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ASSESSING CASSAVA PRODUCTION, PROCESSING AND VALUE CHAINS IN WESTERN KENYA

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Abstract

Cassava is an important commodity capable of fixing food security challenges and has an industrial potential. Its potential has not been fully documented in western Kenya. We assess cassava production, processing and value chains in Western Kenya, given a dearth in literature. We employ the qualitative research paradigm. We target cassava producers, cassava processors and cassava policy makers. We use purposive sampling method to select 21 informants in cassava value chains in Migori and Siaya counties of western Kenya. Purposive sampling is useful in selecting experts and individuals with unique and in-depth knowledge in the cassava value chain. We conduct thematic analysis of the KII responses to inform our feedback. We find that cassava production, processing and value chains are still underdeveloped in Western Kenya. We recommend the use of technology along the value chain that hopefully, will in turn increase value chain participants' income and improve their livelihoods. Our research has practical implications.

Keywords: Cassava value chains, production, processing, policy and regulations, food security, household income, Key informants

INTRODUCTION

Cassava is one of the most important crops in the globe; it is a drought resistant crop, and it is rich in many nutrients. Advanced economies such as Thailand which managed to realize $ 1.19 billion in terms of production volume are well advanced in cassava production compared to African countries (Otekunrin & Sawicka, 2019). In Asia, countries like Lao People's Democratic Republic have policies governing starch production (Wongpit, Boungvatthana, Xaysombath & Chanhthalangma, 2024). In Africa, Nigeria is leading in cassava production; this is evidenced when in 2017 Nigeria produced up to 20.4% of the world's cassava production (Otekunrin & Sawicka, 2019). Empirical evidence reveals that cassava is produced in large scale in Asia, North America and Africa among other areas in the world. However, in these areas, there exists variation in terms of production process, cassava processing and cassava value addition, despite its importance in addressing food security. Lives of a considerable population in the globe especially in developing countries are hence in danger (Otekunrin & Sawicka, 2019; Wongpit, Boungvatthana, Xaysombath & Chanhthalangma, 2024; Kayode et al., 2023).

Value-added cassava products are recognized to have the potential to move the economy of Kenya to a better level since it has the potential to improve the food security and livelihoods of resource-poor rural farmers, processors, and their families (Muchira, 2019;

Mokhtar, 2020; Amelework et al., 2021). The importance of cassava has been prioritized in all development initiatives in Kenya since its independence in 1963. However, the cassava value-chain sub-sector remains underdeveloped (Omondi, Tana, Lutomia, Makini, & Wasilwa, 2023). This is because government initiatives on cassava have been mainly on the promotion of its production among farmers and the improvement of agronomical practices in growing cassava (Kamau et al., 2011). Most farmers and aggregators in cassava value chains experience many challenges; they lack current on-farm and off-farm techniques which has resulted in low cassava productivity, low market share leading to low market for farmers, poor storage facilities, poor market access, weather variability and high cost of processing cassava into different products (FAO, 2023). The greatest challenge these farmers experience is the inability to grow cassava of high quality (Tiira, 2018) due to a lack of high-yield varieties since most farmers have low-yield varieties (Opondo, 2022).

Empirical studies such as Tambun (2020) discussed cassava value chain in Toba Samosir district of Indonesia, grounded in the analysis of increasing its value added to stakeholders. The study measured the extent to which the cassava commodity in Toba Samosir District could affect the economics of the relevant stakeholders. Afterward, a value chain mapping was conducted to determine the margins of each node in the supply chain. The value chain map reveals that the value engineering of cassava commodities was not yet optimal, where the final product produced from the supply chain is still far below the potential possible value. The writers recommend some value-added improvement strategy, for example, diversifying the product of cassava derivative that is more valuable, that is grade A tapioca flour and mocaf flour. Additionally, in South Africa, Lubinga et al. (2024) underscored that cassava production is done on a small scale; purposefully for consumption and income and it has not been industrialised. Lubinga et al. (2024) asserted that ownership of livestock, hiring labour and tenure security policies significantly influence participation in cassava value chain by farmers.

Apichaya (2023) reported findings from a study analysing the Development of Bioplastics from Cassava toward the Sustainability of Cassava Value Chain in Thailand. The study analysed the value added to different applications of cassava products and investigated the consumer acceptance of bioplastic from cassava using a two-step cluster analysis. The study found out that consumer acceptance of bioplastic products from cassava accounts for 48.6% of all respondents, the development of cassava-based bioplastic not only positively contributes to economic aspects (Olaoluwa, 2024) but also generates beneficial long-term impacts on social and environmental aspects. Considering cassava supply, bioplastic production, and potential consumer acceptance, the development of bioplastics from cassava in Thailand faces several barriers and is growing slowly, but is needed to drive the sustainable cassava value chain

THEORETICAL BACKGROUND

This study is guided by Michael Porter's 1985 value chain theory, the theory postulates that when raw materials are efficiently transformed into final finished products, customers value is increased, cost is reduced and the organisation attains competitive advantage. In the context of this study, given Porter's value chain proposition, technology development as a facet of Value Chain Theory informed this study. Empirical studies and results of this study conform with value chain theory. For instance, Alonso and Bosch (2022), observed that pests and diseases pose a serious threat to cassava production. Consequently, in Democratic Republic of Congo, Nabahungu et al. (2025) studied farmer typology and adoption of improved cassava production technologies. Furthermore, Sikirou et al. (2025) highlighted that cassava is known for its adaptability to diverse climatic conditions. The study identified 47 high ranking cassava breeds with exceptional performance which are suitable for breeding programs aimed at improving production, disease resistance, and dry matter content. The foregoing empirical studies on production relates to value chain theory which emphasizes cost reduction and customer value.

