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Fish Value Addition and Livelihood Outcomes of Fishing Communities: Evidence from Mkinga District, Tanzania

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ABSTRACT

Fish value addition has been widely recognised as a catalyst for improving the livelihoods of fishing communities in sub-Saharan Africa. However, empirical evidence on its structural, economic, and socio-livelihood implications within specific coastal districts of Tanzania remains sparse. This study investigates the implications of fish value addition on the livelihood outcomes of fishing communities in Mkinga District, Tanga Region, Tanzania. A cross-sectional design was employed. Data were collected from 338 randomly selected registered fishermen using structured questionnaires, supplemented by semi-structured interviews, focus group discussions, and documentary analysis. Value chain mapping, descriptive statistics, and financial profitability analysis were applied. The fishing value chain in Mkinga comprises eight distinct strands involving fishers, assemblers, wholesalers, processors, retailers, food vendors, and consumers. Fishermen demonstrated high awareness of value addition benefits (99.1% affirmed income-enhancement potential), yet practical adoption remains severely constrained by limited access to processing equipment (8.7% reported access), high initial costs (98.3%), and market barriers (93.0%). Average daily fish revenue stood at TZS 83,904 (approximately USD 32), with processed fish strands achieving up to TZS 9,000 per kilogram compared to TZS 3,983 for fresh fish. Housing conditions are predominantly rudimentary, 53.9% of households face regular food insecurity, and all respondents rely exclusively on uncovered wells for drinking water. Value addition holds transformative potential for coastal fishing communities in Mkinga but remains constrained by structural gaps in infrastructure, finance, and market access. Targeted policy interventions involving cooperative strengthening, processing technology subsidies, and market information systems are urgently needed.

Keywords: Fish value addition; fishing value chain; livelihood outcomes; Mkinga district; Tanzania; post-harvest losses; food security

INTRODUCTION

Fish value addition encompassing processes that enhance the economic worth, shelf life, and marketability of fish products has emerged as a critical lever for improving the livelihoods of fishing communities globally (Organization, 2007, 2014, 2015, 2018, 2020) (Kamal & Ismail, 2023). These processes range from basic cleaning and filleting to more sophisticated techniques, including smoking, drying, freezing, canning, and the manufacture of fish-derived products such as fish sauce and fish oil. By transforming raw fish into higher-value commodities, value addition increases household incomes, reduces post-harvest losses, and broadens market access, including export opportunities (Magesa et al., 2024)(Ninan, 2018).

The global seafood industry recognises value addition as foundational to the economic and social resilience of fishing communities. In Southeast Asia and Northern Europe, where advanced value addition is well established, communities benefit from elevated revenues, employment diversification, and improved food security (Yeap, 2012)(Ninan, 2018). In sub-Saharan Africa, however, people largely fail to realise the potential of value addition. Post-harvest losses driven by inadequate processing and preservation infrastructure continue to undermine the economic returns of millions of fishers (Getu & Misganaw, 2015)(Keerthana et al., 2022). Despite promising pilot initiatives in Ghana and Nigeria, the fisheries sector's full potential across Africa is hampered by limited market linkages, restricted access to modern technology, and systemic underinvestment ((Mindjimba et al., 2019).

Tanzania's fisheries sector significantly contributes to national food security and rural livelihoods. Over four million individuals engage in fishing and related activities, with more than 400,000 employed directly in the industry (Muringai et al., 2022). Coastal communities, including those in Mkinga District, Tanga Region, rely heavily on fisheries as a primary source of income and nutrition (Peart et al., 2021). Yet despite this dependence,

most fishers in Mkinga operate below the international poverty line of USD 1.90 per day (National Bureau of Statistics [NBS], 2022), constrained by poor fishing gear, small vessels, limited processing capabilities, and inadequate market access (Mindjimba et al., 2019).

Previous research in the district and the broader Tanzanian coastal context has explored fish supply–demand dynamics (Peart *et al.,* 2021), resource sustainability (Tolentino-Zondervan & Zondervan, 2022), and the influence of artisanal fishing on income (Churu, 2023). (Churu, 2023) found that artisanal fishers in Mkinga earned the lowest gross margins (12.2%), amounting to only TZS 443.60, resulting in persistently poor livelihoods. Critically, however, these studies did not systematically examine how specific value addition practices along the fishing value chain affect household livelihoods. This gap provides the impetus for the current study.

