IN-DEPTH ANALYSIS OF KENYAN AVOCADO, DRIED CHILI AND CASSAVA READINESS FOR EXPORT TO CHINA

PROJECT:

CHINA – AFRICA AGRICULTURAL VALUE CHAIN OPPORTUNITIES

KENYA

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ACRONYMS

AFA	-	Agriculture and Food Authority
CGA	-	Cereal Growers Association
CGIAR	-	Consultative Group on International Agricultural Research
CBSD	-	Cassava Brown Streak Disease
CIF	-	Cost, Insurance, and Freight
CMV	-	Cassava Mosaic Virus
EPZ	-	Export Processing Zone
EU	-	European Union
FAOSTAT	-	Food and Agriculture Organization Statistics
FCM	-	False Codling Moth
FGDs	-	Focus Group Discussions
FPC	-	Fresh Produce Consortium
FPEAK	-	Fresh Produce Exporters Association of Kenya
GACC	-	General Administration of Customs of China
GAP	-	Good Agricultural Practices
HCD	-	Horticultural Crops Directorate
IPM	-	Integrated Pest Management
IITA	-	International Institute of Tropical Agriculture
ISPM	-	International Standards for Phytosanitary Measures
KALRO	-	Kenya Agricultural and Livestock Research Organization
KEPHIS	-	Kenya Plant Health Inspectorate Service
KEPROBA	-	Kenya Export Promotion and Branding Agency
KenInvest	-	Kenya Investment Authority
KenTrade	-	Kenya Trade Network Agency
KHC	-	Kenya Horticultural Council
MRLs	-	Maximum Residue Limits
PPP	-	Public-Private Partnership
ROI	-	Return on Investment
SAF-A	-	Sustainable Agriculture Foundation - Africa
SHF	-	Smallholder Farmer
USP	-	Unique Selling Proposition

1 Executive Summary- Key Findings

Farmer Profiles and Market Segmentation

Kenyan smallholder farmers dominate the production of avocado, chili, and cassava, contributing significantly to both local and export supply chains. Farmers are categorized into subsistence, semi-commercial, and commercial producers, with varying levels of access to markets, inputs, and financing. Avocado farmers are the most export-oriented, particularly those in contract farming arrangements. Chili farmers, especially those producing dried chili, are increasingly engaging in export-oriented contract farming, while cassava farmers largely sell to domestic markets with minimal value addition.

Return on Investment (ROI) Analysis

Financial analysis reveals high profitability variations across the three crops:

- Dried chili farming yielded ROI of 71.4%, driven by low production costs and high export value.
- Avocado farmers exporting directly achieve an ROI of 180%, benefiting from strong international demand but facing high compliance and logistics costs.
- Cassava farmers earn an ROI of up to 167%, as a result of low production cost due to reliance on traditional production methods associated with low input regimes.
- Fresh chili exports have the lowest ROI at 20.8%, attributed to price fluctuations, multiple intermediaries, and inconsistent quality standards.

Export Readiness and Market Dynamics

- Avocado is Kenya's most export-ready of the three crops, with 123,000 MT exported globally in 2023, generating USD 141 million in revenue. By 2023, exports to China had reached 5,000 MT, valued at 8 million. Compared to other export markets like the middle East and some EU countries the prices to China are quite favorable. However, challenges such as logistical constraints, cold chain limitations, and strict Chinese phytosanitary regulations—including mandatory fumigation at 27°C, which impacts fruit quality—continue to hinder profitability.
- Chili exports reached 1,347 MT, though compliance with pesticide residue limits and market consistency remains a challenge. Scaling up processing capacity for dried chili is key to unlocking higher-value exports.
- Cassava exports, valued at USD 1.1 million in 2022, remain underdeveloped, with processing and aggregation bottlenecks hindering competitiveness. Investment in cassava flour, starch, and ethanol production is critical for expanding market opportunities.

Challenges in Exporting to China

Kenya faces several regulatory and market access barriers, including:

- Stringent Chinese phytosanitary requirements, including fumigation protocols that disrupt product quality.
- Market access delays due to slow approvals of registered exporters and high import tariffs (e.g., Kenya's avocados face a 7% tariff, while Tanzania enjoys duty-free access).
- Limited processing capacity for chili and cassava, affecting the ability to meet export specifications.
- High logistical costs, exacerbated by shipping disruptions and cold chain weaknesses.

Opportunities and Strategic Recommendations

To strengthen Kenya's agricultural export competitiveness, the following key interventions are recommended:

- Investment in post-harvest infrastructure, including cold storage, grading centers, and processing facilities to ensure quality compliance.
- Scaling up farmer training in Good Agricultural Practices (GAP) and pesticide management to improve export standards.
- Enhancing market linkages through contract farming, digital trading platforms, and direct buyer engagement to reduce intermediary costs.
- Strengthening government engagement with China to streamline trade agreements, reduce tariffs, and fast-track exporter approvals.

By addressing these strategic areas, Kenya can unlock new export markets, increase farmer profitability, and strengthen its position as a key supplier of avocado, chili, and cassava to China.

