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THE INFLUENCE OF GOVERNANCE ON FOOD LOSS AND WASTE: A TANZANIAN PINEAPPLE VALUE CHAIN PERSPECTIVE

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Abstract: *Food loss and waste remain a substantial challenge in agricultural value chains, particularly in developing countries. This study examines the influence of governance on food loss and waste within the pineapple value chain in Tanzania. Using qualitative methods, data were collected in Dar es Salaam, Geita, Morogoro, and Pwani regions through focus group discussions, interviews, and observations. The study mapped actors and explored the role of governance, power dynamics, and coordination, drawing on resource dependence and institutional theories to explain how actor relationships, power imbalances, and institutional influences shape food loss and waste. Three types of governance structures were revealed– spot market, captive and relational structures, affecting food loss differently. In the captive governance structure, pre-finance arrangements lock farmers into selling only to specific traders, often leading to significant on-farm losses when market conditions shift. Spot markets, on the other hand, generate losses when harvested fruits do not meet the informal standards set by buyers, such as size, ripeness, and other physical attributes, due to limited market information. Weak coordination, information asymmetry, and power imbalances among value chain actors contributed to substantial food loss and waste. Main challenges faced by farmers included poor access to markets, financial constraints, and weak bargaining power. Institutional gaps, including weak regulatory frameworks and inadequate support from government and private sector, exacerbate inefficiencies. The study emphasizes that governance plays a central role in shaping food loss and waste. Strengthening farmers' associations, improving market linkages, and addressing institutional gaps are critical for reducing food loss and waste and increasing value chain resilience.*

Keywords: *Food loss and waste, Value chain mapping, Governance, Coordination, Power dynamics*
(JEL code: Q13; L14)

INTRODUCTION

In agricultural value chains, food loss and waste (FLW) significantly affect food security, incomes, economic growth, and environmental sustainability (FAO, 2019; Petrescu-mag et al. 2024). FLW occurs throughout the value chain, from production and post-harvest handling to processing, distribution, and consumption stages (Holland, 2021; Luo et al., 2021; Surucu-Balci and Tuna, 2022). Despite the increased focus on food loss and waste in the last decade, food is still being lost and wasted along the supply chain (Mann et al. 2020) and is influenced by different factors. Globally, it is estimated that one-third of the food produced annually gets lost or wasted along the value chain (Gustavsson et al., 2011; FAO, 2019), with fruits and vegetables accounting for 46% of the total FLW (Ekka and Mjawa, 2020). The effect of FLW is evident to smallholder farmers, particularly in developing countries. A well-structured and efficient value chain can lead to more effective resource allocation, generating economic benefits for all actors along the value chain and reducing food losses (van der Maden et al., 2021). While coordination requires strong governance and mutual trust among actors (Trienekens 2011), poor coordination can result in significant losses, especially for perishable crops (Kitinoja et al., 2018).

Food loss and waste is experienced in developing and developed countries, and the causes involve several factors. However, FLW occurrence varies with production practices and the state of value chain development. The dynamics of interactions and power relationships among value chain actors are believed to have a significant role in FLW (Herzberg et al., 2022). Governance in a value chain is the authority and power relationships among actors that determine the flow and allocation of resources and finances within a chain (Gereffi and Fernandez-Stark 2016). In the formal mechanism, governance can increase FLW when large buyers, particularly processors and exporters, impose strict quality standards based on

shape, size, color, or delivery schedules, leaving actors liable to losses when they fail to comply (Santos de Carvalho et al., 2018). Actors are forced to endure unequal risk and cost of FLW resulting from power imbalances among actors (Cromwell et al., 2025).

The governance structure is always determined by the complexity of information shared between actors, how the information can be easily codified, and the producer's level of competence (Gereffi and Fernandez-Stark, 2016). On the other hand, governance structures determine how value chains are organized and managed, influencing compliance, quality standards, and resource allocation (Trienekens, 2011). Weak governance structures in agricultural value chains, specifically in developing countries, often fail to address systemic issues like value chain inefficiencies, which limit market linkages, financial support, and collaboration among public and private sectors, which are critical for FLW reduction (Hodges et al., 2011). Strengthening governance mechanisms can facilitate better integration of actors, fostering shared responsibility in managing FLW. An exploration of actors' influences and dynamics provide valuable insights that could inform policy and enhance value chain sustainability (Monticone et al., 2024).