Accordingly, this research examines the impacts of fish value addition on livelihood outcomes among fishing households in Mkinga District, guided by four specific objectives: to characterise the structure and coordination of the fishing value chain; to evaluate fishers' perceptions of value addition practices; to assess the profitability of value chain segments; and to investigate the contributions of chain-generated profits to the livelihoods of fisheries stakeholders.

MATERIALS AND METHODS

Study Area

Mkinga District, located in the northeast of Tanzania within the Tanga Region, serves as a vital coastal hub for the nation's "blue economy."

Covering an area of approximately 2,948 km^2, its unique geographical positioning, bordering Kenya to the north and the Indian Ocean to the east, creates a strategic corridor for both domestic and cross-border seafood trade. As of 2022, 146,802 people live in the district, and the vast majority depend on the marine environment for their survival (Institute, 2017) (Pita et al., 2020; Pomeroy et al., 2020).

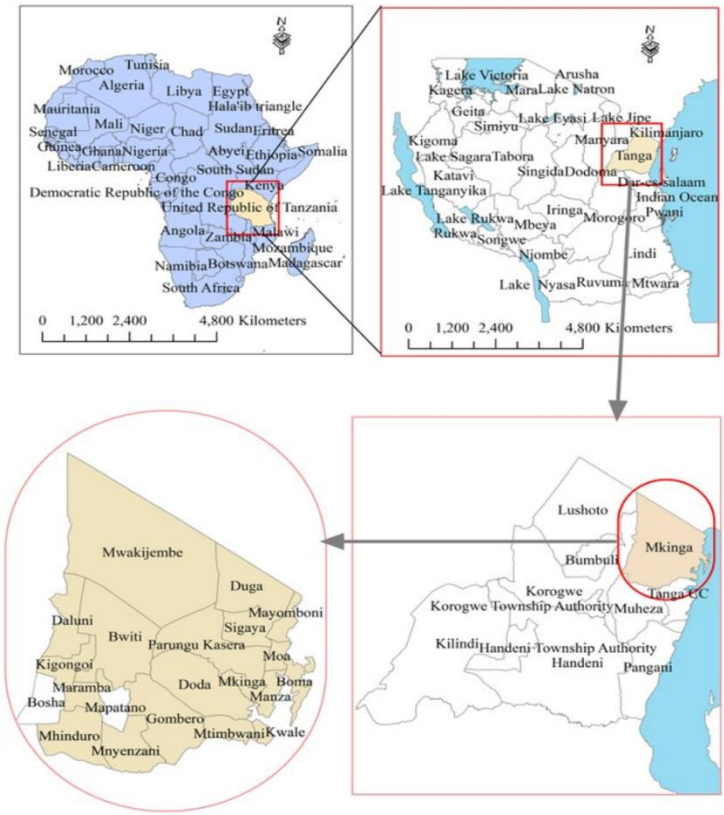


Figure 1. Map of Mkinga District, Tanga Region, Tanzania

Research Design and Sampling

A cross-sectional research design was utilized, which is well-suited for capturing instantaneous evaluations of community-level phenomena. The target population comprised 2,811 registered fishermen in

Mkinga District, from which a sample of 338 respondents was randomly drawn using Cochran's sample size formula. $n_0 = \frac{Z^2 \cdot p(1-p)}{e^2}$. This method ensured statistical validity and representativeness of the wider fishing community (Boniphace et al., 2025) .

Other stakeholders in the value chain including traders, fish vendors, processors, and district officials were recruited through purposive, convenience, and snowball sampling methods to examine the qualitative aspects of chain governance (Mpemba & Mombo, 2019; Roche et al., 2023; White & Scheld, 2024). This strategy yielded a thorough grasp of the varied viewpoints and functions across the fishery value chain, thereby integrating quantitative representativeness with qualitative insight (Roche et al., 2023).

Data Collection

Data collection employed four complementary instruments. Structured questionnaires with closed and Likert-scale items were administered to the 338 fishermen. Semi-structured interviews using a checklist were conducted with key informants, including district fisheries officers and Beach Management Unit (BMU) representatives (Acosta-Alba et al., 2022; Organization, 2018; Pita et al., 2020). Focus Group Discussions (FGDs) were held with homogenous groups of fishers and processors to elicit experiential and attitudinal insights. Documentary analysis of the (Muringai et al., 2022) and national policy documents provided historical and contextual triangulation.

