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Tea Production and Economic Contribution to Smallholder Farmers in Bumbuli, Tanzania: A Rigorous Analysis for Policy and Practice

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Abstract: *Despite its long-standing role in Tanzania's agricultural sector, tea production among smallholder farmers remains under-researched in terms of its actual economic contribution and the persistent structural barriers limiting its potential. In Bumbuli District, Tanga Region, tea farming is often promoted as a viable source of income; however, the majority of smallholders operate under resource-constrained conditions that hinder productivity and sustainability. This study undertakes a rigorous mixed-methods analysis—drawing from surveys, interviews, and secondary data—to critically examine how tea production contributes to smallholder livelihoods and to identify the key constraints affecting income generation. Findings show that 78% of farmers cultivate less than three acres and that fertilizer use is strikingly low, with 95% of farmers not applying any, contributing to average yields ranging from 1,100 to 1,500 kg per acre annually. Corresponding incomes remain modest, between TZS 384,300 and 1,098,000 per year, and are further undermined by market uncertainties such as frequent factory closures and persistently low producer prices averaging TZS 366 per kilogram. Additionally, the sector is dominated by an aging population, with over 60% of farmers aged above 52, raising concerns over long-term generational continuity. Inferential statistical analysis, particularly multivariate regression, identifies land size and adoption of agronomic practices as significant predictors of household income, emphasizing the urgent need for targeted policy responses. These include improving access to agricultural inputs, establishing more reliable market systems, and designing youth-inclusive programs to revitalize tea farming as a sustainable economic activity for future generations.*

Keywords: *Tea Production, Smallholder Income, Agronomic Practices, Market Access, Tanzania*

1. Background Information

Tea is one of the most widely traded agricultural commodities globally, cultivated in over 50 countries and providing direct employment and livelihood support to more than 13 million people, the majority of whom are smallholder farmers (FAO, 2023). As a major global beverage, tea also plays a vital role in shaping rural economies and contributing to national exports, especially in low- and middle-income countries across Asia and Africa (ITC, 2022). The global tea market continues to grow, driven by rising consumption, particularly in emerging markets, and the increased demand for specialty and organic teas. However, this growth is juxtaposed with growing concerns about supply sustainability due to climate variability, labor shortages, low farm-gate prices, and structural inequalities in value chains (Chapagain & van Vuuren, 2022). In Sub-Saharan Africa, where tea is a key export commodity, countries such as Kenya, Uganda, Rwanda, and Tanzania rely heavily on smallholder tea producers, whose economic viability is increasingly under threat due to low productivity, price volatility, and limited bargaining power in liberalized markets (Wambugu *et al.*, 2021).

In Tanzania, tea remains an important contributor to agricultural GDP and rural livelihoods, accounting for approximately 29% of the country's commercial crop exports and supporting over 50,000 households (Tea Board of Tanzania, 2023). The crop is mainly grown in highland regions such as Njombe, Iringa, Tanga (particularly Bumbuli District), and Mbeya, where climatic conditions are favourable. Yet, the Tanzanian tea sector faces several persistent challenges. These include aging plantations, inadequate adoption of improved agronomic practices, weak cooperative structures, poor infrastructure, and declining youth participation in farming (URT, 2021; Magesa *et al.*, 2023). While tea production in large estates has been relatively stable, the smallholder segment, despite its contribution to national output, has not experienced commensurate growth or productivity improvements. Prior studies on Tanzanian tea production have largely focused on export trends and agribusiness development in large estates

(Chege *et al.*, 2022), leaving a significant empirical gap in understanding the microeconomic realities of smallholder producers.

Moreover, there is a notable lack of integrated studies that assess the economic contribution of tea relative to farm size, labor dynamics, and competing land uses such as maize cultivation. This gap is particularly relevant in areas like Bumbuli, where smallholders operate under intense land pressure and often face trade-offs between subsistence food crops and commercial tea. From a theoretical perspective, the limited application of household production theory and agrarian political economy frameworks has constrained efforts to understand how structural variables, such as land tenure, access to inputs, and market institutions, influence productivity and income generation in tea-based livelihoods (Ellis, 2000; Bernstein, 2010; Sitko & Jayne, 2014). Furthermore, many existing studies fall short of employing inferential statistics to identify causal relationships or predictive variables that determine income variations among smallholder tea producers, limiting their utility for policy formulation.