2 Introduction

2.1 Project Background and Objectives

This report is part of the China-Africa Agricultural Value Chain Opportunities Project, led by the Sustainable Agriculture Foundation – Africa (SAF-A). SAF-A is a non-profit organization and a legacy institution of the Syngenta Foundation for Sustainable Agriculture (SFSA). Their goal is to enhance farmer incomes and food security by introducing smallholder-relevant innovations, facilitating market access, and addressing systemic barriers within the agricultural sector. Additionally, SAF-A is committed to scaling up climate-smart agricultural practices and empowering women, youth, and marginalized communities.

This particular project aims at enhancing the understanding of China's market dynamics for key crops produced by smallholder farmers in Kenya and Tanzania. The project focuses on four primary objectives: i) identifying Kenya's agricultural products with export potential, particularly those already approved for import by China's customs; ii) analyzing the market for cassava, avocado, and dried red chili peppers in key production regions; iii) assessing smallholders' involvement, benefits, and financial returns in export activities, including knowledge and technology gaps; and iv) identifying policy interventions and commercial partnerships to strengthen smallholder exports.

Additionally, the initiative fosters China-Africa agricultural cooperation to ensure sustainable investment, facilitate inclusive export platforms, and ultimately enhance productivity and income for smallholder farmers across the region.

2.2 About This Report

This report is the second deliverable of a study evaluating Kenya's agricultural export readiness, challenges, and growth potential for the Chinese market, with a focus on creating profitable opportunities for smallholder farmers. Expanding on the findings of the initial mapping study, which identified export-ready crops and regulatory requirements for Kenya-China trade, this report provides an in-depth market analysis of cassava, avocado, and dried red chili peppers. It examines key areas such as crop production trends, farmer segmentation, food safety and quality standards, Good Agricultural Practices (GAP), post-harvest management, processing capabilities, and overall export readiness. Additionally, the report highlights the challenges and opportunities facing smallholder farmers and includes a return on investment (ROI) assessment for the three value chains. The analysis is informed by insights from key industry stakeholders, including government agencies, exporters, processors, farmers, trade experts, and agricultural trade associations.

This multi-stakeholder engagement provides a comprehensive and in-depth perspective on the factors shaping Kenya's agricultural export readiness to China, particularly for the three high-potential crops identified for expanding exports and enhancing income opportunities for smallholder farmers.

2.3 Research methodology and coverage

Data was collected through a combination of primary and secondary research methods. The primary field research included Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) using semi-structured questionnaires (see annex 1) with key stakeholders such as smallholder and large-scale producers, traders, processors, exporters, farmer cooperatives/organizations, industry associations, business member organizations, government bodies, and industry specialists. The secondary research methods utilized included literature reviews drawing from a wide range of sources, such as research papers, government and institutional reports, industry analyses, market studies, online databases, media reports, and policy documents. By leveraging these diverse information sources, the research provided a comprehensive understanding of market dynamics, regulatory frameworks, and industry trends, offering valuable insights for the study.The selection of interviewees was based on their role in the value chains, with a particular emphasis on smallholder farmers, given their crucial role in crop production and status as primary beneficiaries of the China-Africa Agricultural Value Chain Opportunities Project. Data collection was carried out in January and February 2025.

The number and categories of stakeholders interviewed are detailed in Table 1 below.

Table 1: Interviews held during data collection.

Stakeholder group	Number of interviews
Smallholder Farmer (SHF) Total	66
- Avocado	21
- Red Chili	16
- Cassava	29
Medium-scale farmers Total	5
Farmer cooperatives	2
Exporters	4
Processors	4
Farmer organizations	1
Government	4
Industry associations	2
Sector wide service organizations	4
Industry experts	3

Map of data locations in Kenya (Counties)

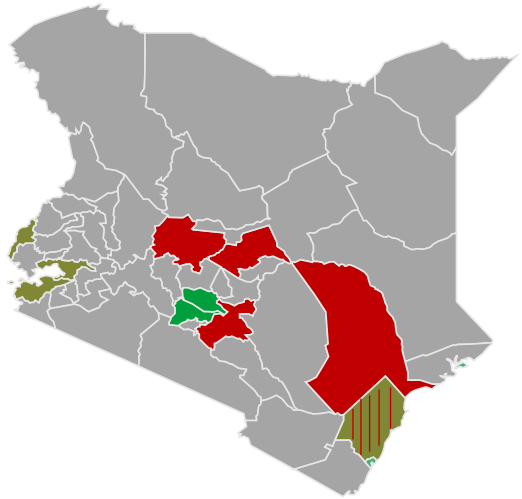

Table 2: Data collection locations

Crop	Research regions
Avocado	Murang'a and Kiambu
Cassava	Kisumu, Homabay, Kilifi and Busia
Chili	Kilifi, Tana River, Machakos, Laikipia, Meru and Kiambu

Interview locations were strategically chosen due to their critical role in both production and trade of the relevant crops, as outlined in the table below.

The data was analyzed using multiple qualitative methods, including Content Analysis, Narrative Analysis, and Framework Analysis. A range of tools facilitated this process, including manual qualitative analysis tools, visualization and mapping software, and online survey and transcription tools, ensuring a comprehensive and structured approach to data interpretation.