Consequently, Verma et al. (2022) asserts that cassava flour may be prepared from wet mash or dried chips. To mash cassava roots, one needs to grant, pound, and mill peeled roots. The mash may be either fermented or unfermented. The study further observes that when the unfermented mashed cassava is dried, it leads to high quality cassava which is known as High Quality Cassava Flour (HQCF). Thiele et al. (2021) described the development and scaling out of flash dryer- innovations geared towards a more efficient, small scale of high-quality cassava flour (HQCF). Upon assessment of the drying process among SMEs, it was realised that much energy is used in processing cassava by SMEs leading to high production costs compared to the energy used in cassava processing by large firms. Therefore, scientists developed quite a number of innovations to maximise energy efficiency and costs together with longer drying pipes, heat exchanger, larger blower for speedy air velocity and product to air ratio. As a result of these improvements, small scale flash dryers are being provided to the private sector in various countries.

In Brazil, there are many cassava mills. However, most of the cassava mills are small and are owned by individual households. The small cassava processing units are usually located near cassava plantations. Both harvesting and processing is performed by the same community group, always by the same family members. The milling facilities consist of structures which are rustic and made of wooden materials. There is absence of good or modern manufacturing practices. To improve the quality of cassava derivatives, there is a need to modernise the small rural cassava processing mills; cassava processing equipment

efficiency should be improved. However, improvement of the equipment may be challenging due to the low level of education among small holder farmers and resistance to change (Clarissa, 2016).

METHODOLOGY

Research Philosophy and Design

Research philosophy is a world view (Creswell, 2013), at times philosophy is referred to as paradigm (Mertens, 2010, Cohen, Manion and Marrison, 2000). According to Crotty (1998), research philosophy is epistemology and ontology while Neuman says it is broadly conceived research methodologies. Research should be informed by the researchers philosophical believe regarding a phenomenon (Holden, Mary, Lynch & Patrick, 2004). Philosophy, research problem and research methodology should be consistent in a study (Holden, Mary, Lynch & Patrick, 2004). Additionally, the researchers employed a multi-case design which is consistent with examining grounded theory (Glaser & Strauss 1967, Yin 2003). The current study used qualitative paradigm, this paradigm can be traced from anthropology and American Sociology. The qualitative paradigm is investigative in nature. It involves comparing, cataloguing, replicating and classifying a phenomenon (Creswell, 2012). Since it makes use of diversified and flexible data collection procedures such as surveys, questionnaires and observation, it was considered for this study to know the status of cassava value chain added cassava products in Migori and Siaya County.

Study Area

Migori County is one of the devolved administrative units in Kenya. The County is unique in the sense that it is a home of many ethnic communities such as the Luo, Kisii, Luhya, and Kuria. Due to this diversity, the county has a variety of economic activities with the main activity being agriculture. Geographically, Migori County is bordered by Homabay County to the North, Kisii County to the Northeast, Narok County to the Southeast, The Republic of Tanzania to the West and South and Lake Victoria to the West as shown in figure 1. Administratively, Migori County is demarcated into eight Sub counties which are Rongo Sub County, Awendo Sub County, Uriri Sub County, Suna East Sub County, Suna West Sub County, Nyatike Sub County, Kuria West Sub County and Kuria East Sub County. Cassava cultivation is concentrated mainly in Suna West Sub County, Uriri Sub County, Kuria West Sub County and Nyatike Sub County.

Figure 1: Map of Migori County in Kenya. Source: Google Maps

Siaya County is one of the 15 counties forming the Lake Region Economic Block (LREB) and one of the devolved administrative units in Kenya. Formerly Siaya district and fondly referred to as Central Nyanza. Siaya County is divided into six sub counties which are: - Alego Usonga Sub County, Gem Sub County, Bondo Sub County, Rarieda Sub County, Rarieda Sub County, Ugunja Sub County and Ugenya Sub County. Siaya is between latitude 0^0 26´ to 0^0 18´ north and longitude 33^0 58 ' east and 34^0 33'. Siaya County is bordered by Kisumu to the Southeast, Kakamega and Vihiga to the Northeastern, Busia to the North and Lake Victoria to the South. Siaya is well known as a conservative area in the former Nyanza province. From the foregoing, it can be noted that traditional crops such as cassava, finger millet and sorghum still form part of the resident's dietary.

Figure 2: Map of Siaya County. Source: Google Maps.

Target Population and Sampling Technique

The target population were cassava producers, cassava processors, and cassava policy makers in Migori and Siaya counties in Kenya. Key Informant Interviews (KII) were used to collect qualitative data from 21 key informants. In Migori, we interviewed a total of 11 informants. The informants included producers, processors, marketers and value chain participants. In Siaya, we interviewed a total of 10 informants. The informants included producers, processors, marketers and value chain participants. KII provides a greater opportunity to explore the personal experiences of farmers and other actors in the cassava value chain regarding their needs, preferences, challenges, on-farm experience, and possible solutions to these problems. The interviews allow a good understanding of their feelings regarding value-addition mechanisms for food security. The small size of a qualitative sample (20-30) represents the in-depth inquiry involved and the longer contact with the interviewees (Morse, 1995; Creswell, 2003).