This study addresses these critical gaps by conducting a rigorous mixed-methods analysis of tea production and its economic contribution to smallholder farmers in Bumbuli District, Tanga Region. Specifically, it aims to quantify how tea farming contributes to household income in relation to farm size, input use, and agronomic practices. Through multivariate regression analysis, the study models the key determinants of productivity and income while identifying constraints related to market access, aging farmer demographics, and input availability. In addition, qualitative interviews with farmers, cooperative leaders, and stakeholders enrich the analysis by uncovering lived experiences and institutional barriers. The central research question guiding this inquiry is: To what extent does tea production contribute to the income and livelihood sustainability of smallholder farmers in Bumbuli District, and what factors enhance or hinder this contribution? Therefore, by generating context-specific evidence, this research aims to inform inclusive and actionable policy interventions for revitalizing Tanzania's smallholder tea economy.

2.0 Theoretical Framework

This study is anchored in two interrelated theoretical perspectives, **Household Production Theory** and the **Agrarian Political Economy Framework**, which together provide a comprehensive lens through which the economic contribution of tea production among smallholder farmers in Bumbuli District can be examined.

At the micro-level, Household Production Theory offers a valuable analytical foundation for understanding how smallholder farmers make decisions about resource allocation, labor use, and production under constraints of land, capital, and time. According to Becker (1965), households act as both consumers and producers of goods and services, aiming to maximize utility by allocating available resources optimally. In the context of agriculture, this theory posits that decisions such as whether to allocate land to tea or food crops, apply fertilizers, or adopt improved agronomic practices depend on internal household dynamics, such as age structure, labor availability, and consumption needs, as well as external factors like market prices and input access. In Bumbuli District, where 78% of tea farmers operate on less than three acres of land and 95% do not use fertilizers, the household production model helps explain how constraints in land and inputs directly affect yield levels and household income. Furthermore, the theory is useful in interpreting intra-household trade-offs between short-term subsistence needs and long-term income-generating investments in perennial crops like tea, especially in aging farming communities where over 60% of farmers are older than 52 years.

However, while Household Production Theory explains farmer decision-making from a rational-choice perspective, it inadequately addresses the broader structural, institutional, and historical dynamics that shape those decisions. To fill this gap, the Agrarian Political Economy Framework provides a macro-analytical lens to situate household production within the context of wider economic, political, and social systems. Rooted in Marxist and neo-Marxist thought, this framework emphasizes how power relations, market liberalization, land tenure regimes, and global commodity chains mediate agricultural production outcomes (Bernstein, 2010). In liberalized sectors such as Tanzania's tea industry, where state support has diminished and processing factories are often privatized, smallholders are subject to market forces they cannot control—such as fluctuating prices, factory closures, and delayed payments. These structural vulnerabilities undermine farmers' bargaining power, weaken cooperative systems, and entrench dependence on exploitative value chains, thereby limiting their capacity to accumulate income from tea. The empirical evidence in this study—particularly the low producer prices (TZS 366/kg), unstable market linkages, and absence of youth in the sector—resonates with the political economy critique that smallholders are often marginalized within capitalist agrarian structures.

Moreover, the Agrarian Political Economy Framework draws attention to historical processes of dispossession, underinvestment in rural infrastructure, and policy neglect of smallholder agriculture, all of which have contributed to the stagnation of rural livelihoods (Peters, 2004; van der Ploeg, 2008). It also interrogates the role of international donors, multinational companies, and domestic elites in shaping

agricultural policy in ways that prioritize export commodities without adequately addressing the needs of smallholder producers. In Bumbuli, these dynamics manifest through aging and under-capacitated farmer groups, limited extension services, and youth disinterest in tea farming due to poor returns and uncertain market prospects. Such conditions reflect the broader challenges of agrarian transformation and rural inequality that cannot be understood through household models alone.

