Jefore Ethiopian Journal of Applied Sciences

ISSN 3006-6263 Volume 2 (1), 2026

Journal homepage: www.jejas.org

Research Paper

Mapping Enset Value Chain: Roles, Constraints, and Opportunities in Guraghe Zone, Ethiopia

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Article History:
Received: 08 October 2025
Accepted: 10 December 2025
Published online: 27 January 2026

Keywords:
Enset Value Chain, Constraints, Opportunities

Abstract

Enset is a staple food crop consumed primarily by many people in the Guraghe Zone. This study aims to examine the Enset value chain in the Guraghe Zone, focusing on the roles, constraints, and opportunities faced by the actors involved in the value chain. Cross-sectional data from a total of 356 Enset farming households were collected using a survey. Panel data on Enset product production and productivity from 2013 to 2021 were also analyzed, in addition to data gathered from focus group discussions and key informant interviews. In the study area, Enset input suppliers, Enset farmers, Enset product village collectors, product retailers, wholesalers, and consumers were the major actors in the Enset value chain. The study estimated the yield of three major Enset products; yields were highest in 2019, with 0.37 qt/tree for amicho and 0.39 qt/tree for kocho. The quintal/tree yield for amicho ranged from 0.14 to 0.37 between 2013 and 2021, whereas kocho yield ranged between 0.14 and 0.39. Using Mean Likert Scale (MLS) analysis, the major constraints in the Enset value chain were bacterial wilt disease (MLS = 4.93), lack of storage (MLS = 4.23), perishability and odor (MLS = 3.61), and seasonal market demand (MLS = 3.9). Interventions are necessary to enhance the adoption and innovation of bacterial wilt-resistant Enset varieties, in addition to improving Enset production and processing methods for better productivity and reduction of post-harvest loss.

1. Introduction

Enset (*Ensete ventricosum*) is a staple food in Ethiopia (Mulatu, 2021). It is resilient to drought, accessible yearly, can store for long periods, and has a multipurpose role beyond consumption. It contributes to the diet of about 20 million Ethiopians (Valentina, 2015). The importance of enset for Ethiopians is beyond food, as it is also used to make local clothing, beds, houses, cattle feed, and plates (Birmeta, 2018). The crop is an important climate-smart crop that can improve soil fertility and is suitable for intercropping with coffee, potatoes, and other food crops (Tamire & Argaw, 2015). Enset is consumed in the form of

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DOI: https://doi.org/10.70984/xxg43r91

Kocho[2], Bulla[3], and Amicho[4] and it is the primary source of food in different regions of Ethiopia. The caloric value of these kocho is very high, consisting mainly of carbohydrates (80–85%), mainly starch. Kocho has low protein (2.4%) and fat (below 1%). Kocho also contains little minerals such as calcium, potassium, and iron, despite a relatively low level of fiber. Hence, these foods are often consumed with protein-rich additions like milk, meat, or legumes (Birmeta et al., 2019).

Bulla is a pure starch product extracted from the liquid fraction after squeezing the pulp of the pseudostem and corm. It has more starch but less fiber than Kocho. Bulla is relatively light, highly digestible, and energy-rich, often reserved for special occasions or vulnerable groups in the form of drinks, porridge, baby food, or convalescent diets (Brandt et al., 1997). Amicho is a fresh, boiled starchy food eaten soon after harvest. Its nutrient profile is closer to root and tuber staples than to Kocho or Bulla (Muhammed & Abraha, 2016).

The south and southwestern regions of Ethiopia have high enset production potential, where it is cultivated using traditional farming systems, typically as part of mixed cropping at the household level (Brandt et al., 1997). In enset-growing areas, about 70% of households' calorie intake comes from enset; however, market participation remains at an early stage, as enset products are mainly consumed within the home. In non-enset-producing regions, consumption of enset products is either absent or minimal due to cultural preferences or limited awareness (Borrell et al., 2020).

In enset growing regions of Ethiopia, predominantly Guraghe, Sidama and Hadya are known for enset production and consumption. The regions experience the cultural, economic, and ecological value of enset (Brandt et al., 1997; Borrell et al., 2020). Beyond its usual use as a staple food, enset is used for livestock feed, construction material, and a traditional medicine (Shigeta, 1990). However, the crop remains underemphasized in development strategies and value chain programs. The production activities of enset, such as land preparation, planting, and processing are often conducted using traditional tools and labor-intensive methods.

Previous study in this topic primarily mark the agronomic and cultural dimensions of enset, with very limited empirical research on the economics of the enset value chain development. Value chain studies in different parts of Ethiopia focus on high-value products like khat, coffee, wheat, honey, sesame, and livestock (Minten et al., 2016; Gebreselassie & Sharp, 2007), leaving a significant research gap on exploring the role of enset in the Ethiopian livelihood and economy. Up-to-date information on enset farming practices, processing methods, pricing mechanisms, and market participation of enset-producing farm households remains fragmented and scarce (Brandt et al., 1997; Shank & Ertiro, 2013). Furthermore, there is a weak relationship between actors within enset value chain, including producers, traders and local consumers. This hinders the performance of

[2] *Kocho is the fermented starch produced from a mixture of decorticated leaf sheaths and finely grated corm of enset, the underground stem base.*

[3] *a small, water soluble starchy substance that can be obtained from kocho by squeezing and decanting the liquid.*

[4] *Amicho is the fleshy inner part of the enset corm, which can be cooked and eaten on its own, with a taste similar to that of a potato.*

enset farming that targeted policies and investments needed to fully realize the potential of the enset farming sector are still scanty.

Guraghe Zone[5] , the study area, is among the regions known for enset farming and consumption. A significant share of the agricultural cropland in the zone is covered by enset, and the Gurage highlands are known for their enset-based farming system. The Guraghe communities are known in Enset farming practices for at least 2,000 years (Brandt et al., 1997). However, the enset value chain in the Guraghe Zone remains poorly developed and scrappy (Borrell et al., 2020). Limited participation in markets, labor-intensive processing, the existence of bacterial wilt disease and declining genetic diversity hinder the performance of enset farming (Borrell et al., 2020; Yemataw et al., 2018).