Sampling Method

Purposive sampling method is used to select informants. Purposive sampling is a non-probability sampling method where items are selected deliberately by researchers. The small mass selected out of the huge one is a representative of the whole (Kothari, 2004). Purposive sampling is useful in selecting experts and individuals with unique and in-depth knowledge about cassava production, processing and value chain.

We administered key informant interviews (KII) on 21 stakeholders: cassava farmer group leaders, County Ward Administrators, County Director of Agriculture, cassava producers, cassava processors and cassava value chain participants from the two participating counties as indicated in Table 1. Key informant interviews are a research method to gather specific qualitative information from selected knowledgeable people or “informants” about a topic of interest (Joshi, Gauchan & Ayer, 2022). The selected informants are key stakeholders in cassava value chain, therefore, their opinions and responses are considered representative of the sector in the study. Therefore, this study informs direction of further studies about cassava production, processing and value addition.

Data Analysis and Presentation

We analyse the data qualitatively using thematic analysis technique. Thematic analysis involves the identification of themes using a qualitative data set (Christou, 2022). Key informant interviews (KII) took place in Migori, Siaya and Kakamega counties where 21 key informants

comprising cassava farmers, processors, agricultural extension officers, cassava traders and researchers provided answers to study questions in between 45 minutes to 1 hour.

Table 1: Distribution of Data Collection

Day	Thematic Areas	County	No
1	Production, Processing, policy and Value Chain	Migori	**11**
1	Production, Processing, policy and Value Chain	Siaya	**10**

RESULTS AND DISCUSSIONS

Status of cassava production

The study followed the stages of thematic analysis which are achieving familiarity with the data through open minded reading, searching for meanings and themes and organising themes into meaningful wholeness. Under achieving familiarity with the data through open minded reading, the researchers read the text and become familiar with the data, explored experiences and searched for the unique and novel sides apart from what is already known. In the process of searching for meanings and themes, meanings were marked, described with words and notes, their differences and similarities were compared, and the meanings were organised into patterns. The patterns were then organised into meaningful wholeness by writing and rewriting the meanings, describing themes into meaningful texts and description and naming of themes and meanings described experiences in the actual context.

These findings are consistent with empirical studies reviewed; for instance, Wongpit et al., (2024) and Tirra et al., (2019) underscored the importance of cassava production and value chain, challenges such as intense competition, lack of trading license, rising fuel prices and toll fees and lack of drying facilities. From a value chain perspective, uses of cassava produced should be re-defined and prioritised. The current situation in the ground involves production of cassava mainly for domestic consumption. Lubinga et al. (2024) asserted that cassava production is done on a small scale; purposefully for consumption and income and it has not been industrialised. Furthermore, the results confirmed empirical studies about challenges in the production process such as Suryani, Masyhuri, Waluyati, and Utami, (2023) who identified risks affecting cassava production in Indonesia. The risks are unpredictable weather changes, scarcity of fertilisers, absence of farming standards, limited capital, delivery technical problems, price fluctuations, negligence of work force, default credit and lack of customer knowledge leading to confusion. Kwibuka et al., (2022) identified risk factors associated with brown streak disease dissemination through seed pathways in Eastern Democratic Republic of Congo. The authors asserted that vegetatively propagated crops are prone to disease dissemination through

their food systems. Therefore, phytosanitary measures are important to reduce the effect of the disease as observed by Adebayo, (2023).

The implication of these results is that cassava production should be industrialised so that cassava should not just be grown as a subsistence crop used only for consumption. During an interview with Kanyasa ward administrator, he stated as follows:

"There should be advocacy on nutritional benefits of cassava and its potential for various products; promoting cassava as a crop to improve lives economically through large scale commercialization since it is a drought resistant crop".

In an interview with chairman Kasigria Self Help Group in Suna West Sub County he noted that *"Everyone is involved in cassava production. The purpose of production is both for commercialization and subsistence; seeds are obtained from local farmers and planted through vegetative propagation. The size of the farms depends on the size of the land owned by an individual farmer, and this varies from one farmer to the other. Cassava produced ranges between 40 to 50 sacks (100kg) per acre. The cost of production is average Kenya Shillings 14, 000 per acre". These views by the chairman of Kasigria Self Help Group are consistent with views of Migori County Director of Agriculture, Kanyasa ward Administrator and farmers in Suna West Sub- County. There are challenges affecting cassava production such as rodents (Oyiech Fuko) and various cassava diseases. One of the key informants stated that "there are diseases which are very hard to treat and negatively affect production. Examples of these diseases are Cassava Mosaic Disease (CMD) and Cassava Brown Streak Disease (CBSD) are significant challenges. Farmers also lack certified seeds and adequate planting materials. Some varieties have low genetic yield potential, especially local varieties. Extended Bags: This is when a 100kg or 50kg bag is made larger than it should be, thus extending the kilos but not paying for the extended kilos, which exploits farmers".*

In an interview with Josephine Oduol, a producer in Ugenya Siaya County, she stated that *"We produce bitter and sweet cassava, cassava is produced for domestic consumption, cassava flour is used for making porridge and ugali, those who are involved in cassava production are nuclear family members, planting materials or cassava seeds and cassava raw materials are sourced from farmers, it is difficult to estimate cost of production because they rely on family labour, the main challenges of cassava production include theft cases, pests and disease, the main reason which inspired us to produce cassava is for subsistence and we do not belong to any cassava processing group". "An informant from Migori said that "Cassava takes eight months to be harvested".*

In an interview with Gabriel Oraw, a farmer from Ugunja in Siaya, he said that

"We produce sweet and bitter cassava, we plant stems vertically after preparing the land, cassava is produced for subsistence, such as to make porridge and ugali, family members take part in cassava production, 0.5 hectare of land is set aside for cassava production, planting materials are sourced from the farmers, the family members take part in cassava production thereby bringing the cost of production to as low as KES 2,500 per hectare, there are no major challenges in cassava production, what prompted me to produce cassava is its nutritional value, especially in ugali, we don't have a cassava production group but we have an idea of starting one and challenges in cassava production include high transport cost for raw materials".