Henceforth, by integrating these two theoretical frameworks, this study benefits from a dual analytical approach: the Household Production Theory facilitates the modelling of income determinants and productivity factors at the household level using inferential statistics (e.g., multivariate regression), while the Agrarian Political Economy Framework enables a critical analysis of the institutional and market constraints that shape those household-level outcomes. Together, they provide a robust basis for interpreting the empirical findings and formulating policy recommendations that not only address input gaps and land use efficiency but also challenge structural barriers and promote inclusive rural development. This theoretical synergy is crucial in understanding how smallholder tea farming can be made more economically viable, socially sustainable, and attractive to younger generations in Tanzania and beyond.

3.0 Methodology

This study adopted a rigorous mixed-methods design informed by the *Household Production Theory* and the *Agrarian Political Economy Framework*, allowing for a multidimensional examination of tea production and its economic implications for smallholder farmers in Bumbuli District, Tanzania. The choice of a mixed-methods approach is grounded in the need to capture both the measurable outcomes of household production, such as income, land use, and yield, and the structural and institutional factors that shape these outcomes, such as market dynamics, policy environments, and aging farming populations (Greene, Caracelli, & Graham, 1989). The integration of quantitative and qualitative techniques ensures the validity, reliability, and depth of findings, reflecting the complexity of rural livelihoods as emphasized by Ellis (2000) and Bernstein (2010).

3.1 Study Area and Sampling

The study was conducted in Bumbuli District, Tanga Region, one of Tanzania's historic tea-growing zones. The area receives between 800 and 1,700 mm of rainfall annually, with average temperatures of 18°C, offering favorable conditions for tea cultivation (URT, 2020). Four wards, Mponde, Tamota, Dule B, and Funta, were purposively selected based on their high concentration of tea farming activities and the presence of active Agricultural Marketing Cooperative Societies (AMCOS). These wards also reflect varying degrees of access to processing factories and extension services, which was vital for capturing spatial variation in production challenges.

A stratified random sampling technique was employed to select 120 smallholder tea farmers. Stratification was based on key variables such as farm size, distance to processing factory, and membership in a cooperative, ensuring a representative cross-section of the local farming population. This sampling method was justified to reduce bias and enhance generalizability across diverse household profiles (Kish, 1965).

3.2 Data Collection Methods

Both primary and secondary data sources were utilized.

- *Primary data* was collected through structured household surveys targeting 120 farmers, capturing variables such as landholding size, fertilizer use, household age structure, yield, income from tea, and access to extension services.
- To deepen contextual understanding, key informant interviews (KIIs) were conducted with 8 AMCOS leaders and 2 agricultural extension officers to gather institutional insights on market functioning, cooperative performance, and policy bottlenecks.
- *Secondary data* was obtained from district agricultural reports (2015–2023), the Tea Board of Tanzania's production records, and archival data from the Ministry of Agriculture. This triangulation was essential to corroborate self-reported figures and assess trends over time.

3.3 Analytical Framework

In line with the Household Production Theory, the study employed descriptive statistics (means, frequencies, standard deviations) to profile land use patterns, yields, and household income. These outputs help establish the empirical foundation for understanding how resource constraints (e.g., land and input scarcity) affect production choices and income generation (Becker, 1965; Chayanov, 1966).

To identify predictors of household income, inferential statistical analysis using multiple linear regression was applied. The model specified was:

$$\text{Income} = \beta_0 + \beta_1(\text{Land Size}) + \beta_2(\text{Fertilizer Use}) + \beta_3(\text{Age}) + \varepsilon$$

This model was chosen based on both theoretical justification from household production literature, which emphasizes input-output relationships (Ellis, 2000), and empirical expectations that land size and agronomic investments strongly influence returns. The regression helped determine the strength and significance of each factor in predicting tea income under current structural conditions.

Although spatial mapping was not a core component of this version of the analysis, village-level georeferencing was conducted to track production clusters. This step, however, was not elaborated as a formal spatial econometric analysis due to the study's focus on economic rather than geospatial determinants.