Moreover, enset farming practices and its socio economic values to enset growing regions are not well documented in the literature. Value chain mapping provides a systematic methodology to identify actors, functions, constraints, and opportunities along the chain (Kaplinsky & Morris, 2001). Therefore, this study aimed to fill the existed literature gap by mapping enset value chain in the Guraghe Zone with a focus on: (1) assessing the socio-economic characteristics of value actors; (2) examining the structure and functions of enset production, processing, and marketing; and (3) identifying key constraints and opportunities that shape stakeholder engagement and value creation across the chain. The outputs of this study are crucial for policymakers, development practitioners, and value chain actors to design targeted interventions that enhance efficiency, market participation, and income generation, while preserving the cultural and economic significance of enset in the region.

Therefore, the study is designed to examine the enset value chain in Guraghe Zone focusing on the roles, constraints, and opportunities along actors involved, specifically:

a. To assess the production trends and productivity of enset in Guraghe zone
b. To examine the functional and marketing structure of the Enset
c. To identify the constraints and opportunities faced by value chain actors

2. Literature Review

2.1. Theoretical Review

Porter (1985) conceptualise value chain as a sequence of activities that a firm operating in a specific industry performs to improve the value of a product or service for the market or consumption. In agriculture context, value chain analysis involves defining actors, activities, and linkages of various value chain functions starting from input supply, production, processing, distribution and consumption along with the flow of information, resources, and services between them (Kaplinsky & Morris, 2001).

The Sustainable Livelihoods Framework provides a theoretical base for how to mobilize assets and capabilities to engage in numerous livelihood strategies targeting agricultural production and marketing (DFID, 1999). This framework shows the significance of institutions, policies, and processes that shape access to resources and value chain governance, especially for smallholders. The Transaction Cost

[5] *an administrative region term in Ethiopia that includes several districts and covers a larger area than a district*

Economics also provides an understanding of the constraints that those actors in developing countries face when participating to market (Williamson, 1981). These theories collectively support the need to explore the enset value chain by mapping actors, their roles, the market systems they engage in, and the challenges and constraints they encounter across the value chain.

Enset is a drought-resilient and multipurpose crop for the Ethiopians, and it has been known as a critical food security crop. Guraghe Zone shares over 3.6% of the national Enset production (CSA, 2021). Studies such as Nuri (2016) and Ashenafi et al. (2017) revealed that inadequate extension service, lack of improved seed varieties, bacterial wilt diseases, poor processing technology, and marketing inefficiencies are critical challenges of enset farming. These findings provide a baseline understanding for further exploration of value chain dynamics.

2.2. Empirical Review

The existed literatures on enset (Ensete ventricosum) show its agronomic roles, processing difficulty, and progressive market demand. Earlier research by Shigeta (1990) revealed the role of indigenous knowledge of traditional enset management practices in enset productivity in southern Ethiopia. Also, Brandt et al. (1997) confirmed the significance of enset to household food security, and others as well revealed that labor availability, land size and cultural practices determine production decisions.

A recent study by Yemataw (2018) revealed the determinants of enset production performance by employing household surveys and morphological characterization. Accordingly, he identified that on-farm diversity, farmers' trait preferences, and the agronomic attributes affect production performance. Olango et al. (2014) conducted genetic and phenotypic analyses and confirmed the presence of regional production system differences due to high intra-species variability and linked diversity patterns with processing qualities.

Borrell et al. (2020) show how production systems and climatic adaptability affect yields, resilience, and potential for enset varietal improvement. Tsegaye and Struik (2002) analyzed traditional processing and utilization of enset, indicating the traditional mode of enset farming and processing. The authors revealed that poor access to improved processing tools and market information hampers its commercialization. Negash and Niehof (2004) found that actors in enset value chain, mainly producers, face constraints related to poor infrastructure, low bargaining power, and lack of organized markets.

Aliy et al. (2016) revealed that enset value chains prove informal setting with minimal institutional support, leading to inefficiencies in marketing, price volatility, and weak linkages between producers and traders that actors operate in the Sidama Region. Similarly, Urugo et al. (2024) gave emphasis to the potential of integrating enset into formal agri-business systems but noted the absence of coordinated value chain development activities in Ethiopia.

Nowadays, the enset-producing regions of Ethiopia find that enset farming performance is constrained by limited processing technologies, high marketing costs, poor quality, and weak value-chain linkage, despite growing urban demand for processed enset products. Enset production and processing remain dominated by smallholder practices, while commercialization is emerging but faces structural and technological challenges.

In the Guraghe Zone, enset production is widespread but poorly linked to urban markets, and middlemen often capture the majority of the

value (Gebre-Mariam, 2019; Worku et al., 2020). Smallholder enset-producing farmers have limited knowledge about pricing, quality standards, and market requirements. These findings show a gap in systematic value chain analysis targeting value chain actor roles, marketing structures, and location-specific constraints in the enset farming particularly in Guraghe zone, where the crop embraces both economic and cultural value.

This study employs a conceptual framework adapted from Kaplinsky and Morris (2001) and the FAO (2005) guidelines for value chain development.