Magret Akeyo from Caduoki group in Siaya said that

"We source cassava seedlings from Ugunja resource centre and farmers, challenges of sourcing cassava raw materials and seedlings are poor roads, cassava varieties include SELINA, MJERA, MH 95, MH 113 and MM 96, we also get seedlings from KALRO"

In Migori, Director in charge of Agriculture, Billy Nyang'aya said that

"Cassava varieties include 554; MIGNERA MIYIERA, 192/0427, MM967688, MH950183, other production challenges are weather variabilities, pests and diseases, there is a challenge in getting seeds, however, MEDA and Self-help Africa procured seeds for farmers and formed cassava seed entrepreneurs who bulked seeds and gave to other farmers, common cassava disease is Cassava Mosaic Disease, cassava brown stake disease; causes of these diseases are lack of certified seeds and inadequate planting materials".

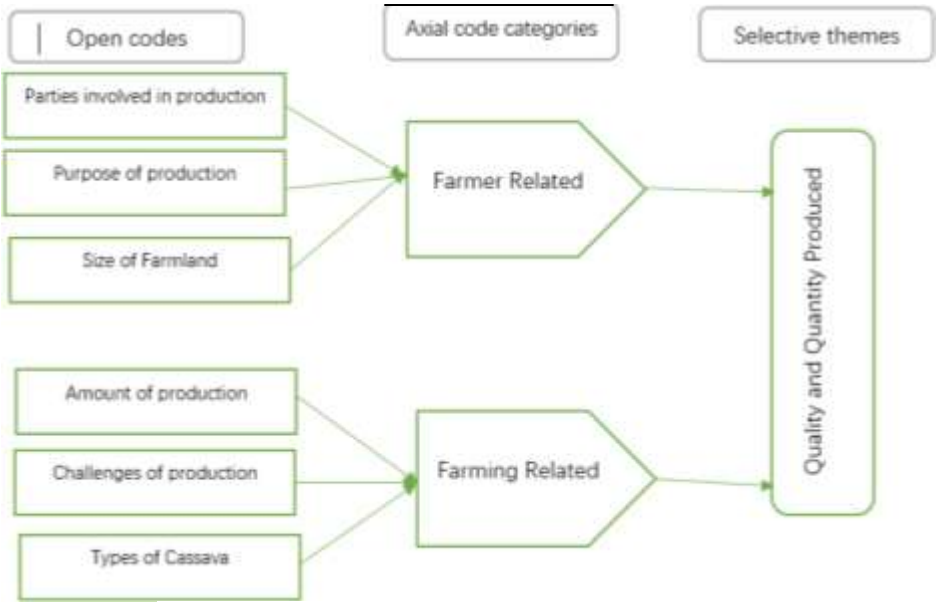

Figure 3: Cassava production data coding

Cassava production in western Kenya is shaped by a combination of subsistence needs, commercialization opportunities, varietal preferences, and challenges such as pests, diseases, and access to quality planting materials. The interviews reveal consistent themes across Siaya and Migori counties concerning motivations for cassava cultivation, production practices, yields, cost structures, and constraints within the value chain.

The Kanyasa Ward Administrator emphasized the need for increased advocacy on the nutritional and economic benefits of cassava, especially considering its drought resistance and potential for commercialization at scale. This perspective aligns with the broader literature, which positions cassava as a climate-resilient crop that can significantly enhance food security and rural livelihoods when effectively commercialized (Adebayo et al., 2020; FAO, 2020).

In Suna West Sub-County, the chairman of the Kasigria Self-Help Group reported that cassava production involves nearly all community members, supporting both subsistence and commercial objectives. Seed materials are sourced locally and propagated vegetatively, with yields averaging 40 to 50 sacks (100 kg each) per acre and production costs estimated at approximately KES 14,000 per acre. These insights reflect patterns observed in other Kenyan cassava-producing regions, where farm size and productivity vary considerably depending on land availability and access to improved varieties (Mbah & Ezeano, 2022). The chairman's observations were consistent with those of the Migori County Director of Agriculture and the Kanyasa Ward Administrator, who also highlighted major production challenges, including rodents (*Oyiech Fuko*), Cassava Mosaic Disease (CMD), and Cassava Brown Streak Disease (CBSD). These diseases significantly constrain cassava output across East Africa (Legg et al., 2015).

Farmers also reported exploitation through extended bags, where 50 kg or 100 kg sacks are enlarged without proportional payment, resulting in unfair market practices. This challenge reflects systemic issues in informal agricultural markets where pricing, measurement, and standardization are inconsistent.

In Siaya County, producers such as Josephine Oduol described cultivating both sweet and bitter cassava varieties primarily for household consumption. Cassava flour is typically used for preparing *ugali* and porridge, with nuclear family members contributing labor and planting materials sourced locally. She highlighted production challenges such as theft, pests, and difficulty estimating production costs due to reliance on family labor. These findings are consistent with literature pointing to the importance of household labor in smallholder cassava systems and the challenges in quantifying informal production inputs (Nduwumuremyi et al., 2016).