Pineapples are an important horticultural crop in Tanzania, providing a vital source of income for smallholder farmers (Pesha and Mbawala, 2018). However, the pineapple value chain struggles with food loss and waste. Factors such as inadequate market information, financial constraints, and underdeveloped agricultural institutions contribute to pineapple losses (Abdalah et al., 2018; van der Maden et al., 2021). Although existing literature emphasizes chain governance and its influence on food loss and waste (Arinloye, 2013; Warsanga, 2014; Santos de Carvalho et al., 2018; Kiambi et al., 2020; Nyokabi et al., 2023; Massawe and Mwololo, 2024), there is a lack of empirical research examining the governance mechanisms affecting food loss and waste in Tanzania (Kulwijila et al., 2018). Most literature on food loss, especially related to post-harvest losses in Tanzania, has focused on technological or infrastructural causes, with minimal studies investigating coordination, power dynamics, actor relationships, or standards and compliance (Chegere, 2018; Ahmad et al., 2020; Issa et al., 2021; Mutungi et al., 2023; Kamugisha, 2023; Izdori et al., 2025), thus overlooking the critical role of chain governance in influencing food loss and waste.

Moreover, a few existing pineapple research works have examined issues such as opportunities and challenges of smallholder pineapple farmers in improving rural livelihoods (Haji and Babune, 2023), pineapple diversity and generic identity (Abdalah et al., 2018), the impact of savings and credit cooperative societies services on pineapple growers income (Pesha and Mbawala, 2018), and the factors influencing sustainability of improved pineapple production technologies (Mauya, 2016). These studies lack detailed information on the existing governance structures, coordination of the pineapple value chain, and their connection with FLW. This study seeks to bridge this gap by exploring how governance structures influence FLW in the Tanzanian pineapple value chain. Specifically, the study has two objectives: (i) to map actors and identify governance structure in the Tanzania pineapple value chain and (ii) to explore the role of governance structures, coordination, and power dynamics in influencing food loss and waste across the

LITERATURE REVIEW

This study assimilates elements of resource dependence theory and institutional theory to assess the actor relationships, coordination, and power asymmetry and their influence on FLW. Factors like governance structure, power dynamics, coordination, and compliance were assumed to influence FLW in the pineapple Value chain. Resource Dependence Theory (RDT) examines the relationship between organizations and their external environment (Viscardi et al., 2024). It highlights how organizations depend on external resources such as finance, inputs, technology, information, and market access (Wry et al., 2013), which lead to interdependencies within a network. For instance, small-scale farmers lack the financial resources to invest in modern storage facilities or processing technologies, resulting in higher levels of food loss. According to Pfeffer (1978), firms develop dependencies on the provider of resources due to external constraints, and these dependencies can vary in strength and may be reciprocal. In this study, the main concepts from the resource dependence theory include power imbalances (differences in bargaining power) and interdependencies among value chain actors. In the context of FLW, RDT suggests that food loss and waste can occur when organizations lack access to essential resources that could improve efficiency and reduce food loss and waste.

Institutional Theory (IT) focuses on how rules, norms, and beliefs influence organizational behavior and decision-making. Food loss and waste can be regarded as a result of informal and formal institutions governing relations in the value chain (Cromwell et al., 2025). Social organizations, service companies, and regulatory authorities can impact the value chain (Alam, 2022), and high reliance on external entities and limited information exchange among actors have been identified as crucial challenges for reducing food waste in supply chains (Ramanathan et al., 2024). Institutional theory can be used to explain the barriers to FLW reduction in the value chain.

MATERIALS AND METHODS

Data collection

This study was conducted between February and August 2024 in the Dar es Salaam, Geita, Morogoro, and Pwani regions of Tanzania. The regions accounts for the major pineapple-producing areas and potential markets (URT, 2021). A qualitative research approach was adopted. Key informant interviews and focus group discussions (FGDs) were employed in gathering data. Pineapple farmers were recruited for the study through agricultural officers in the areas, and only farmers with at least 2 years of pineapple farming experience were considered for this study. Seven (7) focus group discussions with 5-11 participants were formed. Furthermore, twenty-five (25) semi-structured interviews were conducted with traders, processors, agricultural officers, and stakeholders from

NGOs and the government. Agricultural officers in the study areas were contacted to identify pineapple farmers and solicit their willingness to participate in the group discussions. Key informants were recruited using purposive and snowballing techniques. Participant characteristics are presented in table 1.

