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Institutional Challenges Constraining the Performance of Agricultural Marketing Cooperative Societies (AMCOs) amid Climate Change

Insights from Coffee Farming in Nyasa District

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ABSTRACT

This study examines the institutional challenges that constrain the performance of AMCOS in the face of climate change in Nyasa District, an emerging coffee-producing area in southern Tanzania. Employing a qualitative case study approach, data were collected through 20 semi-structured interviews and four focus group discussions with AMCOS leaders from four cooperatives, complemented by a review of relevant policy documents and operational reports. Thematic analysis revealed six interrelated institutional challenges: volatility in global coffee prices, resistance to adopting improved and climate-smart farming practices, the persistent influence of unauthorized private buyers (locally known as Kangomba), limited access to affordable financing, inadequate transportation infrastructure, and the lack of local coffee processing facilities. These challenges collectively weaken cooperative governance, erode member trust, reduce operational efficiency, and constrain the ability of AMCOS to facilitate climate-resilient agricultural development. The findings underscore the need for integrated policy and development interventions, including cooperative-friendly financing mechanisms, infrastructure investment, regulatory enforcement, and participatory extension services. Strengthening the institutional embeddedness and adaptive capacity of AMCOS is critical to improving smallholder farmer livelihoods and ensuring the long-term sustainability of the coffee sector in climate-vulnerable rural areas.

Keywords
Climate Change
Coffee Sector
Institutional Challenges
Rural Development
Smallholder Farmers

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Introduction

Agricultural cooperatives are widely recognized as vital institutions supporting smallholder farmers by enhancing their access to markets, agricultural inputs, credit facilities, and technical knowledge [1]. In many developing countries, cooperatives are essential in reducing rural poverty, strengthening farmers' bargaining power, and building resilience to external shocks. Among these shocks, climate change has emerged as one of the most pressing challenges affecting agricultural productivity and rural livelihoods [2]. In Sub-Saharan Africa, where over 60% of the population depends on agriculture, cooperatives are increasingly promoted as instruments for inclusive rural development and critical actors in strengthening climate resilience and adaptation capacity among smallholder farmers [3].

In Tanzania, coffee remains a key export crop and an important source of income for over 400,000 smallholder farmers, particularly in the Southern Highlands, Northern Zone, and parts of the Ruvuma Region, including Nyasa District [4]. AMCOS have been established as farmer-owned institutions responsible for aggregating produce, distributing inputs, facilitating credit access, and coordinating collective marketing efforts to support coffee production and marketing. By 2022, more than 150 AMCOS were active within Tanzania's coffee sector [5]. Beyond these traditional roles, AMCOS are increasingly recognized for their emerging function in helping farmers adapt to climate change by facilitating information flow, resource mobilization, and collective risk management [6].

Despite their potential, the performance of coffee-based AMCOS is increasingly constrained by a combination of institutional weaknesses and climate-related risks [7]. Empirical evidence highlights persistent challenges such as limited access to affordable finance, weak governance structures, irregular or delayed member payments, and poor transparency and accountability mechanisms [8],[9]. These shortcomings erode member trust, weaken cooperative cohesion, and impair AMCOS's ability to deliver timely and effective services. More importantly, these institutional inefficiencies limit cooperatives' capacity to respond to intensifying climate risks, including erratic rainfall, prolonged droughts, rising temperatures, and pest and disease outbreaks that increasingly threaten coffee production [10].

AMCOS with limited institutional capacity often struggle to support their members in anticipating or responding to such climate impacts. Delayed access to inputs, inadequate

communication systems, and fragile financial foundations hinder the promotion of adaptive farming practices, the dissemination of climate information, and buffering against seasonal shocks [11]. This challenge is particularly acute given Tanzania's increasing exposure to climate variability and extreme weather events, jeopardizing coffee yields and income stability. Consequently, the intersection of institutional fragility and climate change has become a central concern for ensuring the sustainability and effectiveness of farmer cooperatives [12].

While the institutional challenges facing AMCOS, such as weak governance, financial mismanagement, and limited transparency, are well documented in established Tanzanian coffee-producing regions like Kilimanjaro and Mbinga [13],[14], less is known about these challenges in emerging coffee-growing areas. Climate variability also significantly threatens coffee productivity in these traditional zones [7],[15]. Nyasa District, an emerging coffee production area in the Ruvuma Region, faces additional institutional weaknesses, including inexperienced leadership and poor infrastructure, which are further exacerbated by escalating climate-related risks [16],[17].