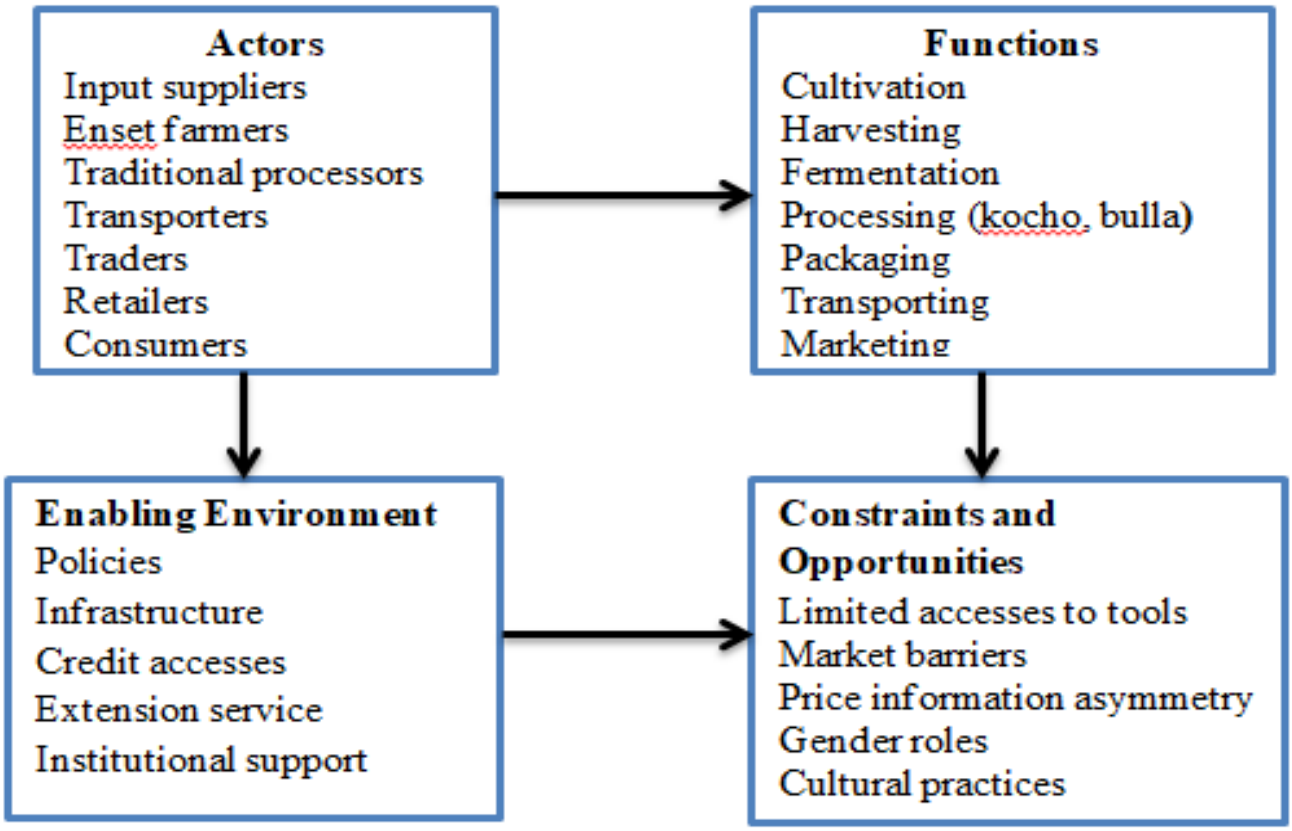

Figure 1. *Conceptual framework of the study*

3. Research Methodology

2.3. Study Area

Enset-based farming has been predominantly practiced in the study area, specifically in the Guraghe Zone. It is one of the administrative zones in Central Ethiopia, and agroecologically, the majority (65.3%) of the land area is placed in the midland or "Woina-dega", about 31.6% of the land area is highland (degga), and the remaining 3.1% of the land constitutes the lowland (kolla). The main staple food crop in the study area is Enset, and its geographical location extends from 8° 00' 18.9" to 8° 15' 28.53" N and 37° 35' 46.48" to 38° 03' 59.59" E at an elevation ranging from 1,000 to 3,000 meters above sea level (masl) (GZoARD, 2019).

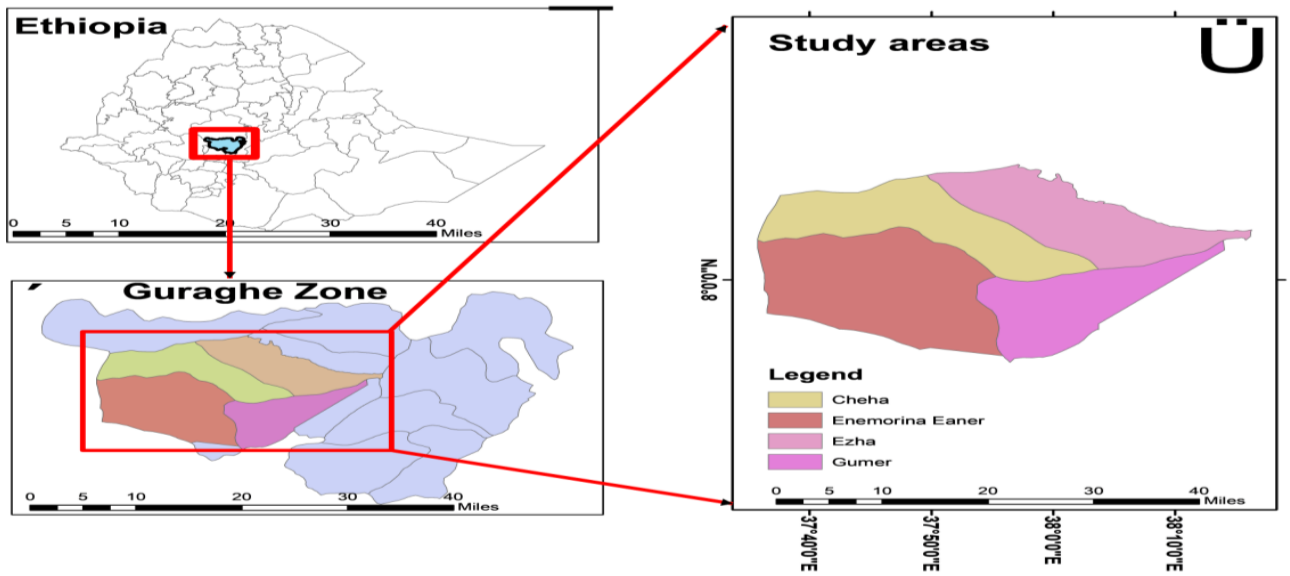

Figure 2. *Map of the study areas (Source: Own design from GIS)*

2.4. Research Approach and Design

The study followed a mix of qualitative and quantitative approaches. A descriptive research design was employed to explore the roles, constraints, and opportunities of enset value chain. Particularly, the study collected cross-sectional data to gather quantitative and qualitative data required for the study.

2.5. Sampling and Methods of Data Collection

A combination of sampling designs and data collection approaches was employed to ensure a comprehensive, valid, and contextually grounded analysis of the enset value chain in Guraghe Zone. Primary data from structured questionnaires, FGDs, and KIIs provided both quantitative and qualitative insights necessary to capture production practices, institutional dynamics, and chain-wide constraints that cannot be obtained from a single source. Secondary data from CSA reports, agricultural offices, and literature strengthened contextual understanding and allowed triangulation.