Before commencing with data collection, the researchers prepared, pre-tested, and revised the interview and FGDs guide, where it was necessary. The interview guide (Appendix 1) included 13 open-ended questions covering actors, market linkages, pricing, pineapple quality standards, handling practices, and the causes of losses in the pineapple value chain. The interviews and FGDs were conducted in Kiswahili since it is the common means of communication in Tanzania. During data collection, the participants were asked permission to record the discussions and the interviews. All interviews were face-to-face except for two that were conducted by telephone. FGDs lasted between 55 and 97 minutes, whereas interviews were between 30 and 45 minutes. To ensure validity and reliability, researchers asked similar questions to participants unless a follow-up question was needed for more understanding, and all FGDs were well-moderated and recorded. Sampling and data collection were concluded, adhering to the principle of theoretical saturation. That is when no new information or theme emerged from additional responses (Hennink & Kaiser, 2022).

Table 1. Participants in the FGDs and KII

Focus Group Discussions				
			No. of participants	
Type of participants	**Region**	**No. of FGDs**	**Male**	**Female**
Farmers, traders, and processors	Geita	3	15	10
Farmers and traders	Morogoro	1	5	3
Farmers and traders	Pwani	3	14	4
		7	**34**	**17**
Key Informants Interviews				
			No. of participants	
Type of participants	**Region**	**No. of KIIs**	**Male**	**Female**
Traders, and processor	Geita	5	2	3
Farmers, processor	Pwani	7	5	2
Wholesalers, processor	Morogoro	7	5	2
Traders, and Exporter-(Zawadi Agrifoods)	Dar es Salaam	6	5	1
		25	**17**	**8**

Source:Authors' field survey data

Data analysis

Value chain mapping and thematic analysis were employed in analyzing data. Mapping the value chain is a necessary first step for the value chain analysis (Hellin & Meijer, 2006; Stein & Barron, 2017). Thematic analysis is useful in exploring experiences, views, and opinions (Chen et al., 2019). The recorded discussions and interviews were transcribed verbatim in Kiswahili and translated into English for further analysis. For accuracy, the transcripts were cross-checked against the original recordings, and notes were taken. Further, using qualitative data analysis software (NVivo 10), codes and categories were generated regarding the predetermined themes as shown in Table 2, Table 3, Table 4, and Table 5. Direct quotes from participants have also been presented to amplify participants' views.

RESULTS AND DISCUSSION

Pineapple value chain mapping

The pineapple value chain was structured based on the information collected from value chain actors. Identified actors in the pineapple value chain include farmers, brokers/local traders, wholesalers, processors, and retailers. Consumers have been depicted as the end-users. Both the domestic and export value chain were identified. The significant roles of actors include input supply, production, collection, trading, processing, and consumption. Figure 1 depicts the value chain map showing the stage/functions, key actors, and supporting actors. Pineapple farmers in the study areas mentioned that they acquire inputs such as fertilizer from local traders and some from government-subsidized fertilizer through their local government leaders. An informal supply of inputs, such as pineapple seeds and fertilizer, exists through farmer-to-farmer exchanges. The labor employed in land preparations and harvest is mainly hired. Usually, farmers pay for land preparations and weeding costs, whereas the buyer incurs harvesting costs (labor). Farmers incur harvesting and collecting costs when they take pineapples to the market directly.

Smallholder farmers are the dominant pineapple producers and are the primary and most significant actors in the value chain in the study areas. Most farmers own less than one hectare, and their main roles in the value chain include land preparation, planting, farm management, harvesting and marketing. Most farmers sell pineapples to the local traders/middlemen at the farm level. However, they also sell to retailers and consumers at local markets. Grading and sorting are done mostly by local traders (also referred to as brokers) in agreement with farmers. Farmers have limited access to markets and resources. Local traders and brokers collect and resell pineapples to wholesalers and processors. They serve as a link between farmers and