There is a notable empirical gap in understanding how these institutional challenges intersect with climate change impacts in such emerging regions. Unlike established coffee zones with more mature cooperative systems, emerging areas like Nyasa represent a unique convergence of institutional fragility and environmental vulnerability that remains underexplored. This study seeks to fill that gap by investigating the institutional constraints limiting AMCOS performance in Nyasa District, focusing on their interaction with climate change-related risks. By addressing this gap, the research aims to generate localized insights to inform cooperative development policies, guide targeted institutional reforms, and contribute to designing climate-resilient support systems that enhance smallholder coffee farmers' adaptive capacity and livelihoods in Tanzania's underrepresented regions.

Literature Review

This study is grounded in Institutional Theory, initially developed by Meyer and Rowan [18] and expanded by DiMaggio and Powell [19]. Central to this theory is the concept of institutional embeddedness, which explains how organizations are deeply enmeshed within their institutional environments, comprising formal regulations, informal norms, social networks, shared values, and cultural beliefs. These institutional contexts fundamentally shape organizational structures, behaviors, and performance, extending beyond mere technical or economic factors [20],[21]. For AMCOS, institutional embeddedness means that their operations and effectiveness are closely linked to the quality and nature of their relationships with broader institutional actors and frameworks, including government agencies, financial institutions, community norms, and climate governance mechanisms [18],[19],[22]. The

degree to which AMCOS are embedded within these formal and informal institutions can either facilitate or constrain their ability to provide critical services such as credit access, input supply, governance, and climate adaptation support [8],[9].

In many cases, institutional weaknesses manifest as limited financial resources, inadequate leadership capacity, poor governance structures, weak transparency, and insufficient infrastructure, which are often rooted in or exacerbated by the broader institutional environment [13],[23]. For example, AMCOS, which lacks strong linkages with regulatory bodies or financial institutions, may face challenges in securing affordable credit or complying with policy requirements. At the same time, those embedded in communities with rigid social norms may struggle to ensure inclusive governance and member participation [10],[17]. This institutional embeddedness also shapes AMCOS' capacity to respond to external shocks such as climate change. Cooperatives operating in institutional settings with weak climate adaptation frameworks or limited resource mobilization mechanisms often lack the resilience to buffer members against climate variability, pests, and yield losses [6],[12].

The applicability of Institutional Theory to this study lies in its capacity to illuminate how the complex network of formal and informal institutional relationships directly impacts the performance and resilience of AMCOS in Nyasa District. By examining AMCOS through this lens, the study can uncover how specific institutional factors ranging from regulatory policies and financial systems to socio-cultural norms and climate governance interact to support or hinder cooperative operations. This approach enables a nuanced understanding of why AMCOS faces persistent challenges in providing effective services and adapting to climate-related risks in a context marked by institutional fragility and environmental vulnerability. Ultimately, Institutional Theory offers a robust lens for diagnosing these embedded institutional challenges and guiding the design of targeted interventions to strengthen cooperative governance, resource mobilization, and climate adaptation capacity.

Materials and Methods

A. Research design and study area

This study employed a qualitative case study design to investigate the institutional challenges constraining the performance of AMCOS amid climate change in Nyasa District. This approach was chosen for its ability to provide an in-depth, context-specific exploration of complex institutional dynamics, organizational processes, and the lived experiences of AMCOS leaders. These dimensions are difficult to quantify through purely quantitative methods. The qualitative case study design also enables the integration of multiple data sources, fostering a holistic understanding of how AMCOS operate within their unique institutional and environmental contexts [24]. The research was conducted in Nyasa District, located in the Ruvuma Region of southern Tanzania, a predominantly agricultural area where coffee farming

sustains the livelihoods of many rural households [25]. Nyasa was purposively selected due to its emerging role in Tanzania's national coffee sector, relative institutional underdevelopment, and heightened exposure to climate variability [26],[27]. The district also has an active AMCOS presence and faces significant climate-related challenges, with AMCOS leaders being pivotal in steering cooperative activities and adaptation efforts [28]. Data were collected from four AMCOS operating within Nyasa District: Kimbango AMCOS and Litindo AMCOS in Luhangarasi Ward, and Ukuli AMCOS and Kingerikiti AMCOS in Kingerikiti Ward. These cooperatives were purposefully selected to capture geographic diversity and operational variation within the district's coffee-growing landscape, providing a comprehensive view of the institutional challenges and adaptive strategies [14].