Primary data were collected through structured questionnaires, Focus Group Discussion (FGDs), and Key Informants (KIs). Using these combinations of data collection tools, both quantitative and qualitative insights are necessary to capture production practices, institutional dynamics, and chain-wide constraints that cannot be obtained from a single source. Secondary data were obtained from Central Statistical Agency (CSA) reports, agricultural office records, and relevant literature, and this helped to strengthen contextual understanding and allowed triangulation. A multistage sampling procedure was employed to manage the geographic difference and variation of enset-producing areas, while purposive sampling ensured that only districts and kebeles[6] with significant enset cultivation and active value chain participation were included. Within these selected locations,

[6] *lowest administrative unit of government and it is similar with neighborhood, ward, or village-level unit*

random sampling of households minimized selection bias and ensured representativeness, resulting in a robust and analytically reliable sample of 356 respondents.

Table 1. *Sample size determination in selected kebeles*

District	Kebeles	Total enset farm households	Sample households	Total from each district
Cheha	Endebra [a]	622	45	93
	Teresh[b]	452	33	
	Anzenabate[c]	217	15	
Ezia	Menter [a]	417	26	83
	Yegobet [b]	527	33	
	Ketane[c]	396	24	
Gumer	Abota[a]	367	34	99
	Ama[b]	398	37	
	Mocha[c]	309	28	
Enemorina Ener	Gomeshe[a]	465	34	81
	Shanqa[b]	382	28	
	Agata[c]	254	19	
Total sample				**356**

[a] high producer (>2000 ha); [b] medium producer (≥1500-2000 ha); low producer (<1500 ha)
Source: From CSA and the Agricultural Office (Own computation)

2.6. Method of Data Analysis

Descriptive statistics were employed to analyze data gathered for this study. Also, inferential statistics were used to compare market participants and non-participants.

In this study, the functional approach of value chain analysis was employed to investigate enset value chain from the production level to the final consumption. This approach is preferable to examine technical processes and relationships in the value chain. In this study, this approach is chosen to obtain a detailed 'big picture' of enset value chain in the Guraghe zone.

4. Results and Discussion

4.1. Description of Respondents

The descriptive analysis results of the study revealed that the majority, about 85.15%, of participants responsible for enset farming in the study area were females, while the remaining 15.15% were males. This finding indicates that females are more actively engaged in enset farming, whereas males are less involved in this activity in the study area. About 39.88% of the respondents accessed credit, while approximately 56.46% received training during the study. The results also revealed that about 31.17%, 46.34%, and 22.47% of the respondents rated the price of enset products relative to the farming cost as low, intermediate, and high, respectively. Additionally, about 50% of the respondents reported nearby road accessibility, and about 46.91% owned a mobile phone. Regarding enset value addition, about 65.16% of the respondents tried to add the value of enset and enset products before selling. The analysis of the chi-square test also showed the presence of a significant mean proportion difference in enset value addition participation due to accessing credit, training, and road availability (Table 2).

These findings indicate the multidimensional nature of enset based livelihoods activities, where better performance from enset farming depends on both individual capacities (training, credit, gender empowerment) and structural factors (infrastructure, markets, and technology). The studies also show the possible extra role of enset farming in more equitable and prosperous rural development.

Table 2. *Descriptive information on dummy variables used for the study*

Variables	Participation category			
	Participants (232)	Non-participants (124)	χ2- value	p-value
Sex (male)	36	24	1.7863	0.181
Credit access (Yes)	103	39	10.0313***	0.002
Access to training	149	52	29.9547***	0.00
Price (Not attractive)	72	39	0.0834	0.959
Road accessibility (Nearby road)	122	56	3.1493*	0.076
Mobile ownership (Yes)	112	55	0.8392	0.360

*, ** and *** indicates 10%, 5% and 1% of significance probability level respectively
Source: own survey (2019/20)

On average, the family size of respondents was about 6.21. The formal years of schooling averaged 2.83, enset farming experience as a family leader was 16.31 years, and approximately 0.269 hectares of land were covered by enset in the 2019/20 production year. The comparative analysis between the two groups showed that the mean land under enset for participants was higher than that of non-participants. On average, enset product value addition participants cultivated 0.293 hectares of enset in the study area. The average educational level, measured in years of schooling, for value addition participants was 4.09 years, which is greater than that of non-participants, who averaged about 1.583 years. This difference was significant at the 1% significance level. This is because individuals with more years of formal schooling tend to make wiser decisions and diversify their income by selling value-added enset products.

On average, participants had 3.978 TLU, whereas non-participants had 4.185 TLU. Family size was 6.184 for participants and 8.304 for non-participants. The average distance from the nearest market for participants was 8.937 km, whereas it was 8.304 km for non-participants. Mean non-farm income for participants' households was Birr 4,011, whereas it was Birr 3,856 for non-participants (Table 3).

Table 3. *Description of continuous independent variables*

Continuous variables	Participants (n=232)	Non-participants (n=124)		
Variables	**Mean (SD)**	**Mean (SD)**	**t-test**	**P-value**
Family size	6.184 (2.321)	6.245 (2.433)	0.7508	0.3177
HHHs education level	4.090 (3.709)	1.583 (2.948)	8.830 ***	0.00
HHHs years of experience	17.372 (8.528)	15.25 (8227)	0.423	0.672
Land under *enset*	0.293 (0.201)	0.245(0.158)	3.087***	0.002
HHs livestock ownership	3.978(1.909)	4.185(2.001)	-1.304	0.192
HHs off/non-farm income(log)	4.011(2.057)	3.856(1.611)	0.470	0.6383
Market distance	8.937 (6.355)	8.304(5.826)	1.248	0.212

HHHs=household heads; HHs =households; *, ** and *** indicates 10%, 5% and 1% of significance level
Source: own survey (2019/20)

The qualitative data from FGD and KII revealed that enset in the study area used as food, animal feed, traditional medicine, fiber, roofing, live fence, mats, local-handkerchief, fiber-mesh-mattress, plate (to serve food), ropes, cordage, wrapping materials. Also, they revealed that the

production and management of enset farming is largely done by women's. The secondary data assessment also showed that majority of farmers in Guraghe zone cultivates Enset and together account for over 3.6% of the national output (CSA, 2021).

4.2. Enset in Guraghe Zone

Enset is widely grown in the Guraghe highlands and midlands largely for consumption, and a few intentions are provided to make the crop for commercial purposes. Figure 2 depicts that enset production in number of trees harvested, output (quintals), and yields (Qt/tree). The figures are based on data from the Central Statistical Agency of Ethiopia from 2013 to 2021. The figure indicates enset production in the Guraghe Zone has been increasing since 2013, and it was highest in 2021 when it was 4 million quintal of Enset (specifically amicho, kocho and bula). Between 2013 and 2021, production ranged between 588,000 and 4,000,000 quintal.