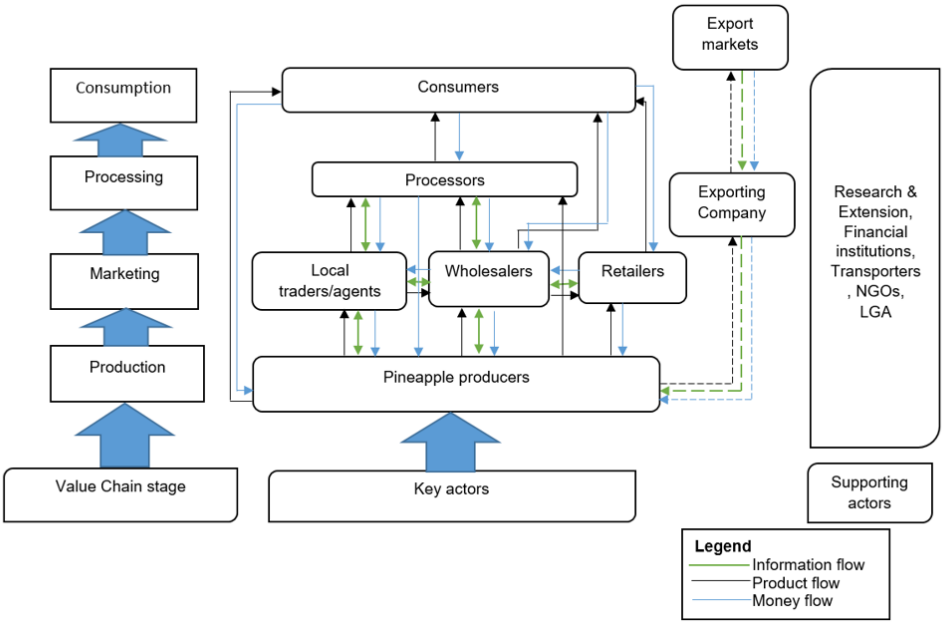
buyers. Their role included buying, assembling, and reselling. The mode of transportation to collection centers or local markets is largely by motorcycle, bicycle, or mini truck. The major buyers are wholesalers, retailers, and processors responsible for procuring, aggregation and distributing pineapples to other parts of the country. Wholesalers and processors use local traders (brokers) to collect pineapples from the farmers. However, they can also purchase pineapples directly from the farmers. Wholesalers own trucks or hire from private transporters, and transportation costs depend on the distance and capacity of the truck. They transport and sell to the large markets in big cities and others export to nearby countries like Kenya. Payments from wholesalers to farmers are mostly made through local traders. Retailers in the pineapple value chain typically perform the last marketing role. Retailers sell small amounts of pineapples, around forty to fifty pineapples a day. They sell at their stands alongside the roads or market centers, and some sell as street sellers. The results revealed limited procurement and pineapple handling capacity because of a lack of finance, transportation, and storage facilities.

The results also revealed that fresh pineapple processing is not well established as there are few processors, mainly small-scale processors, identified in some areas. Processed products include fresh juice, pineapple wine, dried and fresh pineapple slices for direct consumption. Two large processors (Sayona and Bakhresa) were identified and interviewed. However, they produce fresh pineapple juice among other products. Large processors primarily procure pineapples through purchase orders issued to middlemen or agents, while small-scale processors typically source directly from farmers or local traders. Big pineapples are directed to the fresh produce market, whereas smaller, lower-priced pineapples are often used in processing. It should be noted that processors use a small portion of the pineapples. Likewise, van der Maden et al. (2021) found that most horticultural produce in Tanzania is consumed locally as fresh produce, with only a small portion being processed. This leaves unexploited potential for reducing food loss and waste and increasing economic value.

Payments by large processors are generally made based on the weight of the pineapples, calculated per kilogram. Pineapple processing in Tanzania remains limited and faces numerous challenges. The export filament of the pineapple value was found to be at an infant stage. One of the fresh pineapple exporters was interviewed and revealed that the export chain is still struggling and faces many challenges, including meeting the requirements to preserve pineapples from the farm to the final customers. Supporting actors found in the study areas were agricultural extension officers, private transporters, researchers, the Small Industry Development Organization (SIDO), the Tanzania Horticultural Association (TAHA), and the local government authorities. The current assistance from the supporting actors is insufficient in terms of extension services, research, and financing, highlighting the need for collaboration between the government and the private sector to achieve the desired outcomes.

Access to formal financial institutions, including bank accounts, is similarly gendered. A large proportion of fisherfolk lack bank accounts (91.44), significantly higher than Liberia's national unbanked rate (71.40%) (the Global Economy.com,2025) . However, men (71.43%) are far more likely to have bank accounts than females (25%) as shown in Table 4. Development finance theory suggests that female's exclusion from formal finance is often rooted in limited human capital—such as literacy and numeracy skills—and restricted access to social and economic resources. The findings reflect this, with female having far lower education levels, making it difficult for them to meet documentation requirements for bank accounts or loans. This aligns with Pomeroy et al. (2020) and Letouze et al. (2021), who both emphasize education as a central barrier to financial inclusion.