B. Data collection and analysis

The study employed qualitative methods for both data collection and analysis. A total of 20 semi-structured interviews were conducted with AMCOS leaders- chairpersons, deputy chairpersons, secretaries, and treasurers from four selected cooperatives in Nyasa District. These individuals were purposively selected due to their direct involvement in the cooperatives' management, decision-making, and day-to-day operations [14]. Four focus group discussions (one per AMCOS) were held to complement and triangulate the interview data. These discussions focused primarily on institutional challenges constraining the performance of AMCOS amid climate change. Key areas of inquiry included cooperative service delivery, governance structures, financial management, climate adaptation strategies, gender dynamics, and the nature of institutional support. A document review was undertaken to supplement the primary data to analyze relevant agricultural policies, AMCOS operational reports, and climate-related plans at both the district and cooperative levels. This helped contextualize the findings within broader institutional and policy frameworks [29].

Thematic content analysis was used to guide the interpretation of the data, with institutional challenges emerging as the central theme. The study identified recurring patterns and sub-themes such as weak governance, limited financial capacity, inadequate leadership, lack of transparency, infrastructural deficits, and the cooperatives' limited ability to respond to climate-induced risks. Ethical standards were strictly adhered to, with approval from the Nyasa District Council in the Ruvuma Region. Official permissions were secured before fieldwork, and informed oral consent was obtained from all participants. To protect participant identity and uphold research integrity, anonymity and confidentiality were rigorously maintained throughout the study.

Table 1. Data analysis framework

Main Theme	Sub-Themes
Institutional Challenges	1. Global Coffee Price Fluctuations
	2. Free Rider Problem (Kangomba)
	3. Insufficient Funding
	4. Transportation Challenges
	5. Lack of Local Coffee Processing Industries
	6. Resistance to Adoption of Improved Practices

Data Source: Interview and Focus Group Discussion

Results and Discussion

A. Demographic Profile of the Respondents

The study involved 20 AMCOS leaders drawn from four cooperatives in Nyasa District: Kimbango, Litindo, Ukuli, and Kingerikiti AMCOS. Each cooperative was represented by five key office bearers, including chairpersons, deputy chairpersons, secretaries, and treasurers. These individuals were purposively selected due to their direct involvement in the cooperatives' management, decision-making, and day-to-day operations [14]. Their insights were critical in understanding how institutional challenges affect cooperative performance, particularly in the face of climate-related pressures. Regarding gender, the leadership composition was predominantly male, with 14 men (70%) and six women (30%) participating in the interviews. While this distribution reflects the male-dominated structure that characterizes many rural cooperative institutions in Tanzania, the involvement of women in some key roles, primarily as secretaries and treasurers, indicates a gradual increase in female leadership and participation [11],[30]. This trend suggests emerging opportunities for gender inclusion within cooperative governance, although significant disparities remain.

The age distribution of respondents revealed that most AMCOS leaders were in the 40–49 age group, accounting for 45% of participants. Leaders aged 50–59 comprised 25%, while those in the 30–39 age range comprised 20%. Only 10% of the respondents were 60 years or older. This age profile indicates that cooperative leadership in Nyasa is primarily held by individuals in their mid-career stage, who often combine experience with a capacity for active engagement in management and field operations [31],[32]. Educational backgrounds among the respondents were varied. Approximately 40% had attained secondary education, while 30% had completed only primary school. Notably, 25% had received diplomas or certificates in agriculture, finance, or cooperative management—qualifications relevant to their leadership responsibilities. Only one respondent (5%) had no formal education. These findings suggest that while formal education levels remain modest, a growing presence of technically trained leaders within AMCOS structures could potentially strengthen cooperative governance and service delivery [33].