Data Analysis

Value chain mapping and flowchart visualisation were employed to examine the structure and coordination of the fishing value chain (Objective 1). Descriptive statistics, including frequencies, percentages, and averages, were calculated to evaluate fishermen's perceptions of value addition (Objective 2) (Acharjee et al., 2023; Council, 2015; Musa et al., 2016). The examination of financial profitability, encompassing average revenue, price per kilogram, and daily trading volumes, was conducted for Objective 3. Livelihood analysis frameworks, based on the Sustainable Livelihoods Approach (SLA), were employed to evaluate the overarching effects of profits on household welfare (Objective 4).

Ethical Considerations

Before data collecting commenced, ethical approval was secured from the Tengeru Institute of Community Development, the Tanga Regional Administrative Secretary, and the Mkinga District Council. All subjects granted informed verbal consent (Katikiro, 2014; Keerthana et al., 2022; Organization, 2007; Tanzania, 2015). Confidentiality was guaranteed, and participants had the liberty to withdraw at any time. The dataset contained no personally identifiable information.

RESULTS

Socio-Economic Profile of Respondents

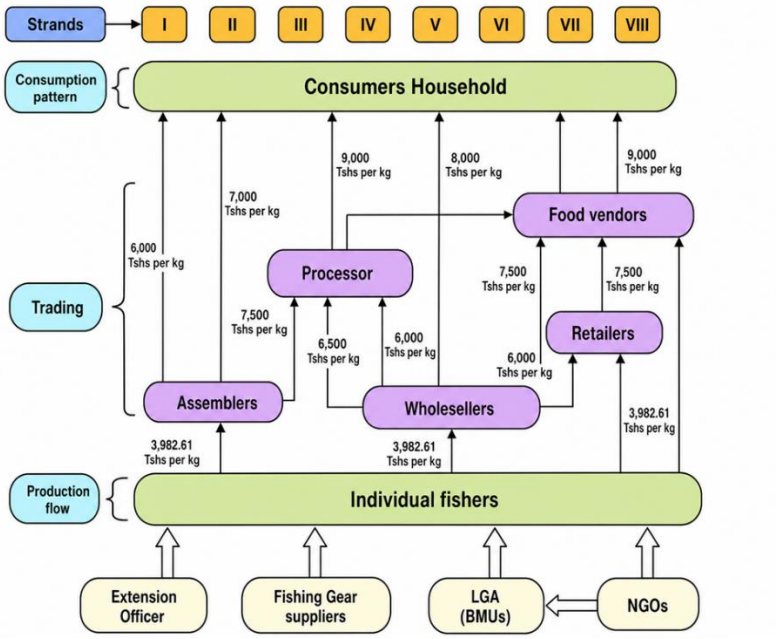
The majority of respondents (54.8%; n = 185) were aged 34–54 years, representing prime working-age adults. 226 respondents were male and 112 were female, reflecting cultural norms limiting female headship of fishing households in the area. Most respondents (87.8%; n = 297) had completed only primary education (seven years of schooling), with 8.7% (n = 29) achieving secondary education and 3.5% (n = 12) having no formal education. A substantial majority (90.4%; n = 306) were married (Table 1).

Table 1. Socio-Economic Characteristics of Respondents (n = 338)

Variable	Category	Frequency	Percentage (%)
Age Group	19–33 years	59	17.4
	34–54 years (majority)	185	54.8
	55 years and above	47	13.9
Education	No formal education	12	3.5
	Primary education	297	87.8
	Secondary education	29	8.7
Marital Status	Single	18	5.2
	Married	306	90.4
	Divorced	15	4.3
Gender	Male	226	66.86
	Female	112	33.14

Structure of the Fishing Value Chain

Value chain mapping revealed eight distinct strands in Mkinga's fishing value chain, distinguished by the number and kind of intermediaries engaged, as well as the format in which fish is marketed (fresh, processed, or cooked). Table 2 summarises the eight strands and their respective average pricing.