Figure 1. Value chain map of Tanzanian pineapple



Source: Researcher conceptualization from the field data (2024)

Local governance structure of the pineapple value chain

The governance structure refers to the organization of the value chain and coordination among the actors that facilitate the product flow from production to the end user (Tadesse & Bekele, 2022). It is influenced by actors' interdependence in the supply chain and by differences in market power (Trienekens, 2011). The results revealed that three governance structures exist in the Tanzanian pineapple value chain. The most prevailing structure is market governance, although captive and relational governance can be observed. The market governance is based on the spot market relationship, where the prevailing market price guides the interactions. The transactions among pineapple farmers and buyers are simple. The price is typically determined based on the quality and size of the pineapples. Similar results have been observed by Cromwell et al. (2025), that fruits of a large size fetch better prices than medium or small ones. On average, farmers sell pineapple for 760 Tanzanian shillings, equivalent to €0.26 per pineapple.

In the captive governance, wholesalers assisted by the local traders/agents were observed to be the key value chain drivers. Likewise, through the agents, processors were observed to have control over the pineapples supplied and the price. Focus group discussions with farmers revealed their position in the price setting and negotiations as very weak, reflecting captive relationship they operated in. The upfront financial assistance advanced by traders assures local traders and brokers exclusive rights to buy pineapples at harvest. This creates a lock-in relationship between farmers and prospective buyers, cementing the captive governance structure. A farmer (F3SV) from Sungusila village responded:

F3SV: *"Once the farmer takes some amounts from the middlemen, that farm is no longer under his authority. He can't even sell because he'll be held responsible".*

Likewise, substantial dependence on brokers' financing results in losses if there is any delay on the brokers' agreed harvesting date, and also limits farmers' ability to search for alternative buyers and competitive prices. When buyers fail to fulfill their commitments, farmers are unable to sell their pineapples to other buyers due to these exclusive agreements, which further intensify their financial vulnerability, as one of the key informant farmers (KIF1) highlighted: "For example, a buyer might promise to come on a certain date, but they don't show up. You're not allowed to sell to another buyer during that time. When they finally come, you find some pineapples have spoiled on the farm, and out of 1,000, you might lose 150 to 200 fruits."

The relational governance structure is observed when coordination and transactions between farmers and local traders or local traders and wholesalers are based on trust, mutual dependence, and long-term relationships rather than formal contracts or standardized rules. Similar results were obtained by van der Maden et al. (2021). In the Tanzania pineapple value chain, local traders and middlemen usually maintain relationships with farmers by providing financial assistance when needed. For example, local traders or middlemen offer credit or upfront payments to farmers, which assist in meeting their different needs. Although such assistance may not guarantee a good market, it can also lead to loss if pineapples are ready to be harvested and the trader has not shown up. It also limits the farmer from searching for other buyers who could offer better prices during harvest.

F3SV: *"I think maybe another reason causing pineapple spoilage is these middlemen, because, when middlemen provide pre-finance credit to the farmer, they tell you not to sell the produce to another buyer. As a result, the middlemen leave those pineapples to ripen excessively before they show up for harvesting, causing losses on the farm."*

Generally, the governance structure in the study areas favors the wholesalers and the local traders/brokers. The source of their power and dominance arises from two areas, i) possession of information about pineapple supply and demand, and ii) resource endowment, as traders have larger capital, enabling them to advance credit to farmers, thereby effectively creating the lock-in captive relationship that assures them of supply and low prices, hence dominating the channel.