Regarding experience, half of the respondents (50%) had served in their respective AMCOS for between four and six years. Another 35% had over seven years of experience, while only 15% had served for less than three years. This indicates a relatively stable leadership base, with many respondents having accumulated considerable institutional knowledge [34]. However, as the findings later reveal, this experience does not always translate into effective performance due to persistent structural and systemic challenges. The demographic profile of AMCOS leaders thus reveals a leadership landscape shaped by moderate education levels, a predominantly male composition, mid-career age distribution, and varied lengths of service. These characteristics offer a meaningful context for interpreting how institutional embeddedness, leadership capacity, and governance practices influence AMCOS performance in the climate-vulnerable setting of Nyasa District.

B. Institutional Challenges Constraining AMCOS Performance

This section presents the key institutional challenges that undermine the performance of AMCOS in Nyasa District, especially regarding climate change. Drawing from semi-structured interviews and focus group discussions with AMCOS leaders, the study reveals how internal weaknesses and broader systemic constraints hinder the cooperatives' capacity to deliver essential services, maintain member trust, and facilitate climate adaptation. The findings highlight interconnected challenges that consistently emerged across the four selected cooperatives. These include global coffee price fluctuations, which erode financial predictability and member loyalty; resistance to change among farmers, which limits the adoption of climate-resilient practices; and the persistent problem of free riders or "Kangomba" buyers, who weaken cooperative structures by undermining collective marketing. Additional institutional barriers include insufficient funding and limited access to affordable credit, inadequate transport infrastructure, and the absence of local coffee processing industries within the district. Together, these challenges reflect the structural and institutional fragility of AMCOS in Nyasa, constraining their effectiveness and limiting the resilience of smallholder coffee farming systems in the face of increasing climate-related risks.

1. Price fluctuation in the world market.

   A major institutional challenge constraining the performance of AMCOS in Nyasa District is the fluctuation of global coffee prices. Findings from interviews and focus group discussions with AMCOS leaders revealed that these unpredictable price shifts severely undermine member confidence, discourage active participation, and threaten the financial stability of the cooperatives. Such volatility makes it difficult for AMCOS to offer consistent prices or plan effectively, weakening its capacity to serve and retain members.

As one AMCOS leader explained:

"When global coffee prices fall, our members become frustrated. They blame AMCOS, thinking we are not doing enough to secure better prices, even though these fluctuations are beyond our control."

Another leader stated:

"Whenever prices drop, we lose members. Some shift to private buyers or free riders in search of better returns. They often return when prices recover, but this constant movement makes it hard to maintain a stable and committed membership."

During a focus group discussion, participants further emphasized how global price instability constrains cooperative operations:

"We would like to offer better prices to our farmers, but the international market keeps changing. When prices are low, we generate less revenue, which affects our ability to pay staff or invest in essential services and infrastructure."

These perspectives underscore the vulnerability of AMCOS to external market forces. Because they depend heavily on exporting raw coffee, cooperatives are exposed to global price shocks driven by international demand shifts, speculative trading, and supply fluctuations. This finding reinforces the importance of price stability for the effective functioning of cooperatives.

2. Free Rider Problem (Commonly Known as *Kangomba*)

Data from interviews and focus group discussions revealed that, despite ongoing government efforts to regulate and centralize coffee marketing through AMCOS, unauthorized private buyers (commonly referred to as *Kangomba*) continue to operate widely in Nyasa District. These free riders purchase coffee directly from individual farmers, bypassing cooperative channels and undermining AMCOS operations. As a result, cooperatives face declining membership, reduced delivery volumes, and significant revenue losses. Additionally, this informal trade contributes to diminished government tax income, further weakening public support systems. The presence of *Kangomba* not only erodes the financial base of AMCOS but also disrupts collective marketing strategies and long-term cooperative sustainability.

A leader from Nambawala AMCOS explained:

"Sometimes we receive a low amount of coffee because some farmers sell their crops to free riders. This reduces income for AMCOS as well as government revenue."

Another AMCOS leader elaborated:

"Kangomba arrive early in the harvest season with cash, and farmers use them for immediate needs. But pulling produce out of the cooperative weakens our collective marketing efforts."

During a focus group discussion, leaders voiced further concern:

"These free riders don't adhere to quality or grading standards, yet farmers sell to them because they pay on the spot. This damages cooperative unity and undercuts those who wait for fair [cooperative] prices."