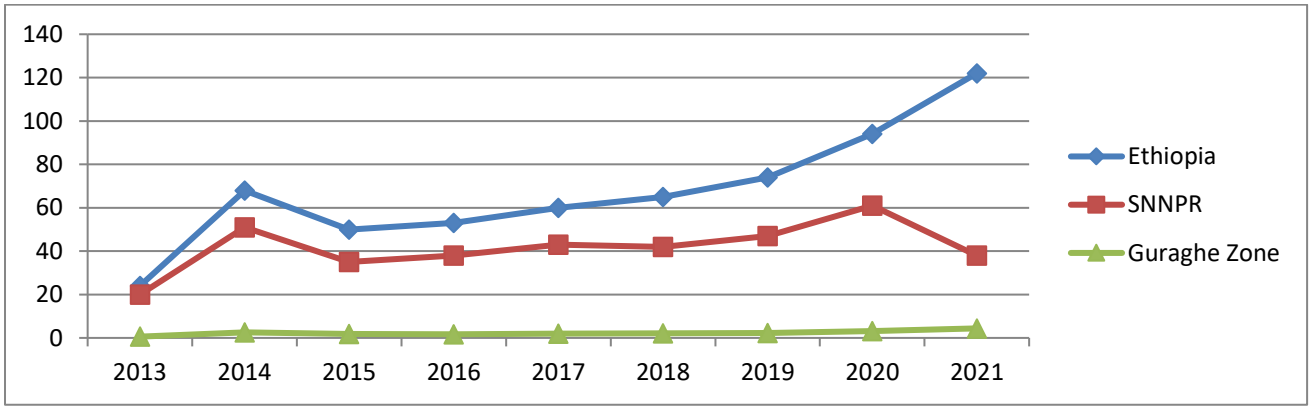

Figure 3. *Enset production trends in Guraghe Zone (Source: CSA of Ethiopia (2013-21) (http://www.csa.))*

The study estimated the yield of three major enset products, and the yields of enset products in Guraghe zone were highest in 2019 with 0.37 qt/tree for amicho and 0.39 qt/tree kocho. The yield in quintal/tree for amicho has ranged from 0.14 to 0.37 between 2013 and 2021 (Figure 3). Correspondingly, kocho yield has ranged between 0.14 and 0.39 between 2013 and 2021.

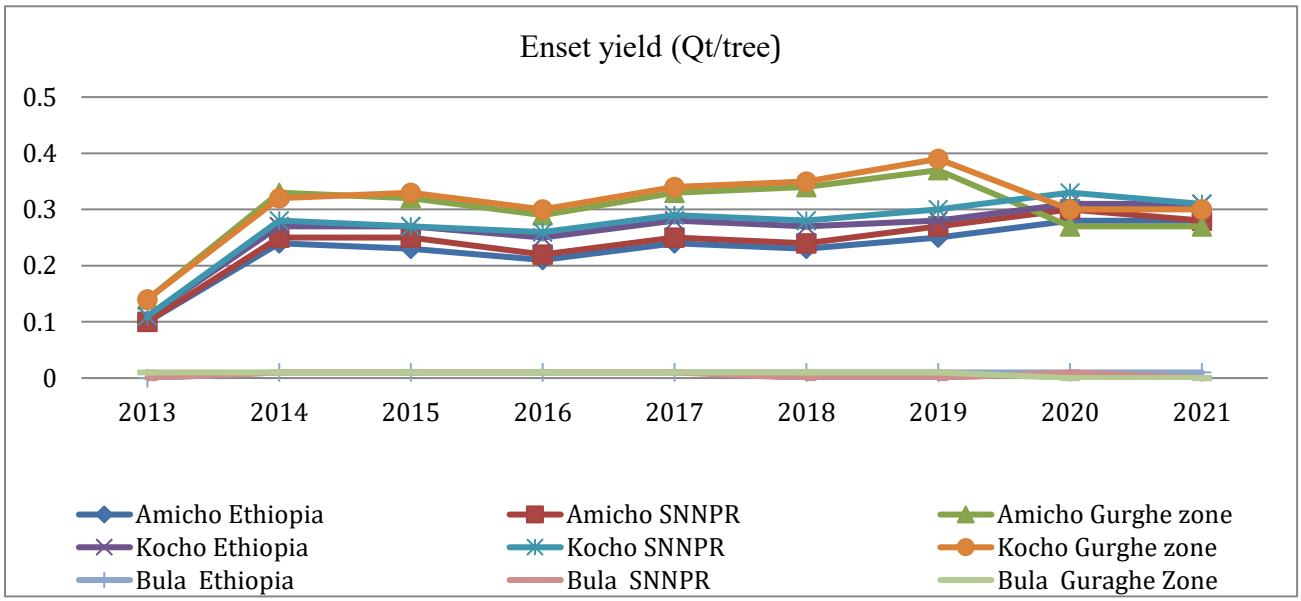

Figure 4. *Enset Yield (Qt/tree) (Source: CSA of Ethiopia (http://www.csa))*

4.3. Value Chain Functions and Marketing Structure of enset

The study employed the functional analysis approach of the value chain for understanding the detail in enset value chain function and marketing. Using this approach, each of the technical processes and actors, as well as their power and role are presented, and accordingly, numerous value chain actors like enset input suppliers, esnet farming households, enset product collectors, enset products retailers, enset products wholesalers, and enset products consumers were participants of enset value chain.