In line with the Agrarian Political Economy Framework, qualitative data from KIIs and open-ended survey questions were analyzed using thematic coding to identify recurring structural constraints such as market instability, declining youth participation, and cooperative inefficiencies. This analytical technique allowed the study to explore how historical and institutional factors shape smallholder vulnerabilities beyond individual behavior (Peters, 2004; van der Ploeg, 2008). Key themes such as delayed payments, factory closures, and weak state involvement were examined to reveal the embedded inequalities in Tanzania's tea value chain.

3.4 Ethical Considerations

Informed consent was obtained from all participants, and ethical clearance was secured through institutional protocols at Sokoine University of Agriculture. Anonymity and confidentiality were strictly observed to protect respondents' identities and data integrity.

4.0 RESULTS AND DISCUSSION

The analysis of tea production in Bumbuli District reveals multiple dimensions of socio-economic and structural challenges facing smallholder farmers, highlighting critical areas for policy intervention. The socio-demographic data (Table 1) indicate that the tea farming sector is predominantly composed of aging farmers, with 60% aged over 52 years. This age structure signals potential risks for the sector's future sustainability, as younger generations show limited engagement in tea cultivation, which resonates with agrarian political economy critiques emphasizing the marginalization of youth in rural agricultural economies (Bernstein, 2010). Education levels are low, with 90% of farmers possessing only primary education, potentially limiting their capacity to adopt innovative agronomic practices and access market information effectively, a factor highlighted by Household Production Theory which underscores the importance of human capital in enhancing productive efficiency (Becker, 1965).

Table 1: Farmer Characteristics (n=120)

Variable	Mponde (%)	Tamota (%)
Age > 52 years	48.3	43.3
No Fertilizer Use	58.3	60.0
Male Dominance	85.0	84.5

Productivity data underscore the resource constraints faced by these farmers. Landholding sizes are generally small, with 78% cultivating less than three acres, limiting economies of scale and potential income generation. Fertilizer usage is exceptionally low, with 95% of farmers not applying any inputs due largely to cost barriers, which severely restricts yield potential (Table 2). Yield distribution shows that 55% of farmers produce between 1,100 and 1,500 kg per acre annually, which aligns with modest income generation in the range of TZS 384,300 to 1,098,000 per year (approximately USD 166–475), insufficient for substantial household economic transformation. These findings conform with Household Production Theory, which links access to productive inputs and scale of operations directly to output and income levels (Ellis, 2000).

Table 2: Yield vs. Income (n=120)

Yield (kg/acre)	% Farmers	Average Income (TZS)
< 1,000	8.3	360,000
1,100 – 1,500	55.0	549,000

Inferential analysis through multivariate regression robustly supports key theoretical insights by identifying land size and fertilizer use as statistically significant positive predictors of household income among smallholder tea farmers in Bumbuli District ($p < 0.05$ and $p < 0.01$, respectively), while farmer age shows a significant negative association with income ($p < 0.05$) (see Table 3). This finding underscores that greater landholding sizes provide farmers with expanded productive capacity and opportunities to generate higher returns, consistent with empirical literature that demonstrates economies of scale as crucial for enhancing agricultural income (Binswanger & Deininger, 1997; Carter, 2001). Larger farm sizes also enable diversified crop production and risk mitigation, which align with the household production theory's assertion that household assets, including land, are central to optimizing production choices and maximizing welfare (Singh, Squire, & Strauss, 1986).

Table 3: Multivariate Regression Predicting Household Income (TZS)

Predictor	Coefficient (β)	Significance (p-value)
Land Size	+0.45	< 0.05
Fertilizer Use	+0.58	< 0.01
Age	-0.33	< 0.05

Similarly, the positive impact of fertilizer use on income reflects the critical role of input adoption in improving soil fertility, boosting yields, and ultimately raising economic returns, consistent with numerous studies on smallholder productivity in Sub-Saharan Africa (Matuschke & Qaim, 2008; Abdoulaye & Sanders, 2005). Household Production Theory emphasizes that the allocation of household labor and capital toward purchased inputs like fertilizers enhances marginal productivity and income, especially when integrated with sound agronomic practices (Becker, 1965). The low fertilizer adoption rates in Bumbuli, however, highlight persistent access barriers, such as high costs and limited extension services, that continue to suppress

productivity, a constraint also widely documented in similar smallholder tea systems (Shiferaw *et al.*, 2014).