This problem aligns with broader cooperative literature. For example, in Moshi District report that over 50% of cooperative members engaged in free riding, receiving input subsidies and services without full membership contribution, choose private buyers when cooperative prices are low. Similar patterns were observed in Rwanda: farmers maintained parallel sales channels selling to cooperatives and independent buyers based on trust, convenience, and access to in-kind credit.

Table 2. Institutional Challenges, Illustrative Quotations, and Interpretations

Challenge	Illustrative Quotation	Interpretation
1. Price Fluctuation in the World Market	*"When global coffee prices fall, our members become frustrated. They blame AMCOS, thinking we are not doing enough to secure better prices."*	Global price volatility undermines member trust and cooperative stability, limiting AMCOS's ability to maintain loyalty and plan effectively.
2. Free Rider Problem (Kangomba)	*"Kangomba arrive early in the harvest season with cash... They weaken our collective marketing efforts."*	Unauthorized buyers disrupt collective systems, reduce AMCOS membership, and erode long-term cooperative sustainability.
3. Insufficient Funding	*"We rely heavily on conventional banks... high interest rates... delays in payments to our members. As a result, we are often blamed by farmers."*	Financial dependency on costly loans delays service delivery, damaging farmer-cooperative trust and weakening AMCOS' operational capacity.
4. Transportation Challenges	*"Our roads are in deplorable condition. When transporting processed coffee... It's not uncommon to spend an entire day on a single trip."*	Poor infrastructure and lack of transport increase operating costs and delay delivery, making AMCOS less efficient and competitive in the coffee value chain.
5. Lack of Coffee Processing Industries	*"All AMCOS in Nyasa depend on industries located in Mbinga District... our transport costs double... farmers lose money."*	The absence of local processing facilities adds logistical burdens, reduces quality, and limits economic benefits for AMCOS and farmers.
6. Resistance to Change	*"Even when improved Arabica seedlings are given for free... farmers cling to traditional varieties, even though they are less resilient."*	Farmer reluctance to adopt climate-smart practices hinders productivity and cooperative modernization, requiring enhanced extension efforts and trust-building.

3. Insufficient Funding

The effective operation of any organization depends on adequate financial resources. However, many AMCOS in Nyasa District face significant funding shortages that hinder operational efficiency. Interviews with AMCOS leaders highlighted a heavy reliance on conventional bank loans, which are often accompanied by high interest rates and lengthy approval processes. This financial dependency complicates day-to-day operations and frequently causes delays in service delivery, particularly in making

timely payments to coffee farmers after crop sales. Such delays risk eroding trust and damaging the relationship between farmers and the cooperatives.

One AMCOS leader shared:

"We rely heavily on conventional banks, which charge high interest rates. Sometimes the loan application process takes too long, causing delays in payments to our members. As a result, we are often blamed by farmers."

Another leader, through a focus group discussion, stated:

"By the time funds come through, harvest season is over. Farmers have waited weeks for payment, and their dissatisfaction grows. It's a serious trust issue for the cooperative.

These financial constraints not only limit the operational capacity of AMCOS but also undermine its credibility and legitimacy among members. Delayed payments reduce farmers' confidence in the cooperative system, potentially leading to decreased participation and increased likelihood of farmers seeking alternative buyers. This cyclical erosion of trust can weaken cooperative cohesion and jeopardize the long-term sustainability of AMCOS in a climate-vulnerable context where timely support and reliable financial flows are crucial for resilience.

4. Transportation Challenges

Transportation is a significant operational barrier affecting the performance of many AMCOS in Nyasa District. Interviews and focus group discussions with AMCOS leaders revealed several transportation-related issues, including poor road infrastructure and a lack of reliable transport vehicles. These constraints are particularly severe when moving processed coffee from Central Processing Units (CPUs) to processing industries or export facilities. The long distances involved drive up transportation costs and cause delivery delays, forcing AMCOS to hire expensive, and often unreliable, private transport services.

A leader from Litindo AMCOS explained:

"Indeed, we lack trucks to transport coffee from the Central Processing Unit (CPU) to the industry. We have to hire private transport at a high cost, and sometimes they delay because they are busy with their own activities."

Another leader remarked:

"Our roads are in deplorable condition. When transporting processed coffee to industries, it's not uncommon to spend an entire day on a single trip."

During a focus group discussion, participants added:

"We often schedule delivery days, but breakdowns and muddy roads turn a 4-hour journey into a full-day ordeal. By then, buyers have moved on."

