate change has affected food availability, highlighting the critical nature of food security challenges in the community. Among the primary manifestations of food insecurity, 60% of respondents identified higher food prices as a major issue, while 40% reported loss of crops or livestock. Regarding the frequency of food insecurity, 65% indicated that they are sometimes affected, and 35% reported always experiencing food insecurity. To cope with food scarcity, 65% of farmers resort to buying cheaper or less nutritious food, and 35% reduce the number of meals they consume per day. These findings reveal significant vulnerabilities in food security linked to climate change and illustrate the adaptive strategies employed by farmers to manage scarcity. Food price inflation in Somalia hit 15% in 2023 due to crop failures (World Food Programme, 2023) [42], forcing households into negative coping strategies. Diet simplification (e.g., skipping meals) increased child malnutrition by 25% in Bay Region (UNICEF, 2024) [46].

Table 6: Food Security Impacts and Coping Mechanisms 6

Question	Response	Counts	(%)
Has climate change affected food availability?	Yes	97	97%
	No	3	3%
Primary manifestation of food insecurity	Higher food prices	60	60%
	Loss of crops/livestock	40	40%
Frequency of food insecurity	Sometimes affected	65	65%
	Always affected	35	35%
Coping mechanisms during food scarcity	Buying cheaper/less nutritious food	65	65%
	Reducing meals per day	35	35%

According to the analysis on climate change adaptation among farmers reveal varying levels of adoption, which in turn effects their level of resilience, (see figure 2; below). Half of the respondents (50%) sometimes use drought-resistant crops, while 35% often change planting or harvesting times to adjust to climate variability. Building water storage systems is less common, with only 15% reporting occasional use. Regarding training, 70% of farmers have received climate adaptation training, suggesting good outreach, although 30% have not yet benefited. In terms of support needs, 40% of respondents prioritized improved irrigation systems, 30% requested financial aid or credit, and 20% emphasized access to resilient seed varieties. These findings highlight both the progress and gaps in adaptation practices and underscore key areas where support and resources are needed to enhance climate resilience in the agricultural sector. Limited adoption of water storage (15%) reflects high costs and technical barriers. In contrast, drought-resistant sorghum adoption in Somaliland increased yields by 30% (FAO Somalia, 2025; UNDP, 2024) [24] Irrigation demand aligns with World Bank projects rehabilitating Somalia's canals.

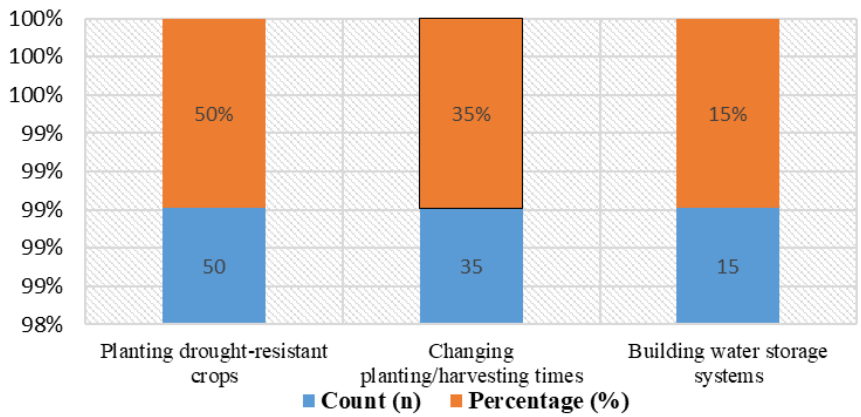

Fig 2: Climate Resilience Strategies

This study also found that farmers perceive varying levels of climate change impact across different food categories. As shown in table 7, vegetables and fruits are seen as the most highly affected, with 45% and 40% of respondents, respectively, indicating a high level of impact. Cereals also face considerable effects, with 35% highly affected and 20% completely affected. Legumes and oil crops show a slightly lower perceived impact, though still significant, with 30% of farmers reporting high effects. Livestock products appear somewhat less affected, comparatively, with only 25% reporting a high impact and 10% completely affected. These perceptions highlight key vulnerabilities in the local food system, especially for perishable crops like fruits and vegetables, underscoring the need for targeted adaptation measures to safeguard food security. Perishable crops are vulnerable to heat stress and water scarcity. Somalia's tomato production fell 60% in 2023 due to droughts (Food and Agriculture Organization of the United Nations, 2023) [22]. Cereal losses mirror Malawi, where maize yields dropped 35% under similar conditions (Yadav, 2025) [25].