Similarly, Gabriel Oraw from Ugunja reported producing cassava mainly for subsistence and emphasized its nutritional value. He cultivates cassava on 0.5 hectares, with production costs as low as KES 2,500 due to family labor contributions. While he noted no major agronomic challenges, transport costs significantly affect production feasibility. Transport limitations, including poor roads, were also mentioned by other participants and are widely recognized as barriers to efficient cassava production and market access in rural Africa (Verma et al., 2022).

In Siaya, members of the Caduoki Group such as Magret Akeyo reported sourcing cassava seedlings from Ugunja Resource Centre, local farmers, and the Kenya Agricultural and Livestock Research Organization (KALRO). They identified several varieties, including SELINA, MJERA, MH95, MH113, and MM96, and noted persistent challenges such as poor roads that hinder sourcing of planting materials. This reflects the importance of formal seed systems and improved varieties in strengthening cassava productivity.

In Migori, the County Director of Agriculture, Billy Nyang'aya, provided additional details on commonly planted varieties such as 554, Mignera Miyiera, 192/0427, MM967688, and MH950183. He identified weather variability, pests, diseases, and difficulty accessing certified seed as major constraints. CMD and CBSD were identified as the most prevalent diseases, an issue widely documented in agronomic studies (Legg et al., 2015). Nyang'aya further noted that initiatives by MEDA and Self-Help Africa have supported the procurement of improved seeds and the establishment of cassava seed entrepreneurs who bulk and distribute planting materials. This approach aligns with recommended strategies for enhancing resilience and productivity through sustainable seed systems (Mbanjo et al., 2021).

Collectively, the interview findings illustrate that cassava production in western Kenya is a dynamic mix of subsistence-oriented farming and emerging commercial potential. However, maximizing cassava's full benefits requires addressing constraints such as pests, diseases, inadequate seed systems, inconsistent market practices, and poor infrastructure. Strengthening value-chain coordination, improving access to improved planting materials, and scaling farmer training programs could significantly enhance cassava productivity and farmer livelihoods, as supported by evidence from regional and global cassava development initiatives (FAO, 2020).

Cassava Processing

Processing of cassava can take place at the farmers level or at the marketers or seller's level. Farmers, marketers, Self Help Group leaders, county director and Kanyasa ward representative interviewed had several observations.

The participants observed that cassava processing cost is relatively low. It is observed that there are two categories of processed cassava, that is, fermented (*Akuoga*) and non-fermented (*Ongata*). The participants stated that no technology is used in Migori for cassava processing. Gabriel Oraw said that

"Traditional knowledge about cassava processing include washing, peeling and sun drying, there are poor roads hence transporting cassava to processing sites is difficult, processed cassava is stored in sacks in a cool and dry place, and processors don't package processed cassava; buyers come with their own packages"

Elsie Odhiambo, a shop owner in Siaya said that

"Cassava customers walk-in and buy raw cassava, raw cassava from the farm goes bad easily because they are from the firm and are not processed".

In Migori, Director in charge of Agriculture, Billy Nyang'aya said that

"Selling challenges include extended bags leading to exploitation of farmers; instead of selling as 50kgs, they extend the bags to weigh up to 100kgs hence exploit the farmers, opportunities of cassava farming and selling in Migori County are high demand in both local market and regional market, cross border trade and private and public sector partition".

Irene Otieno is the representative of a banana group in Siaya. She said that

"We process cassava by washing with clean water, cut them into pieces or chips, then sun dry them at times, we use solar dryer at Caduoki aggregation centre to get variety, some of the challenges faced during cassava processing and sourcing are poor road for transport during rainy seasons; motor bicycles are the only means of transport during such times.

In Migori, Linet Atieno said that

"Cassava is brought at home, peeled, then it is chipped and packed in a sack to ferment for three to four days, then pounding and drying them, to prepare "Ongata", cassava is cut and dried without fermenting, there is no logistical challenges because farmers look for market by themselves, cassava products include fermented cassava and none fermented product "Ongata" and cassava is used to make ugali, chapatis and mandazi". Additionally, Linet said that "there is sweet and bitter cassava, the sweet cassava has green and brown stem, processing technology involves milling in posho mill and pounding using stone, some people also use a wooden bowl (pany) for pounding, other processing methods are fermenting for

approximately three days and sun drying, packaging is done using carrier bags and farmers meet the processing cost".

Magret Akeyo from Caduoki group in Siaya said that
"We process cassava by peeling, washing, cutting into chips and then drying using solar dryer, we identify bitter cassava from sweet cassava by looking at their leaves, we use machine to cut cassava after washing and then we use solar dryer for drying, the cost of processing cassava by millers ranges between Kenya Shillings 15 to ksh. 20 and, we remove bitterness from cassava by handling cassava carefully while washing and cleaning".

In Migori County, Kanyasa ward administrator Michaiel Odhiambo said that
"Cassava raw materials are sourced from farmers, challenges of cassava production are few people are involved in cassava farming in Migori county, market access, solution of these challenges should be advocacy about the nutritional value of cassava and the fact that cassava has many products"

Jacinta Odira, a cassava consumer from Migori said that
"We buy dry cassava, mix with sorghum and then mill to use either for ugali and porridge, we buy fresh cassava and boil for breakfast, I buy their tins of cassava weekly, I buy cassava only for consumption and my fear in buying cassava is that i may buy bitter cassava".