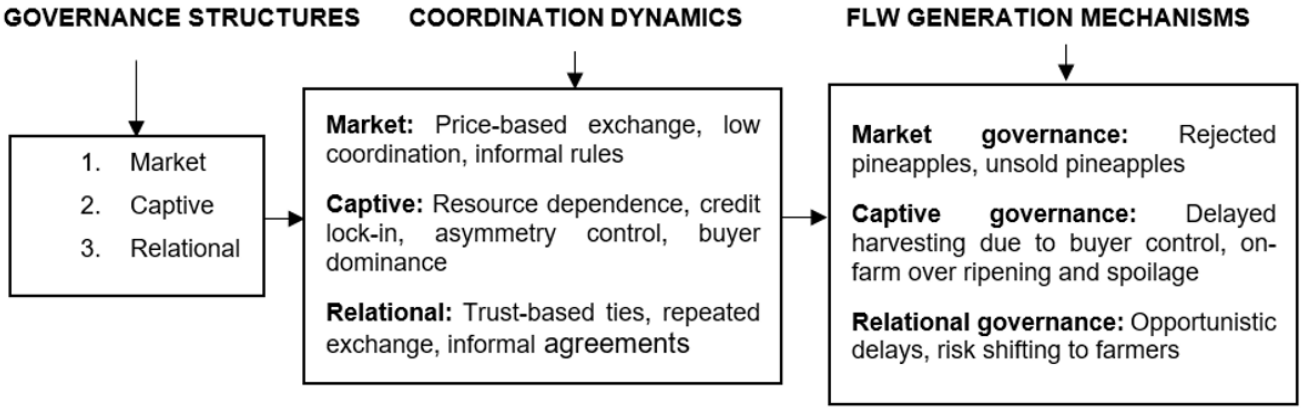
Table 2. Existing governance structures (Theme #1)

Codes	Categories	Theme
-They won't sell to just anyone; they have to look for you -Dependency on the broker for market access -I will give you a little money so that when the fruits are ready, you can sell them to me -Farmers find themselves without the power to sell elsewhere -Once the farmer takes some amount of money, that farmer is no longer independent -Farmers bear a loss for not being able to sell to any buyer	Captive governance and farmer dependence	Existing governance structures
-I sell to buyers at the market -The relationship with traders starts when I have a product they want to buy -My interaction with brokers ends after selling -Once we purchase from the farmer, the transaction is complete	Market governance	
-Small traders are from here; we know them -Brokers and local traders assist farmers when in need -Most relationships result from financial assistance -Middlemen can give farmers money, even if the produce has not ripened	Relational governance	

Source: Authors' own editing

The summary of governance structures and FLW mechanisms in the Tanzanian pineapple value chain is presented in Figure 2 below.

Figure 2. Governance structures and FLW mechanisms in the Tanzanian pineapple value chain



Source: Authors' own editing

Coordination and collaboration

Weak coordination and lack of formal institutional support appeared as a recurring theme across the discussions and heightened the challenges in the pineapple value chain. The results revealed weak horizontal and vertical coordination in the study areas. Farmers reported limited involvement by institutions, including financial support and organized farmer groups. A farmer (F2KV) from Kakubilo village explained:

F2KV: *"For example, here in Kakubilo, we don't have other stakeholders because we don't even have institutions dealing with pineapples. Because when you mention institutions or stakeholders, it means maybe there are loans that we get from institutions, we don't have loans, as pineapple farmers".*

The collaboration among actors is often limited and transactional. While pineapple farmers, brokers, and traders depend on each other for financial and logistical support, their relationships seldom extends to mutual problem-solving and strategic partnerships. Inadequate information flow among actors hinders coordination and decision-making. Similarly, a lack of farmers' associations, such as producers' cooperatives, leads to weak bargaining power. Studies support that collaborative strategies have the potential to reduce FLW by directly link farmers with buyers, processors, and supporting actors (Petrescu-mag et al., 2024; Voge et al., 2023; Izdori et al., 2025). When asked about farmer groups or associations, another farmer (F4KV) from Kakubilo village responded:

F4KV: "*We don't have that; everyone farms individually and sells individually, so there's no farmers' group that buys collectively like they do with cashews; everyone sells individually."*

Unlike farmers, incidences of collaboration have been observed among traders as they share transportation and other resources. Traders were observed to have their associations, as it was observed during the visit at the Buguruni market in Dar es Salaam. This reveals potential opportunities for cost reduction and improving efficiency in the value chain. Similarly, the government's role in providing subsidized fertilizer, however limited, signifies progress in enhancing coordination.

Furthermore, farmers stated that there was no equal access to information across chain actors and that information asymmetry affects their decision to sell, particularly to the large processors. The large processors usually use agents to collect pineapples from the farmers through purchase orders. The order specifies the amount required and the price offered per kilo of pineapples. When collecting pineapples from the farmers, the agents offer a price below what is stated in the purchase order. Petrescu-mag et al. (2024) also pointed out that limited market access and low prices can result in unsold and wasted products.