The negative correlation between farmer age and income suggests that older farmers face declining productive efficiency and income potential, which may be attributed to physical limitations, reduced risk tolerance, and weaker capacity or willingness to adopt innovative technologies (Fleming *et al.*, 2017; Kassie *et al.*, 2015). This age-related decline in productivity is also consistent with Agrarian Political Economy perspectives, which highlight structural challenges experienced by aging rural populations, including limited access to credit, weak institutional support, and exclusion from emerging agricultural value chains (Bernstein, 2010; Bryceson, 2002). These systemic barriers not only reduce older farmers' ability to invest in and sustain intensified production but also contribute to the sector's vulnerability given the absence of effective youth engagement and succession mechanisms.

Henceforth, the regression results reinforce the household production framework's premise that household assets, labor allocation, and input use critically shape income outcomes (Ellis, 2000; Udry, 1996). Concurrently, they illuminate the agrarian political economy's concern with socio-structural constraints that disproportionately affect smallholder livelihoods and perpetuate inequalities in agricultural productivity (Peters, 2004; Scoones, 2016). Addressing these intertwined factors is imperative to unlocking the full economic potential of smallholder tea farming in Tanzania and achieving sustainable rural development.

A major theme emerging from the qualitative data and secondary sources is market instability, which compounds the income challenges faced by smallholders. Approximately 70% of farmers depend on the Mponde Tea Factory, which experiences frequent closures due to operational challenges. This creates a precarious income stream and undermines farmers' ability to plan investments, consistent with the Agrarian Political Economy critique of structural vulnerabilities and power imbalances in rural commodity markets (Peters, 2004). Furthermore, tea prices remain significantly low at an average of TZS 366 per kilogram compared to other cash crops such as coffee, which fetches between TZS 3,000 and 4,000 per kilogram. This price disparity reflects the weak market position and limited bargaining power of smallholder tea farmers, who face monopsony market conditions with few buyers and limited alternative outlets.

Input accessibility is another pressing challenge. High costs and inadequate extension services restrict fertilizer use to a marginal few, inhibiting yield improvements and income gains. This aligns with empirical findings from similar contexts, where input subsidies and improved extension provision have demonstrated potential yield increases of up to 30% (Abay *et al.*, 2022).

In policy terms, addressing the multifaceted challenges facing smallholder tea farmers in Bumbuli District necessitates a multi-pronged and context-specific approach that simultaneously tackles productivity, market access, and generational renewal. First and foremost, improving access to agricultural inputs, particularly fertilizers, improved seedlings, and farm tools—through targeted subsidies and strengthened extension services is essential for enhancing yields and household incomes. According to the Household Production Theory, households act as both producers and consumers, allocating available resources to maximize utility and welfare (Becker, 1965; Singh, Squire, & Strauss, 1986). Thus, when constraints to input access are alleviated, farmers are more likely to adopt yield-enhancing practices, translating into improved economic outcomes. Empirical studies across Sub-Saharan Africa have demonstrated that input subsidies and access to technical support are positively associated with increased agricultural productivity and resilience (Jayne & Rashid, 2013; Holden & Lunduka, 2012).

Furthermore, market-related constraints, particularly the overreliance on a single processing facility (Mponde Factory) and the persistently low farm-gate prices (TZS 366/kg), reflect deeper issues of market failure and power asymmetries within the tea value chain. From an Agrarian Political Economy standpoint, such asymmetries emerge from historically entrenched structures where smallholders are marginalized in relation to powerful actors like processors, traders, and state institutions (Bernstein, 2010; Akram-Lodhi & Kay, 2009). One critical response is to enhance market diversification by facilitating linkages to broader regional and international platforms such as the East African Tea Trade Association (EATTA) auction in Mombasa, which could enable farmers to secure better and more stable prices, reduce the risks of monopsony, and create leverage through collective marketing. Supporting smallholder-owned cooperatives and AMCOS to gain certification and direct export capabilities could also further democratize market participation (Muthee & Mugambi, 2020).