Table 7: Perceived Impact of Climate Change on Food Categories

Food Type	Not Affected (%)	Slightly Affected (%)	Moderately Affected (%)	Highly Affected (%)	Completely Affected (%)
Cereals	5%	15%	25%	35%	20%
Fruits	3%	12%	30%	40%	15%
Vegetables	2%	10%	28%	45%	15%
Legumes	8%	17%	35%	30%	10%
Oil Crops	7%	20%	33%	30%	10%
Livestock Products	10%	25%	30%	25%	10%

Similarly, the results show that most surveyed farmers (65%) reported not receiving any food assistance during climate-related crises, indicating significant gaps in support coverage. Among those who did receive assistance (35%), NGOs and international organizations were the predominant providers, accounting for 77% of aid distribution. Government support was reported by only 15% of recipients, while local community support constituted 8% (see Table 8). These findings suggest that while non-governmental actors play a vital role in crisis response, there is potential to strengthen government and community-based food assistance mechanisms to better reach vulnerable populations. NGOs dominate aid due to weak state capacity. Only 20% of Somali households access government safety nets (United Nations Development Programme, 2023) [47]. In 2022, WFP and NGOs reached 2M people, but funding gaps left 40% uncovered (United Nations Office for the Coordination of Humanitarian Affairs, 2023) [49].

Table 8: Food Assistance During Climate Crises

Question	Response	Count	Percentage
Received food assistance?	No	65	65%
	Yes	35	35%
Primary assistance providers?	NGOs/International Organisations	77	77%
	Government	15	15%
	Local Community Support	8	8%

According to the results of the study, farmers employ various coping mechanisms during periods of food scarcity, with differing frequencies. Table 9 shows that buying cheaper or less nutritious food (50%) and eating fewer meals per day (40%) are the most frequent strategies, reflecting broad changes in diet quality and quantity. Borrowing food or money is also a frequent coping method, with 40% using it sometimes and 25% often. Selling assets is less common, with only 15% reporting it often or always, reflecting its role as a more severe, less frequent coping strategy. Seeking food aid is utilized by 40% of households often, demonstrating reliance on external support during crises. Seasonal migration is the least frequent coping mechanism, with only 10% of households using it often or always, possibly due to social or economic constraints. These patterns highlight the diversity of strategies farmers rely on to manage food shortages and underline the importance of addressing both immediate needs and long-term resilience. Dietary compromises exacerbate malnutrition. In Somalia, 1.8M children faced acute malnutrition in 2023 (World Health Organization, 2023) [50]. Asset sales (15%) risk long-term poverty, as seen in Niger, where households lost 50% of wealth after droughts (World Bank, 2022) [41].

Table 9: Coping Mechanisms During Food Scarcity

Mechanism	Never	Rarely	Sometimes	Often	Always
Reducing meals per day	5%	10%	30%	40%	15%
Buying cheaper/less nutritious food	3%	7%	25%	50%	15%
Borrowing food/money	10%	20%	40%	25%	5%
Selling assets	20%	30%	35%	12%	3%
Seeking food aid	8%	12%	30%	40%	10%
Seasonal migration	25%	35%	30%	8%	2%

4.4. An Evaluation of Training, Support, and Policies from the Farmer's Perspective

Climate change training, support, and policies are essential for farmers to adapt to environmental changes. Training helps farmers learn new techniques, such as drought-resistant crops and improved irrigation. Support from NGOs and government agencies provides resources like seeds, equipment, and financial aid. Policies can either facilitate or hinder this process by creating subsidies, market access for new crops, and safety nets against crop failure. The effectiveness of these elements depends on their alignment with local conditions and traditional knowledge.

According to Table 10, among the surveyed farmers, 60% have received climate adaptation training, demonstrating moderate outreach of capacity-building programs. Non-governmental organizations (NGOs) are the primary providers of this training, accounting for 75% of all training delivered. Government agencies and community initiatives play a smaller role, providing 17% and 8% of training, respectively. This distribution highlights the significant contribution of NGOs in supporting climate adaptation efforts but also indicates opportunities for increased government and community involvement to expand and sustain these programs. NGOs led training due to their grassroots presence. In Puntland, FAO-NGO partnerships increased training access by 50% (Food and Agriculture Organization of the United Nations, 2023) [51]. However, sustainability is challenged by funding volatility.