These transportation challenges significantly undermine the operational efficiency and overall performance of AMCOS in Nyasa District. Poor infrastructure and unreliable transport services increase costs and cause delays that ripple through the entire supply chain, from coffee processing to market delivery. This reduces the cooperatives'

competitiveness and ability to secure timely payments for farmers, weakening farmer trust and participation. Moreover, the dependence on expensive private transport limits AMCOS' financial flexibility, exacerbating existing funding constraints. Addressing transportation barriers is therefore critical for enhancing the effectiveness of AMCOS, improving market access, and strengthening the resilience of smallholder coffee farmers against climate-related and economic shocks.

5. Lack of Coffee Processing Industries

It was revealed during interviews and focus group discursion that AMCOS in Nyasa District faces a significant logistical and economic challenge due to the absence of local coffee processing industries. Instead, they must transport their processed coffee crops to the neighboring Mbinga District, approximately 40 kilometers away. This increases transportation costs and creates inefficiencies, especially given the poor road infrastructure in the region. The lack of nearby processing facilities hinders the operational performance of AMCOS and reduces the potential economic benefits for smallholder coffee farmers. The increased cost and effort required to access processing services can discourage participation in the formal market and limit the profitability and sustainability of coffee farming in the district.

An AMCOS leader explained:

"Imagine, all AMCOS in Nyasa District, including ours, depend on industries located in Mbinga District, which is nearly 40 kilometers away. And to make things worse, the roads are in poor condition."

Another leader added:

"Because we must haul coffee far over bad roads, our transport costs double. Sometimes, quality has dropped by the time we arrive, and mills penalize us. Farmers lose money."

During a focus group discussion, one participant observed:

"We lose an entire morning just getting to Mbinga, which results in fewer deliveries per day and negatively impacts the timely payment for farmers' produce."

This situation highlights a key investment opportunity: constructing coffee processing industries within or near Nyasa District. Establishing such facilities would reduce transportation burdens, enhance the efficiency and performance of AMCOS, and contribute significantly to improving coffee farmers' income and economic stability in the region.

Discussion

The findings of this study underscore the multifaceted institutional challenges constraining AMCOS in Nyasa District. These challenges reflect broader structural issues deeply embedded within Tanzania's agricultural cooperative landscape and resonate with current debates on cooperative performance amid climate and market pressures. The

detrimental impact of global coffee price fluctuations on AMCOS performance aligns with widespread concerns about market vulnerability in agrarian economies. Recent literature increasingly highlights how price instability disrupts rural livelihoods by eroding producer trust and undermining cooperative stability [35],[36]. This vulnerability is exacerbated by climate change, which introduces further uncertainties in production [37]. Scholars emphasize that smallholder cooperatives remain highly exposed to global commodity shocks without effective risk mitigation mechanisms such as price stabilization funds, futures markets, or cooperative-managed insurance schemes [38]. This study confirms that AMCOS in emerging coffee regions like Nyasa lack protective buffers, illustrating the persistent gap between global economic forces and local institutional capacity.

Resistance among farmers to adopting improved coffee varieties and climate-smart agricultural (CSA) practices reflects a well-documented pattern in smallholder contexts globally [39],[40]. This behavioral inertia is often shaped by socio-cultural factors, risk perceptions, and limited trust in extension services [41]. Current scholarship advocates for participatory extension approaches and gender-sensitive programming to enhance CSA uptake [42]. The findings align with these perspectives, highlighting the critical role of AMCOS leaders as change agents who require enhanced institutional support and capacity building to foster behavioral change among hesitant farmers.

The persistent problem of “Kangomba” or free riders mirrors broader debates on cooperative governance and member loyalty in environments characterized by weak institutional enforcement and fragmented markets [8]. Side-selling is increasingly understood as a rational survival strategy rather than mere opportunism, particularly where cooperatives fail to offer timely payments or competitive prices [43]. Recent research advocates for hybrid institutional arrangements that combine formal regulation with community-based monitoring to sustain cooperative cohesion [44]. The ongoing presence of free riders in Nyasa underscores the urgent need to strengthen institutional embeddedness and trust-building within these cooperatives.