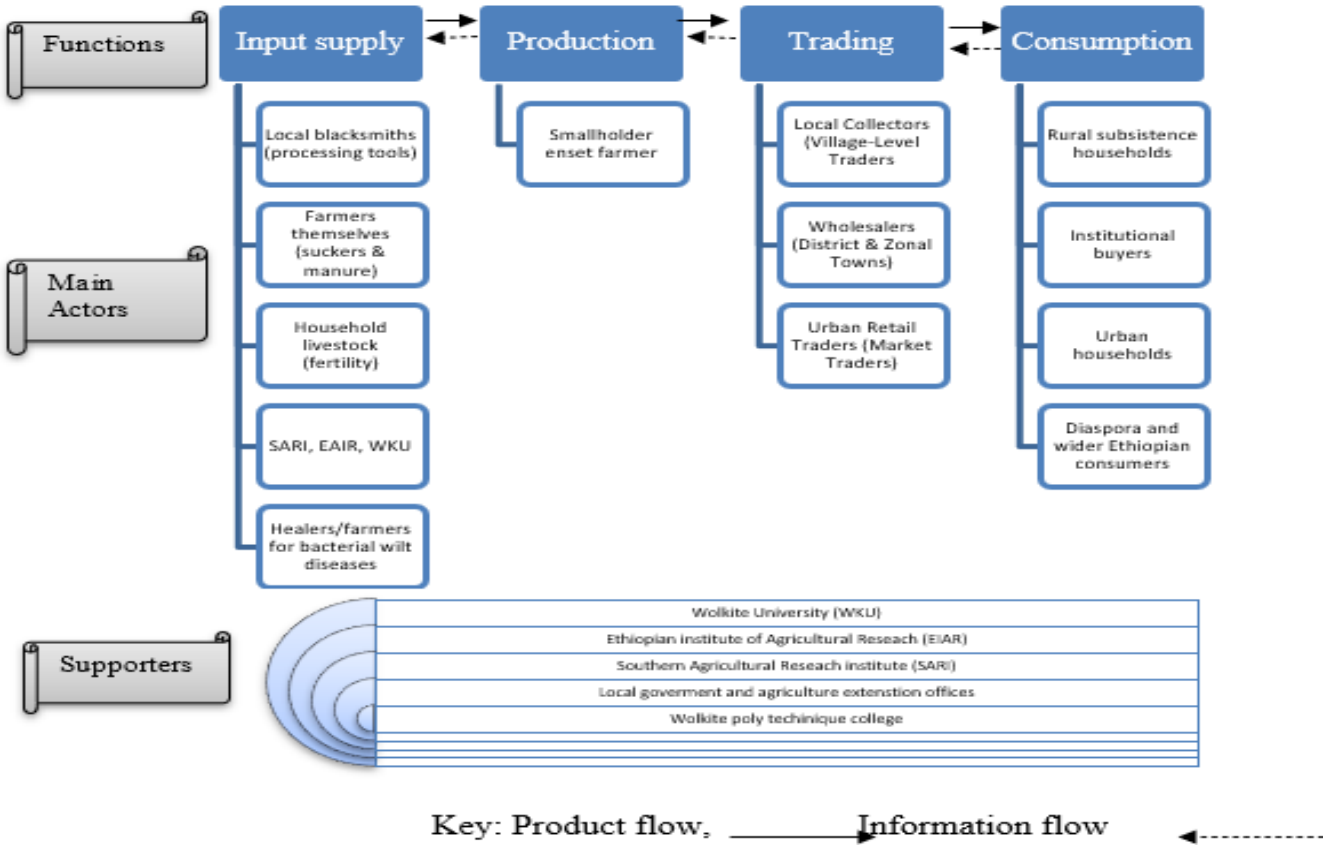

Figure 5. *Value chain map of Enset in Guraghe zone (Source: Own survey result, 2019/20200*

4.4. Enset input suppliers

As depicted in Figure 5, the most important enset input suppliers in Guraghe Zone are planting farmer suppliers, organic fertility suppliers, farm tools and equipment suppliers, and institutional and service providers. Planting material was provided by local farmers themselves, and farmers in the study area exchange and sell enset suckers to their neighbors, and this was the primary source of planting material in the study area. About 85.35% of farmers used their own planting material, and the remaining 14.65% of farmers used a mix of their own planting materials and those from their neighbors.

The main soil fertility enhancement strategies for enset production, like cattle manure, sheep/goat droppings, and farmyard compost, were also provided by households themselves or neighbors. About 75.28% of the respondents owned their own livestock, and they used organic fertility for enset production only from their own source, while the remaining 24.72% used it from alternative sources including neighbors and relatives.

The other inputs for enset production and productivity were farm tools and equipment. The study revealed that farming tools and equipment like hoes (maresha), digging forks, spades, enset

knives for scraping pseudostems and processing kocho were provided by local blacksmiths and artisans. Farmers accessed these inputs from the local market and town shops. The major source of labour for enset production, mainly enset processing, is traditional labour exchange groups like Debo, Wenfel, and Jige. These are important sources of labour for enset land preparation, transplanting, and processing. Other supportive organizations like agricultural offices, Wolkite University, Ethiopian Institute of Agricultural Research, and Southern Agriculture Research Institute are working to support enset value chain by providing advice, limited seedlings, and disease management training.

4.5. Smallholder Enset farmers

Enset-producing farmers are those smallholders whose life is largely associated with enset in the study area. The study revealed that enset farmers stay majority of the enset value chain activities before consumption. They are enset input suppliers, enset and enset products producer, enset processors, transporters, and traders. In the enset production value chain, a list of enset farming activities is done by farmers in the study area. The list of activities includes land preparation (sequentially spaced and sized holes), transplanting, enset management (e.g., weed control, manure application, pest and disease management), harvesting, post-harvest management, including farm gate processing. Some of the production activities are unique to the study area, and enset tree growth has its own steps. The KII and FGD analysis showed the role of indigenous knowledge for enset farming. The details of enset production activities and descriptions are presented in Table 4.