Table 10: Climate Adaptation Training

Question	Response	Count	Percentage
Received adaptation training?	Yes	60	60%
	No	40	40%
Primary providers	NGOs	45	75%
	Government	10	17%
	Community Initiatives	5	8%

Table 11, Showes the average of the types of support that government provides to farmers' community to respond climate change. A major respondent of 24% stated that the government improved irrigation infrastructure. 23% of respondents revealed that they facilitated access to climate resilience seeds/livestock, the following three types of support of financial support (grants/loans), better weather forecasting information, and training on climate adaptation practices are reported nearly descending percentage of 19 % 18% & 16 % accordingly.

Table 11: Governmental Response to Climate Challenges

Support Type	Count (n)	Percentage (%)
Improved irrigation infrastructure	24	24%
Access to climate-resilient seeds/livestock	23	23%
Financial support (grants/loans)	19	19%
Better weather forecasting information	18	18%
Training on climate adaptation practices	16	16%

Moreover, the results presented in table 12, disclose the effectiveness of practical measures for increasing resilience, with an average rating of 4.35 highlights that Climate Adaptation Measures is very important, economic Incentives is rates as very important at rate 4.30, consequently, Agricultural Infrastructure was also rated at 4.20 while education & Community Awareness marked as 3.65. These results reflect the significant to persist the effectiveness of the practical measures to ensure community resilience, nevertheless for the farmers.

Table 12: Effectiveness of practical measures for increasing resilience (1-5 Scale: 1=Not Important, 5=Very Important)

Category	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Avg. Rating
Climate Adaptation Measures	3.5%	2.5%	8.0%	35.0%	51.0%	4.35
Agricultural Infrastructure	4.0%	3.0%	10.0%	36.0%	47.0%	4.20
Economic Incentives	2.0%	3.0%	8.0%	40.0%	47.0%	4.30
Education & Community Awareness	6.0%	8.0%	27.0%	35.0%	24.0%	3.65

5. Conclusion and Recommendations

This study set out to assess the effects of climate change on agriculture and food security among 100 farmers in the Jawhar district of Somalia. The findings provide compelling evidence that climate change is not a distant, theoretical threat but a present and profound challenge to the livelihoods and resilience of this community. A significant majority of farmers have a high level of awareness regarding climate change and its local impacts, directly observing changes such as increased temperatures and irregular rainfall. These climatic shifts have resulted in very significant and tangible negative consequences, including a decline in overall crop yields, a critical scarcity of water for irrigation, and a substantial loss of agricultural income. The data further highlights a direct link between these agricultural challenges and food insecurity, with most farmers reporting that food availability has been affected. The coping mechanisms adopted, such as purchasing less nutritious food and reducing daily meals, underscore the severe nature of the crisis. While a portion of the community receives some assistance, the study reveals significant gaps in support, with most farmers not receiving food aid during crises and a general perception that government efforts are insufficient. This disparity between high awareness and limited adaptive capacity points to a critical need for targeted, effective interventions. The community's reliance on NGOs for both training and

assistance demonstrates the vital role of these organizations but also reveals a potential weakness in the broader support system, which could be more sustainable with increased government and local community involvement. In essence, the study concludes that Jawhar's farmers are highly vulnerable to climate change. Their resilience is constrained by a lack of resources, technical support, and institutional backing, despite their strong awareness and willingness to adapt.

Based on these findings, it is recommended that a multi-faceted approach be adopted to enhance the climate resilience of Jawhar's agricultural communities. The government should take a leading role by developing and implementing policies that prioritize improved irrigation infrastructure and financial aid. Concurrently, efforts must be made to promote and disseminate practical, climate-resilient farming techniques. This includes increasing access to drought-resistant seed varieties and expanding training programs that focus on sustainable soil and water management. To ensure long-term sustainability, these initiatives should be built upon a foundation of collaboration, empowering local communities and strengthening the capacity of government agencies to work alongside local NGOs. Future research should then be conducted to evaluate the effectiveness of these intervene tions and continuously refine strategies to address the evolving challenges of climate change.

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