However, the KIIs done in Siaya County revealed the use of solar dryers. These results are consistent with empirical studies reviewed such as Mbanjo et al., (2021) who emphasised application of technology in cassava processing. Besides, Verma et al., (2022) concurred that cassava is processed into many products along the value chain. Additionally, Thiele et al (2021) highlighted scaling out of flash dryer-Innovations geared towards a more sufficient, small scale of high-quality cassava.

The study also explored costs and efficiency of using dryers. These results are deduced that stakeholders should strive to industrialise cassava processing; currently, in Western Kenya, farmers are using traditional processing methods hence limiting them from reaping benefits of cassava as a food security crop.

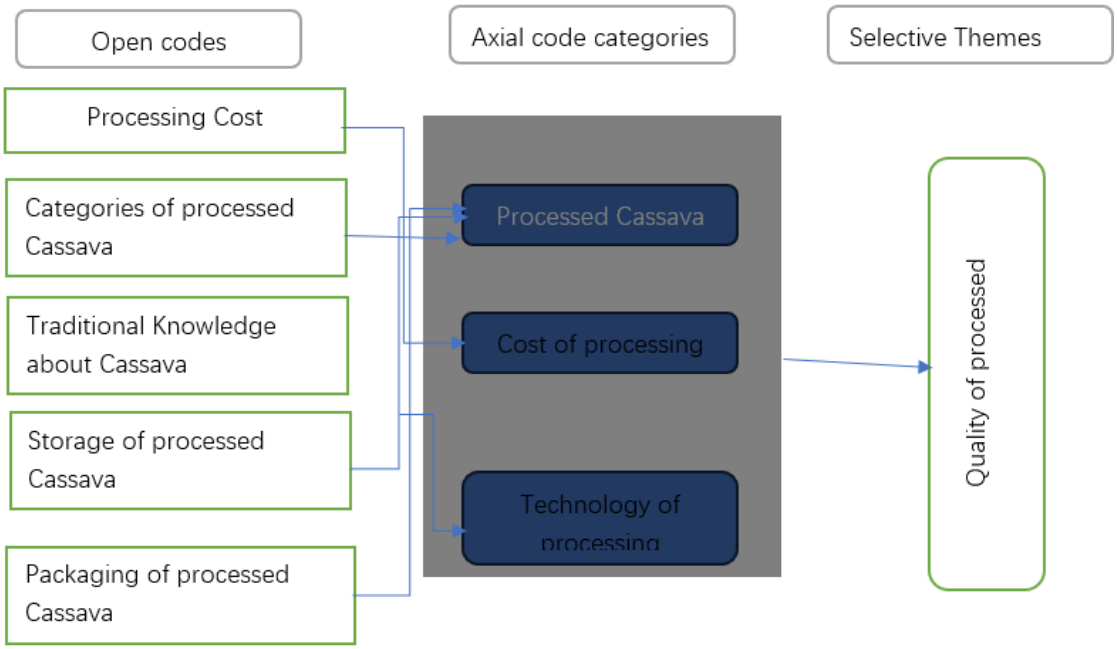

Figure 4: Cassava processing data coding structure

According to Gabriel Oraw, traditional cassava processing typically involves washing, peeling, and sun drying. He further observed that poor road infrastructure complicates transport to processing sites and that processed cassava is stored in sacks in cool, dry spaces, with buyers responsible for bringing their own packaging. These findings align with studies documenting the predominance of manual methods and infrastructural bottlenecks in rural cassava systems (Verma et al., 2022).

Challenges associated with inadequate processing extend to the handling of raw cassava. As noted by Elsie Odhiambo, raw cassava from the farm deteriorates quickly when unprocessed, contributing to postharvest losses. This observation reflects wider literature emphasizing perishability as a major constraint in cassava commercialization in East Africa (Thiele et al., 2021).

Additional challenges emerge in cassava marketing. In Migori, the Director of Agriculture, Billy Nyang'aya, highlighted exploitative practices such as extending bag sizes from the standard 50 kg to nearly 100 kg, resulting in unfair compensation for farmers. He also noted high demand for cassava in local and regional markets, including opportunities for cross-border trade and increased public–private partnerships. These observations demonstrate both the market potential and structural constraints affecting cassava value chains.

Processing methods vary slightly across groups. For instance, Irene Otieno, a member of a self-help group in Siaya, described processing involving washing, cutting, and sun drying, with occasional use of a solar dryer at the Caduoki aggregation center. Poor roads during rainy seasons

were noted as a major logistical challenge, with motorcycles serving as the primary transport option. This corresponds with Mbanjo et al. (2021), who emphasize the importance of appropriate technology, such as solar or flash drying, in improving product quality and reducing losses.

Similarly, Linet Atieno from Migori described detailed processing steps for both fermented and non-fermented cassava, including peeling, chipping, fermenting for three to four days, pounding, and sun drying. She noted that no significant logistical challenges exist because farmers often seek their own markets. Processing technology remains rudimentary, involving posho mills, stones, wooden pounding bowls (*pany*), and basic sun drying. She also reported that cassava products are used for various foods, including *ugali*, chapati, and *mandazi*.

In Siaya, some groups have adopted low-cost mechanization. For example, Magret Akeyo of the Caduoki group described the use of solar dryers and cutting machines to improve efficiency. She explained that bitter cassava is distinguished from sweet cassava by examining leaf characteristics and that processing costs range from KSh 15 to KSh 20 per unit for milling. These practices illustrate incremental technological adoption that aligns with contemporary recommendations for improving cassava processing efficiency (Mbanjo et al., 2021).