TZS = Tanzanian Shillings. Prices represent approximate average transaction values at the final consumer stage

Figure 2. Fishing Value Chain Strands and Average Prices In Mkinga District

The direct fisher-to-consumer strand (Strand II) had the lowest average price (TZS 3,983/kg), while processed fish strands (III, VII, VIII) obtained up to TZS 9,000/kg, more than double the fresh fish price. This pricing differential demonstrates the possible economic benefits of value addition. Individual fishermen (primary producers), assemblers/collectors (aggregating catches from different fishers), processors (freezing, drying, smoking), wholesalers (bulk distributors), merchants (local market sellers), food vendors (preparing cooked dishes), and end users are all important players.

The value chain is dominated by informal coordination: 99.1% of fishermen (n = 335) reported no formal or informal contracts with purchasers, and all 338 respondents (100%) belonged to Beach Management Units (BMUs) but not commercial cooperatives. This lack of institutional coordination leads to market uncertainty, price volatility, and decreased negotiating leverage for primary producers (Table 2).

Table 2. Value Chain Coordination Indicators (n = 338)

Coordination Indicator	Yes (%)	No (%)
Formal/informal contracts with buyers	0.9 (n = 3)	99.1 (n = 335)
BMU membership	100.0 (n = 338)	0.0
Business cooperative membership	0.0	100.0 (n = 338)
Regular interaction with extension workers	26.1 (n = 88)	73.9 (n = 250)
Engaged in any value addition activity (e.g., fried fish)	0.0	100.0 (n = 338)
Primary market channel: fresh fish only	99.1 (n = 335)	0.9 (n = 3)

Fishermen's Perceptions of Value Addition Practices

Fishermen's perceptions of value addition were mainly positive regarding potential benefits but revealed critical gaps in actual enabling (Table 4). Almost all respondents (99.1%; n = 335) agreed that value addition significantly increases income, and all 338 respondents (100%) agreed that investing in fish processing and packaging is essential for business sustainability. A unified view emerged that value addition will secure better livelihoods for future generations (100%; n = 338) and that local cooperative support is vital for success (100%; n = 338).

Despite this positivity, practical implementation is severely constrained. Only 8.7% of respondents (n = 29) had access to the tools and equipment required for value addition. The high initial cost of setting up processing operations was cited as prohibitive by 98.3% (n = 332). Market access barriers were reported by 93.0% (n = 314). Awareness of specific processing methods stood at 61.7% (n = 209), signalling a need for targeted educational programming.

Table 3. Fishermen's Perceptions of Value Addition Practices (n = 338)

Perception Domain	Statement	Yes (%)
Income Impact	Value addition significantly increases income	99.1
Business Sustainability	Investing in processing/packaging is essential	100.0
Awareness	Well-informed about value addition methods	61.7
Training Needs	Training on value addition techniques is crucial	99.1
Resource Access	Has access to necessary tools and equipment	8.7
Financial Support	Government/NGO support would enable investment	95.7
Market Demand	High demand for value-added products locally	73.0
New Markets	Value addition opens new market opportunities	100.0
Cost Barriers	Initial setup cost is too high	98.3
Market Barriers	Faces difficulties accessing markets for value-added products	93.0
Post-harvest Loss	Value addition reduces post-harvest losses	97.4
Quality/Shelf Life	Value addition improves quality and shelf life	97.4
Cultural Integration	Traditional practices can integrate with modern techniques	89.6
Community Support	Community encourages value addition	91.3
Environmental Sustainability	Value addition contributes to sustainable fishing	98.3
Collaboration Benefits	Collaboration with other fishers enhances value addition	99.1
Future Optimism	Optimistic about future of value addition	99.1
Intergenerational Impact	Value addition secures better livelihoods for future generations	100.0

Profitability of Fishing Value Chain Strands

The financial analysis of the 338 respondents indicated considerable diversity in profitability among value chain members. The mean daily fish transaction volume was 22.98 kg, with an average price of TZS 3,982.61 per kg, resulting in a daily revenue of TZS 83,904.35 (about USD 32 at 2024 exchange rates). Daily trading quantities varied between 3 and 90 kg, while prices per kilogram for fresh fish fluctuated from TZS 2,000 to TZS 6,000 (Table 4).

Table 4. Summary of Profitability Indicators For Fishing Value Chain (n = 338)

Indicator	Value
Sample size	338 fishermen
Average quantity traded per day	22.98 kg
Average price per kilogram (fresh fish)	TZS 3,982.61
Average daily revenue (fisher level)	TZS 83,904.35 (~USD 32)
Price range (fresh fish, per kg)	TZS 2,000–6,000
Daily traded volume range	3–90 kg
Price premium: processed vs. fresh fish	+125% (TZS 9,000 vs. TZS 3,983)

Note: TZS = Tanzanian Shillings. USD equivalent calculated using approximate 2024 exchange rate of TZS 2,600/USD.