Financial constraints in this study echo extensive evidence of chronic undercapitalization of agricultural cooperatives across Sub-Saharan Africa [45]. Conventional banks often exclude cooperatives due to perceived risks and lack of collateral, pushing them towards costly loans that impair operational liquidity [46]. Emerging literature promotes innovative financial instruments tailored to cooperatives, including revolving funds, digital credit platforms, and public-private partnerships [47]. The call for diversified and localized financing sources to enhance cooperative resilience is central to contemporary cooperative development discourse, reinforcing this study’s emphasis on alternative funding mechanisms.

Infrastructure remains a critical bottleneck for rural cooperative efficiency. Recent studies link poor transport networks to increased transaction costs, market inefficiencies, and reduced competitiveness [48],[49]. These infrastructural deficits disproportionately affect emerging coffee regions lacking local processing industries, as demonstrated in Nyasa. Current policy debates highlight integrated rural development strategies that combine infrastructure investment with value chain strengthening to amplify cooperative impact [50]. This study empirically supports such integrated approaches, emphasizing that addressing infrastructural gaps is essential to unlocking the full potential of cooperatives as drivers of rural development and climate adaptation.

More broadly, this research contributes to the growing scholarly recognition of institutional embeddedness as a crucial determinant of cooperative performance and climate resilience [22],[51]. The complex interplay of formal policies, local norms, governance practices, and market relations fundamentally shapes cooperative effectiveness. In climate-vulnerable contexts, cooperatives embedded within strong, multi-scalar institutional networks demonstrate greater adaptive capacity [52]. The institutional fragility observed in Nyasa (manifested in governance weaknesses, resource constraints, and social dynamics) undermines the cooperatives' capacity to support smallholder adaptation. Therefore, strengthening institutional embeddedness is a key strategy to enhance climate resilience and promote sustainable livelihoods in emerging coffee-growing regions.

Conclusion

This study has highlighted the complex and interrelated institutional challenges constraining the performance of AMCOS in Nyasa District amid climate change pressures. Key challenges such as global coffee price volatility, farmer resistance to adopting improved practices, the persistence of free riders, limited financial resources, and inadequate infrastructure critically undermine the operational effectiveness and sustainability of AMCOS. These challenges are deeply embedded within the broader institutional environment, reflecting systemic governance weaknesses, market inefficiencies, and socio-cultural dynamics. The study affirms that strengthening institutional embeddedness (through enhancing governance, improving financial mechanisms, building infrastructure, and fostering trust) is essential for empowering AMCOS to fulfill its role as a pivotal agent of rural development and climate adaptation. Without addressing these foundational institutional barriers, efforts to improve cooperative performance and smallholder resilience in emerging coffee regions like Nyasa will remain constrained.

Policy Implications

Based on the study's findings, it is evident that the performance of AMCOS in Nyasa District is significantly constrained by institutional challenges that are deeply rooted in governance weaknesses, financial limitations, infrastructural deficits, and fragmented institutional linkages. An integrated and context-specific policy approach is required to address these issues effectively. Strengthening cooperative governance through capacity-building, transparent leadership practices, and participatory decision-making is essential to improve accountability and member trust. Enhancing AMCOS' linkages with supportive institutions can improve access to technical services, policy guidance, and market information. Financial inclusion should be promoted by introducing cooperative-friendly financing mechanisms such as low-interest loans, government-backed credit guarantees, and revolving funds to ease liquidity challenges and enable timely farmer payments. Investments in rural infrastructure, particularly road networks and local coffee processing industries, are critical for reducing operational costs, improving efficiency, and supporting value addition. Moreover, scaling up climate-smart agricultural extension services using participatory, inclusive, and gender-sensitive methods will promote adopting resilient farming practices. Regulatory enforcement must be strengthened alongside community-based monitoring systems to reduce the impact of free-riding behaviors (Kangomba). Lastly, developing cooperative-based risk mitigation tools can buffer AMCOS and its members against external shocks. Implementing these recommendations will enhance the institutional resilience, adaptive capacity, and long-term sustainability of AMCOS, ultimately contributing to improved livelihoods and inclusive rural development in emerging coffee-growing areas like Nyasa District.

Conflict of Interest

The authors declared no potential conflicts of interest concerning this article's research, authorship, and/or publication. Ethical approval: Research conducted for this paper was approved by the Mwalimu Nyerere Memorial Academy Research Ethics Board and required the informed consent of all participants.

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