In parallel, reversing the demographic aging of the tea farming population, where over 60% of producers are above 52 years, requires targeted youth-inclusive agricultural policies. The growing disinterest among youth in smallholder farming is driven by perceptions of low profitability, inadequate access to land and finance, and poor institutional support (Leavy & Hossain, 2014; White, 2012). Integrating youth into tea production will demand innovative strategies, such as offering start-up grants, land lease arrangements, digitized extension services, and mentorship programs. This

aligns with calls by the African Union (2021) for member states to design agriculture-as-business models that appeal to young people while strengthening rural economies. Additionally, youth-oriented training in climate-smart tea farming, marketing, and cooperative management can enhance intergenerational continuity and promote entrepreneurship in rural areas (Bezu & Holden, 2014; FAO, 2017).

Taken together, these interventions must be grounded in a structural understanding of agrarian transformation. As the Agrarian Political Economy perspective emphasizes, it is not enough to promote technical fixes without addressing underlying institutional and power relations that perpetuate smallholder vulnerability (Peters, 2004; Scoones et al., 2018). Similarly, the Household Production Theory calls attention to how household decisions are constrained by access to assets, markets, and public goods—all of which are subject to broader policy and economic frameworks. Thus, achieving sustained improvements in tea-based livelihoods requires systemic reforms that empower smallholders economically and politically, while ensuring their full participation in shaping the future of Tanzania's agricultural economy.

However, this study is not without methodological and analytical limitations. Notably, the sample design intentionally excluded non-tea growing households, which constrained the possibility of conducting counterfactual analyses that would have enabled clearer attributions of income differentials attributable to tea versus alternative or diversified livelihoods. Comparative evaluations with households relying on maize, coffee, or mixed farming systems would have enriched the study's explanatory scope and allowed for more robust policy recommendations on crop trade-offs and opportunity costs (Barrett *et al.,* 2001; Ellis, 2000). Furthermore, the study did not model the effects of global tea price volatility on local farm-gate prices and income dynamics. This is a critical omission, as international tea markets are increasingly subject to demand fluctuations, geopolitical influences, and climate shocks in other producing countries, all of which shape the local viability of tea-based livelihoods (ITC, 2023; FAO, 2015). Failing to account for such externalities may weaken the robustness of conclusions regarding income stability and longer-term sustainability.

Nevertheless, the findings of this study offer strong empirical grounding to conclude that while tea production remains a meaningful source of income for many smallholder farmers in Bumbuli, its transformative potential is undermined by persistent structural constraints. These include land fragmentation, with 78% of farmers cultivating under three acres, limited adoption of yield-enhancing inputs (95% non-use of fertilizer), dependence on a volatile monopsonistic market system, and an aging demographic with more than 60% of growers above 52 years. These challenges are not merely technical but reflect deeper institutional and structural barriers that align with critiques advanced by the Agrarian Political Economy tradition, which emphasizes how unequal access to productive assets, lack of farmer agency in markets, and weak rural institutions inhibit inclusive agrarian transformation (Bernstein, 2010; Akram-Lodhi & Kay, 2009; Peters, 2004). For instance, the predominance of aging farmers without mechanisms to incentivize or support youth entry into tea farming signals an intergenerational crisis that may exacerbate rural economic stagnation and social exclusion (White, 2012; Leavy & Hossain, 2014).

At the same time, consistent with Household Production Theory, the regression analysis demonstrates that household-level decisions regarding resource allocation, particularly land use and input application, significantly affect income outcomes (Becker, 1965; Singh *et al.,* 1986). The positive associations between fertilizer use and income, and between land size and income, reveal the centrality of input access and resource endowments in shaping productivity and welfare outcomes. However, these household-level decisions are nested within larger economic and institutional systems that condition what choices are available and viable, an intersection that underscores the need for analytical integration of microeconomic behavior with macro-political structures (Ellis, 1993; Jayne *et al.,* 2003).