The results reveals that weak regulatory frameworks and limited enforcement mechanisms contribute to significant FLW. Local traders and wholesalers share information on pineapple prices and supply conditions in the study areas. Hence, the wholesalers and the agents take advantage of the profit over the farmers. Apart from individual networks and business relationships, formal contracts are lacking during transactions. Vidanapathiarana et al. (2020) reported the similar results, that the agents supplying processors have informal (verbal) agreements with farmers. This indicates that the actors in the value chain rely highly on informal agreements and mutual trust. From an institutional theory perspective, the lack of regulatory enforcement and formal contracting mechanisms to protect actors from breaking the agreements introduces dependency risks that may result in losses. Moreover, limited coordination among stakeholders like government agencies, business associations, and researchers is a substantial barrier to improving the value chain and reducing food loss and waste. One of the small processors (KISP2) expressed a lack of commitment from supporting actors:

KISP2: *"They said we would sign contracts later. They told us to build the facility, and once the business picked up, they'd find us a market. Then, we'd sign contracts to start repaying. That's where we're at now. If we could find an individual to advance our business, we'd repay them and grow our capital."*

Table 3. Coordination among actors in the value chain (Theme #2)

Codes	Categories	Theme
-Relationship is when I am in tight condition -The relationship is mainly commercial -Majority have relationships with local traders/brokers -Farmers have no relationship with end user -Brokers are the link between farmers and buyers -Some collaboration among farmers -Information flows from wholesalers to brokers to farmers of fellow broker -Farmers share pineapple information with brokers -The government is involved in bringing us subsidized fertilizer	Actor relationship and collaboration	
-I tell him to trust me -They said we would sign contracts later -The one who provides money will then come and deduct it during harvest -I don't have any contracts with anyone -In fact, no contract, but we use the purchase order	Informal agreements	Weak institutional support and coordination
-Farmers lack market information -Lack of institutions that lend to farmers -We don't have other stakeholders because we don't have institutions dealing with pineapples -Farmers don't receive any kind of empowerment -Lack of feedback from researchers	Limited institutional support and research involvement	
-As farmers, we have nowhere to go for loans -Everyone farms individually and sells individually -No farmer group that buys collectively like they do with cashew	Financial and organizational challenge, Lack of farmer organization	

Source: Authors' own editing

Power dynamics

Power asymmetry between farmers and other actors was frequently presented. The study indicates the existing inequalities in bargaining power between pineapple producers and brokers, who often set the prices and control access to buyers. The lack of access to direct markets and dependence on brokers weakens farmers' bargaining power. Hence, farmers are forced to sell pineapples at lower prices than expected. With limited options and information asymmetry, farmers fail to negotiate better prices, underpinning dependence on brokers who take advantage during selling to end buyers. To explain more, a farmer (F21MV) from Msinune village said:

F21MV: *"When the broker comes and tells you he will buy your pineapples for five hundred shillings, you agree to take your five hundred shillings. If there is seven hundred or a thousand shillings, only the broker knows, because it is the one who brought the buyer".*

With this power imbalance, farmers do not benefit from potential prices that could have maximized their gains. Long-term purchase commitments among local traders and farmers have created trust among them. Farmers may access loans from local traders/middlemen, and the agreement is always to sell pineapples to them during harvest. That means, during harvest, the local trader will take pineapples worth an amount equivalent to that provided to the farmers in return.

Local traders and wholesalers often exploit farmers by offering unfair prices, exacerbating power imbalances. During focus group discussions, farmers revealed that, during peak season, wholesalers or local traders/brokers determine pineapple prices. However, when pineapples are out of season, prices are set by negotiation. Generally, farmers have limited bargaining power due to their dependence on middlemen and limited markets. This power imbalance among actors within the pineapple value chain leads to weak coordination (Assefa et al., 2022), which is evident in its potential for food loss (Herzberg et al., 2022; Ramanathan et al., 2024). From a resource dependence perspective, FLW results from unequal power and constrained decision-making within governance structures.