Strands that included processing activities (Strands III, VII, and VIII) obtained prices of TZS 9,000/kg, more than doubling the direct fresh fish price. This price premium demonstrates that value addition significantly increases economic returns. High operational costs (fuel, gear maintenance), limited access to capital, inadequate processing facilities, and market price fluctuations continue to limit fisher profitability, as found in comparable African contexts (FAO, 2020; Onyango & Yahya, 2022).

Contribution of Profits to Fishery Livelihoods

The livelihood analysis indicates a community experiencing structural disadvantage across many capitals, notwithstanding elevated homeownership rates (Table 6). Although 94.8% of respondents (n = 320) were homeowners, house quality was substandard: 76.5% of roofs (n = 259) were constructed from leaves or

grass, 76.5% of walls (n = 259) from mud, or raw bricks, and 73.9% of flooring (n = 250) from dirt. Only 20.0% (n = 68) had access to power for lighting; the majority depended mostly on solar energy (76.5%; n = 259). All 338 families (100%) relied on uncovered wells for potable water, posing a considerable public health hazard.

Table 6. Livelihood indicators of fishing households in Mkinga District (n = 338)

Livelihood Indicator	Response Category	Frequency	%
House ownership	Own house	320	94.8
Roofing material	Leaves/grass (rudimentary)	259	76.5
	Corrugated iron (durable)	50	14.8
Wall material	Mud/cow dung/raw bricks	259	76.5
	Cement blocks	53	15.7
Floor material	Earth floor	250	73.9
	Cement floor	71	20.9
Sanitation	Open defecation (bush)	162	47.8
	Covered pit latrine	176	52.2
Cooking energy	Firewood/charcoal	335	99.1
Lighting energy	Solar power	259	76.5
	Electricity (grid)	68	20.0
Drinking water	Uncovered well (sole source)	338	100.0
Food insecurity	Regularly food insecure	182	53.9
Food self-sufficiency	25–50% self-sufficient	303	89.6
Remittances (relatives)	Somewhat reliable	317	93.9
Govt support (TASAF)	Not reliable at all	288	85.2

Food insecurity regularly impacted 53.9% of households (n = 182). Climate change, excessive reliance on fisheries, inadequate storage facilities, elevated living costs, and limited access to water were all recognised (100%) as significant factors contributing to food insecurity. The overall household food self-sufficiency was minimal, with 89.6% of respondents (n = 303) reporting a self-sufficiency level of only 25–50% in food production. Government assistance via the Tanzania Social Action Fund (TASAF) was deemed untrustworthy by 85.2% of respondents (n = 288), highlighting the instability of external safety nets.

These findings show that although fishing profits aid in sustaining basic livelihoods, they are inadequate to disrupt the cycle of poverty. The structural challenges of inadequate value addition infrastructure, restricted financial services, and market isolation hinder fishing villages from converting resource plenty into sustainable prosperity, as noted by Opondo *et al.* (2023) and Kuijpers *et al. (*2023)

DISCUSSION

The findings suggest that Mkinga District's fishing value chain is structurally undeveloped in comparison to its revolutionary potential. The eight-strand chain is dominated by fresh fish transactions (99.1% of the 338 examined fishers sell only fresh fish), with little involvement in value-added activities like smoking, drying, or frying. This tendency is consistent with (Beran, 2018)(Fahad et al., 2020), who found that primary producers in smallholder fisheries chains often have the lowest margins due to asset poverty and restricted access to processing technologies (Acharjee et al., 2023).

The contradiction of strong attitudinal acceptance and limited practical implementation of value addition is consistent with findings from similar African fishing situations (White & Scheld, 2024; Pita et al., 2020). Fishermen recognise the income-boosting potential of value addition (99.1%; n = 335) but are structurally excluded from realising it: only 8.7% (n = 29) have access to processing equipment, 98.3% (n = 332) find initial costs prohibitively high, and 93.0% (n = 314) face market access barriers. This disparity between aspiration and capacity highlights the need for supply-side interventions that are more than just awareness-raising, but also infrastructure-enabling (Acosta-Alba et al., 2022).