Kanyasa Ward Administrator Michaiel Odhiambo emphasized that cassava raw materials are sourced from farmers, although few farmers are engaged in cassava production in Migori. He recommended advocacy on nutritional benefits and diverse uses of cassava to promote increased production. This aligns with Verma et al. (2022), who note that cassava possesses significant potential as a multi-product crop within food security strategies.

Consumer perspectives further reflect the dual role of cassava as both a staple and a processed ingredient. According to Jacinta Odira, cassava is purchased dried and mixed with sorghum for milling into flour used for *ugali* and porridge; fresh cassava is also consumed boiled for breakfast. Her concerns about accidentally purchasing bitter cassava underscore longstanding issues related to varietal differentiation and food safety.

Overall, the findings indicate that cassava processing in western Kenya remains largely traditional, with limited adoption of mechanized or modern drying technologies. However, the use of solar dryers in Siaya suggests an emerging shift toward low-cost technological innovation. These results are consistent with empirical studies demonstrating that improved processing technologies, such as solar dryers and flash dryers, enhance efficiency, product quality, and food safety in cassava value chains (Mbanjo et al., 2021; Thiele et al., 2021). The current reliance on traditional methods restricts the scalability and competitiveness of cassava as a food security and commercial crop. Strengthening cassava processing systems therefore

requires targeted investments in appropriate technology, infrastructure, training, and value-chain coordination, echoing recommendations from recent cassava innovation studies.

Cassava Value Chain

John Ochieng, a consumer from Siaya town said that:

"We obtain cassava from farmers. market retailers on market days, at times, cassava actors bring cassava themselves, we prefer sweet cassava, raw materials are sourced from farmers and we add value to cassava by washing cassava, cleaning and drying them".

In Migori County, Kanyasa ward administrator Michaiel Odhiambo said that:

"Main actors in cassava value chain include, farmers, agricultural extension officers and ministry of Agriculture, the place of operation of these actors are villages in various words within the county, value added cassava products are flour and cooked cassava".

In Migori, Director in charge of Agriculture, Billy Nyang'aya said that

"Products which result from value addition are crisps, chips and cassava flour, value can be also added through better quality seed to increase production, agroprocessing for value addition and making of animal feed"

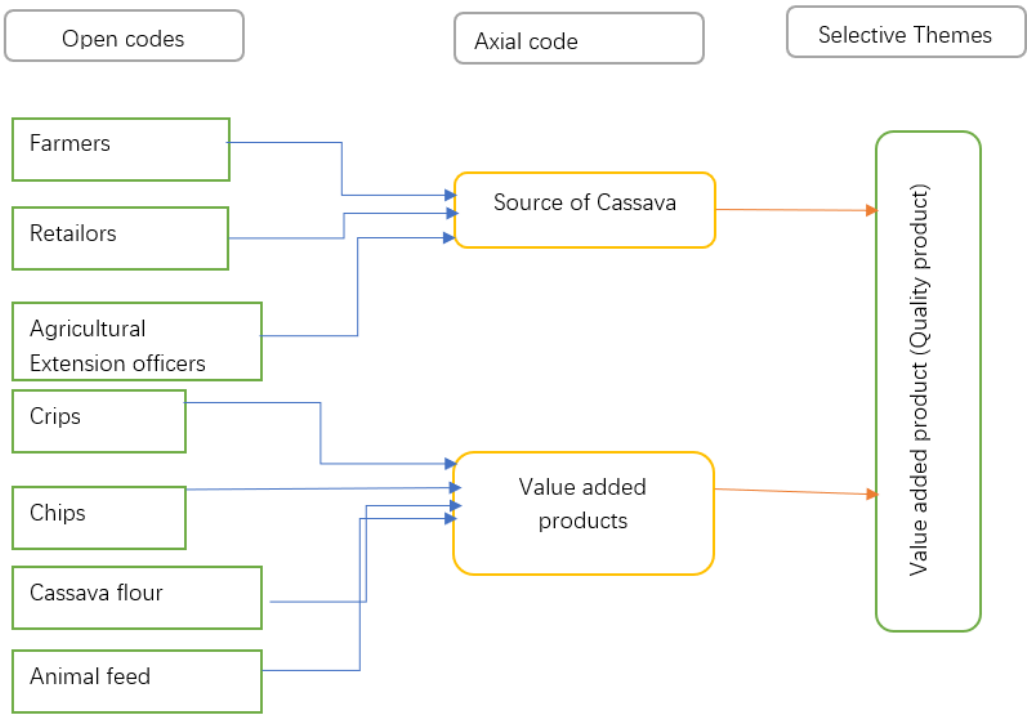

Figure 5: Cassava value chains data coding structure

The cassava value chain in western Kenya involves a network of interdependent actors who contribute to production, aggregation, processing, and distribution. At the consumer–retailer interface, value chain activities are relatively informal but remain essential for market functioning. As described by John Ochieng, a consumer and trader in Siaya, cassava is sourced from local farmers and market retailers, with some producers delivering cassava directly to trading centers. Ochieng noted that sweet cassava varieties are preferred by consumers and that traders engage in basic value-addition practices such as washing, cleaning, and drying before sale. These preliminary stages align with Porter's (1985) conceptualization of value addition, where even minor processing steps enhance usability and market value.