Table 4. Power dynamics (Theme #3)

Codes	Categories	Theme
-Without brokers, you might sell at different prices -Lack of market information -The middlemen will come and lower the price -The farmer doesn't have direct contact with the buyer -Honestly, it is mostly the buyers who set the price	Lack of bargaining power	Power dynamics
-Buyer availability determines the decision to harvest -Once the farmer receives financial assistance, he loses authority over his farm -Farmers are glued to the financial assistance received -Pineapples ripen excessively in the field when buyer delay -Unfulfilled promises by buyers cause the pineapple to spoil	Decision-making constraints	

Source: Authors' own editing

Quality and standards compliance

Buyers and processors set quality standards for pineapples with different levels of specificity. Some buyers require specific sizes, ripeness levels, and physical attributes, which when farmers fail to meet, result in the rejection of the already harvested pineapples. This is supported by FAO (2019), that quality and grading standards are critical in determining product acceptance. Herzberg et al. (2022), pointed out that private quality standards contribute to food loss at the upstream stage of value chains. Such standards result in the exclusion of suitable produce for consumption that does not meet specific market criteria. Moreover, the compulsory quality standards by buyers in the export market aggravates pineapples' loss and waste. Farmers struggle not only to meet the requirements but also endure losses if the pineapples fail to meet the specified quality standards, as explained by one of the exporters (key informant interview 10):

KII10…*" we may request ripe, undamaged pineapples of a particular size, but not all harvested fruits meet these criteria. If we purchase, say, 20 tons, we often find that 1-2% do not meet the standards…"*

This is challenging for pineapple farmers who may not have the required knowledge, calling for training on quality standards and the formation of uniform grading systems. The lack of formalized grading systems is evident in the pineapple value chain as different requirements for size and quality exist. While some mentioned three categorized sizes (large, medium, and small), in some areas, pineapples are categorized as large, medium, small, and "rejects.

KIF1: *"There are large ones, medium ones, small ones, and others they call "rejects," which are very small. When they come to harvest, they take everything. But when it's time to count, you'll find that three of the smallest ones are counted as one pineapple. They say these are like waste, and that's why we complain about market issues"*

However, while this informal categorization is a common practice, it lacks a standardized grading system that could improve market efficiency and reduce pineapple losses. Cromwell et al. (2025) in their studies also found that, informal standards applied were based on size, fruit maturity and appearance. With standardized grades, farmers and traders would ensure quality requirements by the markets and reduce chances of rejection while improving market access to high-quality pineapples. Codes generated in Table 5, indicates that not all harvested pineapples meet standard requirements and hence they get rejected.

Table 5. Compliance to quality and standards (Theme #4)

Codes	Categories	Theme
-Not all harvested fruits meet those criteria -We take only pineapples that are semi-ripen, not fully ripen and not green ones	Inability to meet quality requirements	Compliance with quality and standards

Source: Authors' own editing

Implications of the study

This study contributes to governance and food loss literature by showing how institutional voids reinforce asymmetric resource control structures, generating governance mechanisms that increase FLW in agricultural value chains in developing countries. In particular the results show that the captive governance structure reinforced by informal credit dependencies and weak regulatory enforcement limit farmers' strategic autonomy and decision making, raising on-farm and postharvest losses. By linking governance typologies to loss generation mechanisms the study posits that improving coordination alone in agricultural value chains is insufficient without addressing power and institutional weaknesses. Addressing food loss and waste challenges rooted in governance, the findings emphasize the need for a comprehensive approach that combines empowering farmers, infrastructure development, and policy interventions to create a more inclusive and sustainable value chain. Collective actions could help farmers link with buyers, strengthen their bargaining power, negotiate better prices, access the market directly, and reduce FLW.

CONCLUSION

The study findings indicate that governance structures, power dynamics, and coordination within the pineapple value chain in Tanzania play a vital role in influencing the efficiency of resource allocation and the management of pineapple losses and wastes. The chain is characterized by poor governance structures, weak multi-sector collaboration, and limited infrastructure, exacerbating FLW. Power imbalances among value chain actors, particularly between farmers and middlemen, create inefficiencies, contributing to FLW. Lack of formal structures and existence of power dynamics where brokers and buyers influence the prices and market significantly, position actors, especially farmers at risk of incurring losses or price disputes.

In addressing food loss and waste in the pineapple value chain, the findings of this study highlight the need for a more coordinated approach among stakeholders to promote a more resilient and sustainable value chain that benefits all involved actors. Existing power imbalances can be addressed through strengthening institutional support and enhancing coordination mechanisms. Farmers' empowerment through associations and training programs can enhance their bargaining power, increase fairness, and reduce pineapple loss and waste along the value chain. Further research could explore different agricultural value chains in Tanzania to assess whether comparable challenges and power disparities occur across sectors.

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