Table 4. *Enset production practices in Guraghe zone, Ethiopia*

Production step	Description
Land clearing	In many cases, land clearing includes cutting grass and bushes with cutlasses when the land has been used before. Land clearing activities are mainly done using family labor in the study area. The majority of respondents (93.5%) revealed they used their family labor for land clearing purposes. The remaining 6.5% of respondents stated they hired labor for land clearing. Costs ranged from Birr 250 – 320 per day, including food and coffee expenses.
Ploughing /Mekofer by Wenebo/	Similar to land clearing, only a few farmers spend money on ploughing, which is mostly done by family labor. The study revealed that 69% of respondents plough their land using family labor. The study also indicated a difference in family labor utilization: 84%, 75%, 64%, and 53% of respondents from Ezha, Gumer, Cheha, and Enemore Ener districts respectively plough their land by family labor.
Harrowing/Qore	According to survey results, harrowing is rarely done by family labor because it involves labor and laborer accommodation costs due to the special skill and care required. For example, 35% in Ezha, 40% in Gumer, 32% in Cheha, and 28% in Enemore Ener districts do harrowing of enset farms by family labor. Costs tend to be higher for harrowing, approximately 400 ETB per person per day, including all accommodations (breakfast, coffee, lunch, and drinks). The community does not usually consider these costs when calculating labor costs per person per day.
Planting fonfo	Most farmers do planting of fonfo by family labor. According to the study, over 90% is done by family labor. The results indicate that 95%, 96%, 93%, and 89% of respondents from Ezha, Gumer, Cheha, and Enemore Ener districts respectively performed planting of fonfo by family labor or unpaid neighbor labor.
Transplanting of fonfo	The survey showed that 67% of transplanting fonfo is done by family labor. Participants in the focus group discussion (FGD) revealed that transplanting fonfo requires special skill and experience; therefore, ordinary laborers do not participate in transplanting fonfo.
Weeding	Weeding is basically done by most farmers using family labor. On average, over 90% of respondents replied that weeding in enset production (fonfo, msriye, hiyba, and matured enset) is done by family labor.

Production step	Description
Compost application	Compost is a fundamental and essential component in the enset production process. According to the study, compost application was done by family labor during enset production.
Planting of *Mesrye*	According to the information from the FGD, "Mesrye is a stage reached by fonfo after one or two years. Planting of mesrye requires fertile soil. Soil fertility is improved by applying compost." The study revealed that planting mesrye was done by family labor or hired labor.
Planting of *Hiba*	According to the FGD, "Hiba is a stage of the enset production process and occurs one or two years after the mesrye stage. Planting of Hiba is done by a group of farmers (debo) either with hired labor or exchanged labor." Respondents from Ezha, Gumer, Cheha, and Enemore Ener districts replied that 65%, 62%, 75%, and 78% respectively performed planting of Hiba using hired labor.
Harvesting/mefaq/	According to information from key informant interviews (KII) and FGDs, harvesting is done by hand and leg; both sexes are significantly involved. Collective effort of women and men is required using either hired or exchanged labor. Harvesting is a very difficult task in the enset production process requiring intensive labor. Nowadays, labor is shrinking due to youth emigration to urban areas. Considering all expenses, it costs about 500 ETB per person per day; however, the community does not include accommodation costs in labor cost calculations, which account for more than 300 ETB. The study showed that 68% of respondents hire labor for harvesting. FGD participants also explained that there is a clear gender division of labor during harvesting: males prepare the main hole (worena), identify matured enset, remove it from the ground, and prepare it for mefaq/crushing by crushing the inner strong part (shia), while females crush the body of the enset, differentiate the bula, collect the crushed parts into the main hole, apply spices for fermentation, and cover it properly until fermented.
Mekelakel/Mixing Kocho/	After a few weeks of harvesting/mefaq, the products collected in the main hole (worena) must be mixed the upper and bottom parts for further fermentation of the kocho. This task is mainly done by women through exchanging labor.
Storing	According to information from FGD and KII, storing kocho is considered a women's task, with no involvement of men. There are two types of storing: washed and unwashed kocho.
Selling	According to the study, enset production is mainly for household consumption, but some farmers sell kocho to cover other household expenses. Selling kocho is mainly done by women at the local market.

4.6. Collectors/local traders

Collectors were small-scale traders who operated at village or kebele levels. They buy processed enset products (kocho, bulla, amicho) directly from farmers. They collected small quantities from farmers and usually supplied them to larger traders and local consumers. Their main function is to collect enset products from the village market or farmers and supply them to the district and zonal markets. They are important connectors of farmers with other enset value chain actors.

4.7. Retailer traders

Kocho and bulla retailers are important market actors who directly supply kocho and bulla without converting them into edible food or powder. They are found in Wolkite, Butajira, Embidrr, and Agena. They usually buy kocho and bulla from collectors, wholesalers, and farmers. They sell small quantities of kocho, bulla, and amicho directly to households.

4.8. Wholesale traders

Wholesalers operated at woreda and zonal markets such as Butajira, Wolkite, Emidbirr, and

Agena. They buy enset products in bulk from collectors and farmers. They have participated in transporting enset products to urban centers inside and outside the zone. They have been key in price setting and determining market flow.

4.9. Consumers

Most rural households in the Guraghe zone consider enset as a staple food and consume enset daily. Rural households consumed enset daily in traditional foods like kocho, with kitfo and bulla porridge. In the Guraghe Zone, enset products are heavily consumed during weddings, funerals, religious holidays, and community feasts. Enset is symbolic of social solidarity and hospitality, making these events important consumption points. Diaspora Guraghes often purchased dried or processed form (kocho and bulla exported informally). Nowadays, in the capital city and other towns, non-Guraghe Ethiopians have become consumers because of the popularity of Guraghe restaurants and the rising recognition of enset's nutritional value.

4.10. Supporters

Nowadays, Wolkite Agricultural Research Center, Wolkite University, Wolkite Polytechnic College, district agriculture offices, zone agricultural office, and NGOs contribute to enset value chain development. These stakeholders work collaboratively to find solutions to recurrent enset bacterial wilt diseases and the enset processing machine.

4.11. Constraints and Opportunities Along enset Value Chain

The mean Likert score was employed to evaluate respondents' level of agreement on the existing constraints and opportunities along enset value chain in the Guraghe zone.

Enset-producing smallholder farmers face numerous constraints, as indicated in Table 5. In the study area, enset bacterial wilt disease was recognized as the most pressing challenge threatening enset production with a mean Likert scale (MLs) value of 4.93. The productivity and production of enset-producing farmers were limited by access to inputs (MLs=4.35) and finance (MLs=4.54), both of which are pressing constraints in the study area. Post-harvest (MLs=3.79), poor market access (MLs=3.64), and labor shortages (MLs=3.07). Even though there are constraints, there were also opportunities from enset value chain development. The increasing demand for enset products is mainly for Kocho and Bulla (MLs=4.78), and the increasing number of enset product traders (MLs=3.56) creates marketing opportunities. In the production stage of the enset value chain, intentional value addition awareness (MLs=3.42) and enset-based extension training (MLs=3.00) were also opportunities for enset value chain growth.

Enset farming input suppliers were farmers, neighbors and other supporters. Demand fluctuations (MLs=3.9). Input suppliers benefit from growing farmer awareness about using improved inputs (MLs=3.78) and partnerships with EIAR and Wolkite University (MLs=3.68). These strengthen the input use of management and knowledge transfer of enset farming.