In Migori County, the cassava value chain appears more structured and institutionally supported. According to Kanyasa Ward Administrator Michaiel Odhiambo, major actors include farmers, agricultural extension officers, and officials from the Ministry of Agriculture, who operate across multiple villages within the county. He highlighted flour and cooked cassava as common value-added products, reflecting the importance of household-level and small agro-enterprise processing. This corresponds with findings by Njukwe et al. (2013), who argue that rural cassava systems in East Africa rely heavily on decentralized processing to meet local consumption and income needs.

Further insights from Migori's Director of Agriculture, Billy Nyang'aya, reveal a broader spectrum of value-added cassava products, including crisps, chips, cassava flour, and animal feed ingredients. He also emphasized that improved seed quality and agro-processing technologies are essential for enhancing both productivity and value addition. These observations are consistent with current literature suggesting that upgrading agricultural value chains requires innovation at both upstream (inputs, seed quality) and downstream (processing, product diversification) levels (Trienekens, 2011). Additionally, the development of cassava-based products such as snacks and industrial feed inputs indicates potential for commercialization and integration into higher-value markets, a trend also reported in studies on cassava commercialization in sub-Saharan Africa (FAO, 2020).

Taken together, the interview data and literature show that cassava value chains in western Kenya encompass informal and formal components, ranging from farmer-level production to county-facilitated processing and market development. Figure 4's coding structure likely reflects these layered interactions, illustrating how actors' roles and value-addition practices intersect across the chain. Strengthening such value chains demands coordinated extension support, improved production inputs, and expanded processing capabilities. These are factors necessary for elevating cassava from a subsistence crop to a competitive commercial commodity.

CONCLUSIONS

Cassava production in Western Kenya presents substantial opportunities for enhancing food security and improving household incomes due to its resilience to drought, adaptability to diverse agro-ecological conditions, and low production costs. The findings indicate that cassava serves dual roles: both as a subsistence crop that supports household nutrition and as a commodity with emerging commercial potential. However, the sector remains constrained by several systemic challenges, including traditional production and processing methods, widespread pests and diseases such as Cassava Mosaic Disease and Cassava Brown Streak Disease, inadequate access to certified planting materials, and limited infrastructure for transportation and market access.

The absence of co-ordinated institutional support from key research and regulatory bodies, such as KALRO, coupled with weak government-led policies and insufficient extension services, further restricts technological uptake and value-chain development. Market inefficiencies, such as: exploitation through extended bags, limited aggregation centres, and low levels of value addition, continue to reduce farmer profitability and weaken cassava's potential contribution to local economies. Based on the objective of the study, which was to assess the potential of value-added cassava products for improving food security and household income in Western Kenya, the study concludes that cassava production, processing, marketing, and value addition remain underdeveloped in both Siaya and Migori counties. This underdevelopment limits the crop's capacity to transform rural livelihoods despite its inherent agronomic and economic advantages.

RECOMMENDATIONS

i. **Strengthen Institutional and Policy Support:** County and national governments should prioritize cassava within agricultural development policies by strengthening partnerships with institutions such as KALRO, self-help groups, and private-sector actors. Clear policy frameworks are needed to support seed certification, disease control, and market regulation.

ii. **Enhance Access to Improved Planting Materials:** Establishing sustainable cassava seed systems is essential. This includes promoting certified disease-free planting materials, supporting cassava seed entrepreneurs, and scaling out improved high-yielding and disease-resistant varieties.

iii. **Invest in Processing Technologies and Value Addition:** To unlock cassava's commercial potential, small- and medium-scale processors should be supported through provision of solar dryers, chipping machines, and affordable mechanized equipment.

Expanding local processing centres can reduce postharvest losses and increase income through diversified cassava products.

iv. **Improve Infrastructure and Market Access:** Upgrading rural roads and improving transport networks would reduce transaction costs and improve linkages between farmers, aggregators, and processors. Standardizing measurement units and regulating market practices would further ensure fair pricing and protect farmers from exploitation.

v. **Strengthen Extension Services and Capacity Building:** Extension officers should be empowered to train farmers on modern production techniques, disease management strategies, postharvest handling, and business skills. Farmer field schools and producer groups should be strengthened to facilitate knowledge sharing.

vi. **Promote Nutrition and Consumer Awareness:** Advocacy campaigns emphasizing the nutritional value of cassava and its versatility in producing flour, snacks, and composite food products can stimulate demand and support local value addition.

vii. **Support Farmer Organization and Cooperative Development:** Encouraging farmers to form producer groups or cooperatives can enhance bargaining power, facilitate access to inputs, support collective marketing, and promote investment in shared processing facilities.

IMPLICATIONS FOR FURTHER STUDIES

Based on the study conclusions and recommendations, a comparative study should be carried out on other draught resistant crops such as sorghum, pumpkin, sweet potatoes to assess their production status, processing readiness and value chains development in western Kenya. These crops are essential in mitigating with food insecurity in the region and can be harnessed to reduce dependency on maize as the main staple cereal crop.

The current study covered two counties, namely Siaya and Migori in western Kenya. We suggest that further study can be carried out in the counties within Lake Victoria basin in western Kenya with similar agroecological conditions in order to deepen our understanding of the phenomena. This should draw the knowledge of an array of stakeholders in the region.

Given that the current study followed a qualitative paradigm, it is suggested that future research lens may adopt a quantitative angle to amplify results. We suggest using the survey method to generate large datasets that can be used to make inferences on the data.

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