Therefore, this study reinforces the imperative to combine micro-level productivity enhancements, such as input subsidies, extension support, and farm size optimization, with macro-level reforms targeting market structure, youth inclusion, and policy coherence. Without addressing both the household-level constraints and the structural forces that shape rural livelihoods, the tea sector in Tanzania is unlikely to realize its full development potential. The call, then, is for a dual-track strategy that aligns production-side investments with inclusive agrarian policies to ensure that tea farming not only contributes to incomes but also fosters equitable, generationally sustainable, and politically empowered rural development.

4.0 Conclusions and Recommendations

Tea production continues to play a vital role in the economic life of Bumbuli District, offering an important, though modest, source of livelihood for many smallholder farmers. However, the sector is constrained by systemic bottlenecks that threaten its sustainability, including fragmented landholdings, poor access to inputs, an aging farmer population, and volatile markets. These challenges limit both productivity and income, while also diminishing the sector's ability to attract and retain younger generations. Drawing on the household production theory, this study has shown that

income from tea farming is significantly influenced by household-level resource endowments such as land size and input use, notably fertilizer. Meanwhile, the agrarian political economy perspective underscores how institutional and market structures, such as monopolistic processing arrangements, weak cooperative governance, and a lack of public investment, continue to marginalize smallholder producers and constrain their capacity to upgrade production or negotiate better terms.

To secure the future of tea farming in Bumbuli and similar contexts, a multi-scalar and multi-actor strategy is needed. First, government agencies must play a catalytic role by revitalizing and professionalizing Agricultural Marketing Cooperative Societies (AMCOS), which are currently weakened by poor leadership, limited accountability, and insufficient capital. Strengthening AMCOS can enable collective bargaining, enhance input procurement, and facilitate the marketing of processed tea, thereby redistributing value along the supply chain. In addition, upgrading rural infrastructure, particularly feeder roads and electricity connectivity, will significantly reduce post-harvest losses and logistics costs, ultimately improving farmers' incomes and investment incentives. These reforms are consistent with the political economy imperative of enhancing farmer agency within agricultural value chains (Bernstein, 2010; Poulton *et al.*, 2010).

Second, private sector actors and investors must be encouraged to partner with local cooperatives and farmer organizations to establish value-added processing facilities closer to farms. This would not only reduce reliance on a single processor, such as the frequently disrupted Mponde Tea Factory, but also diversify product offerings and increase value capture within the community. Investments in local green tea processing or organic certification schemes could open new market niches, including export opportunities, while also enhancing resilience to global price fluctuations. These partnerships should be governed by fair trade principles and include social impact indicators to ensure inclusive outcomes.

Third, smallholder farmers themselves need support and incentives to adopt sustainable and climate-smart agricultural practices. Given the environmental sensitivity of tea production, which is highly dependent on rainfall and temperature stability, intercropping with legumes, soil conservation techniques, and organic fertilization must be promoted to enhance ecological resilience. Capacity-building efforts led by extension officers, ideally through participatory, farmer-led learning platforms, will be key to enabling knowledge transfer, innovation uptake, and peer-to-peer adaptation.

Finally, deliberate and sustained youth engagement strategies are needed to reverse aging trends and rejuvenate the sector. These could include access to credit, start-up kits for tea nurseries, land access arrangements for youth collectives, and digital platforms for accessing markets and technical support. Without this generational renewal, the tea economy in Bumbuli faces a real risk of collapse in the coming decades. Overall, the study highlights that a productive and sustainable tea sector will not emerge from isolated interventions but rather through the coordinated transformation of production systems, market relations, and institutional frameworks, anchored in both household capacities and equitable political-economic reforms.

Declaration of Conflict of Interest

We hereby declare that there are no known competing financial interests or personal relationships that could have influenced the research and findings presented in this paper.

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