Storage challenges (MLs=4.23) and price volatility (MLs=2.86) were among the predominant challenges that collectors revealed in the study area. The promising growth of town-level enset products demand (MLs=4.85) offers opportunities for collectors. High transportation cost (MLs=3.65) and odor of enset products (MLs=3.61) constrain wholesalers' engagement in enset value chain. Lack of market information (MLs=2.79) is also relevant but a weak constraint on the enset value chain in the Guraghe zone. Consumers were also constrained by price fluctuations (MLs=3.45) and limited availability of processed enset products (MLs=2.89). Availability of ready-to-use enset products

(MLs=4.35) is expanding opportunities for enset product opportunities.

Table 5. *Constraints along enset value chain*

Actor	Constraints	Opportunities
Producers	Enset bacterial wilt diseases (MLs=4.93), Input access to quality inputs (MLs=4.35), labor shortage (MLs=3.07), post-harvest loss (MLs=3.79), limited finance (MLs=4.54)), poor market access (MLs=3.64)	High demand (MLs=4.78), traders (MLs=3.56), extension training (MLs=3.0)), value addition (MLs=3.42)
Input Suppliers	Seasonal demand (MLs=3.9)	Growing farmer awareness (MLs=3.78), EIAR/WKU partnerships (MLs=3.68))
Collectors	Price volatility (MLs=2.86), storage issues (MLs=4.23), transport	Town demand (MLs=4.85)
Wholesalers	Transport costs (MLs=3.65), perishability and odour (MLs=3.61), lack of market information (MLs=2.79)	Urban market growth (MLs=462), packaged products (MLs=4.18)
Consumers	Price fluctuations (MLs=3.45), limited processed products (MLs=2.89)	Cultural preference (MLs=4.76), ready-to-use products (MLs=4.35)

MLs refer Mean Likert score taken from the sample. Source: Own computation, (survey 2019/2019)

5. Discussions

The study reveals that enset production and processing were largely done by women who are responsible for 85% of the enset farming activities. Studies by Woldeyes et al. (2019) and Tesfaye et al. (2021) show that women participate largely at different stages of enset value chain, like enset processing, storage, and local marketing. Besides, a study by Muluneh et al. (2023) reveals that enset is socially managed by women and is usually considered as women's livelihood management strategies and household food security. The consistency between these findings and the current study findings shows the availability of gendered structure in enset value chain.

The significant association among participation in enset value addition and access to credit, and training is supported by recent literature by Abebe et al., (2018) and Aredo et al., (2020), which describes that rural households with access to microfinance are more likely participate in value addition activities. Access to the road significantly influenced enset value chain actors' participation in value addition activities, and this is consistent with recent spatial and market-access analyses. The studies by Minten et al. (2018) and Bachewe et al. (2022) reveal the role of roads accesses to reduce transaction costs and increase commercialization of agricultural products in Ethiopia. The availability of roads and value addition activities confirms the sustained importance of infrastructure development in strengthening traditional food value chains like enset.

Enset value chain participation and value addition are significantly different in the educational level of the household head. The recent findings by Asfaw et al. (2018) and Ahmed et al. (2021) reveal the role of households' education for value addition and market participation. These findings support that formal education significantly improves farmers' decisions to use improved processing practices and market engagement. A similar study by Tesfaye and Gebremedhin (2020) in enset-growing areas revealed that education supports enset products diversification. The study indicates the role of education in enhancing adaptive capacity and innovative behavior in enset-based farming systems.

The multipurpose role of enset and its predominant reliance on indigenous knowledge are supported by Brandt et al. (2021) and Gebreyesus et al. (2022). The findings revealed that enset contributes to food security, livestock feeding, fiber production, cultural identity, and ecological resilience. Besides, enset contributes to livelihoods during climate variability (Kassahun et al., 2023; Woldemariam et al., 2024). Local labour sharing strategy in the study area, like debo, wenfel, jige is consistent with a study by Alemu and Assaye (2021) in southern Ethiopia.

The structure and roles of value chain actors presented in this study are consistent with recent enset value chain studies. The findings by Yirga et al. (2018) and Abebe et al. (2020) reveal that enset value chain is largely informal, predominantly farmer-based input supply systems and smallholder traders. The major enset value chain constraints acknowledged in this study are enset bacterial wilt, limited financial services, labor shortages, and post-harvest losses. Recent literature by Blomme et al. (2019) and Yemataw et al. (2020) know enset bacterial wilt as a threat to enset production in southern Ethiopia. Besides, recent research reports that inadequate processing technologies, storage shortages, and price volatility continue to limit the market potential of enset products (ATA, 2023; CSA, 2021).

The enset value chain development opportunities acknowledged in this study are growing enset products market demand, growing trader participation, and stakeholders' attention to enset (Wolkite University, Wolkite Agricultural Research Center) are consistent with the national directive that considers enset as a strategic crop for food security (Brandt et al., 2021; Woldemariam et al., 2024).

The study findings are strongly supported by recent empirical evidence and strengthen the reliability of these findings, supporting that improving infrastructure, modernizing enset production system and institutional support are vital for promoting enset value chain in the Guraghe Zone.

6. Conclusions and Recommendations

Enset value chain development is complex but promising farming activities in the Guraghe zone. The production and productivity of enset products have shown improvement between 2013 and 2021. Enset farming is still predominantly done manually using traditional farming tools and indigenous farming management strategies. This limited value chain development despite its potential and role for food security and livelihoods. Numerous actors participated in enset value chain; however, there are demographic, socio-economic and institutional concerns for better value chain development. There are promising interventions and concerns for better enset value chain development from universities and research institutions to overcome the constraints of enset value chain.

Based on the findings of the study, enset farming communities need enset cultivar varieties for better yield and disease resistance and therefore, the study suggests research institutions and universities should look for bacterial wilt-resistant enset varieties. Attention in transiting the production methods (now predominantly traditional) and processing methods (the adoption of new processing technologies is still infant stage) is required. Local agricultural offices should work for extending farmers' understanding, particularly enset products value addition, marketing and building a culture that use enset as an alternative cash income source for resilience. Further investments in rural roads and storage facilities should be made by the local government for enhancing enset value chain.

Acknowledgments

The researcher thanks all individuals who participated in this study.

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