The recorded price premium for processed fish strands of TZS 9,000/kg versus TZS 3,983/kg for fresh fish, representing a 126% premium, provides solid economic proof for the benefits on value addition expenditure. This conclusion is consistent with Acosta-Alba *et al.* (2022) and Kamaylo *et al.* (2021), who found significant price premiums for processed fish across African value chains. However, the benefits are still concentrated among processors and wholesalers, with fishermen receiving merely the raw commodity price.

This distributional imbalance, as emphasised by (Kothari, 2019; Kuijpers et al., 2023) in the Ugandan context, needs cooperative arrangements that allow fishermen to participate in downstream processing and selling.

The livelihood analysis confirms the systemic deprivation of Mkinga's fishing villages. High homeownership rates (94.8%; n = 320) are associated with poor housing quality, unsafe water availability, and widespread food insecurity (53.9%; n = 182). This configuration asset ownership without livelihood security reflects what Natarajan *et al.* (2022) refer to as asset-poor livelihood systems, in which physical capital accumulation does not translate into increased capabilities due to a lack of complementary assets (financial capital, human capital, market access) (Ulega et al., 2022; White & Scheld, 2024; Wickrama et al., 2022). The complete reliance on uncovered wells for drinking water (100%; n = 338) and the near-total reliance on firewood and charcoal for cooking (99.1%; n = 335) demonstrate that fishing profits are insufficient to leverage investment in basic service upgrades.

The unpredictability of TASAF support (85.2%; n = 288), as well as the lack of official loan availability, limit the community's adaptive potential. This conclusion is consistent with (Roest et al., 2018; Statistics, 2022; Tolentino-Zondervan & Zondervan, 2022), who claim that financial inclusion is required to establish economic resilience in small-scale fisheries. Without access to microfinance or subsidised financing, fishermen are unable to invest in processing equipment, cold-chain infrastructure, or market linkages all of which would promote value addition adoption.

CONCLUSIONS

This study presents comprehensive data from 338 registered fishermen in Mkinga District, Tanzania, indicating that fish value addition has enormous transformative potential for fishing communities, but that potential is systematically unrealised. The fishing value chain is wide, encompassing eight main strands, but is dominated by low-value fresh fish trades. Fishermen are well aware of the value-added benefits, but they are hindered by limited equipment access, high startup costs, market obstacles, and inadequate cooperative structures. Processed fish carries a price premium of more than 125% above fresh fish, yet fishermen only receive a portion of this value. Livelihood conditions defined by substandard housing, universal reliance on contaminated water, and pervasive food insecurity demonstrate the insufficiency of present revenue production for sustainable livelihoods.

Policy Recommendations

Based on these findings, the following targeted focused recommendations are proposed: Strengthen fisher cooperatives and Beach Management Units to improve vertical and horizontal coordination, enhance collective bargaining power, and create platforms for shared investment in processing technologies. Implement accessible loan and subsidy initiatives tailored for fish processing equipment (smoking kilns, drying racks, refrigeration units) to reduce the prohibitive entry costs associated with value addition adoption.

Establish market information systems that deliver real-time price data, mitigate information asymmetries, and link Mkinga fishers with urban and regional markets, especially the potential at the Kenya border. Invest in processing infrastructure, such as fish handling centers, cold-chain facilities, and enhanced rural road connectivity, to mitigate post-harvest losses and broaden market access for value-added goods.

Execute specialised training and extension initiatives on fish processing methodologies, business administration, and food safety regulations, specifically aimed at engaging fishers with limited educational backgrounds. Incorporate gender-responsive programming to facilitate women's involvement in value-added processing and marketing, in accordance with findings from Musa et al. (2016) regarding the impact of targeted credit facilities on gender-equitable value chain growth.

Limitations and Future Research

This study is cross-sectional and limited to Mkinga District, which limits temporal and spatial generalisability. Future research should use longitudinal designs to monitor livelihood alterations subsequent to value addition interventions, include women processors and traders as separate analytical groups, and implement econometric techniques (e.g., regression discontinuity or propensity score matching) to determine the causal impacts of particular value addition practices on household welfare outcomes.

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DECLARATIONS

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Ethical Approval: Ethical clearance was obtained from Tengeru Institute of Community Development (Ref. TICD/MCD/F040/2022), the Tanga Regional Administrative Secretary, and Mkinga District Council prior to data collection.

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