3 Introduction to Kenyan Agricultural Exports

Kenya has a long-standing history as an agricultural export powerhouse, leveraging its favorable climate and diverse ecosystems to produce high-value crops for international markets. Tea, coffee, and horticultural products (mainly fresh flowers, vegetables and fruits) have historically dominated the export landscape, contributing significantly to foreign exchange earnings and employment.

Smallholder farmers form the backbone of Kenya's agricultural sector, accounting for over 70% of total agricultural production and playing a critical role in export supply chains. Despite their importance, these farmers often face challenges such as limited market access, high production costs, and inadequate extension services, which affect their participation in global markets.

Kenya's traditional export markets for fresh fruits and vegetables have primarily been the EU and the Middle East. However, with growing demand in China and the expansion of bilateral trade agreements between Kenya and China, the country is increasingly focusing on exporting crops approved by Chinese Customs, such as avocado and cassava. These crops present high-value opportunities, aligning with shifting global consumption trends.

Avocado has already established itself as a leading export crop, with exports to China gaining momentum following trade agreements and phytosanitary clearances. Meanwhile, chili and cassava are also emerging as key export commodities, valued for their diverse applications in food, animal feed, and industrial uses. By leveraging these opportunities, Kenya aims to strengthen its position in international markets and maximize the economic potential of its agricultural sector.

4 Analysis of Crop Production

Kenya has experienced notable growth in the production of avocado, chili, and cassava, driven by rising demand in both domestic and export markets. Each crop follows a distinct trajectory in terms of production trends, geographical distribution, market development, and challenges. Additionally, their routes to market vary, as outlined in the following sections.

Kenya's leading export avocado varieties include Hass, Fuerte, and Pinkerton, with Hass emerging as the dominant variety due to its strong global demand. According to AFA-HCD data, avocado production increased from 317,000 MT in 2018 to over 632,000 tons in 2022, with Hass accounting for 70% of total production. The supply of Hass avocados from Kenya is expected to continue growing as more farmers transition to avocado farming, recognizing its high profitability and strong market demand.

While avocado cultivation spans 42 out of Kenya's 47 counties, Murang'a and Kiambu remain the top producers, contributing over 70% of the country's export volumes. The European Union and the Middle East continue to be Kenya's primary export markets, with demand for high-quality avocados steadily increasing.

Kenya has cemented its status as Africa's top avocado producer, with production reaching 542,277.78 metric tons in 2023, representing nearly 50% of the continent's total output, according to FAOSTAT[1]. The sector is largely driven by 150,000 farmers, 70% of whom are smallholders, while the remaining 30% consists of large-scale producers[2]. Kenya's avocado harvest spans March to late October, benefiting from two key rainy seasons: the Long Rains (March–May), which bring heavier rainfall peaking in April, and the Short Rains (October–December), which are less intense but still support production By 2023, Kenya exported approximately 122,581 metric tons of avocados, generating an estimated USD1. The country's avocado exports to China have been steadily increasing and saw a significant surge in 2023, with 5,000 metric tons exported amounting to USD 8 million in value[3].

Despite being a leading export crop for Kenya, avocado production faces quality and consistency challenges, particularly for smallholder farmers. Key issues include pest and disease pressure (e.g., fruit flies, false codling moth-FCM, anthracnose), lack of training in best agricultural practices, and poor post-harvest handling (inefficient harvesting, storage, and transport). Limited access to certified inputs such as high-quality seedlings and organic fertilizers further affects yield consistency. Additionally, market and certification barriers make compliance with international standards costly. Climate

[1] https://www.fao.org/faostat/en/#data/QCL
[2] https://www.freshfruitportal.com/news/2024/12/02/as-kenyan-avocado-production-grows-how-can-it-increase-its-share-of-global-exports/?utm
[3] https://www.theeastafrican.co.ke/tea/business/kenya-avocado-exports-to-china-hit-64m-4272044

variability disrupts flowering and yields, while inadequate cold storage and logistical delays lead to premature ripening and reduced export quality.

Chili production in Kenya is concentrated in coastal and arid regions, including Kilifi, Tana River, Makueni, Machakos, and Taita Taveta, due to their warm climate. Smallholder farmers dominate the sector, with contract farming for fresh chili exports being the most common model. A few companies also engage both small- and large-scale farmers in dried chili processing, particularly for cayenne and bullet chili varieties. Large-scale cultivation is mainly found in the Hola and Bura irrigation schemes.

Kenya's chili production has experienced moderate growth, reaching 2,989.43 metric tons in 2023 (FAOSTAT), though exports remain volatile. In 2023, Kenya exported 1,347 metric tons (HCD), with dried chilies showing strong export potential due to increasing global demand. However, Kenya remains a small-scale producer compared to India, China, and Mexico, the dominant players in the international chili trade.

While chili is gaining traction as a high-value export crop, particularly to the EU and Asian markets, farmers face pest challenges, poor post-harvest handling, and limited access to structured markets, hindering sector growth.

Cassava is a staple crop in Kenya, primarily cultivated in the Western and Coastal regions, with Busia, Homabay, Kisumu, and Kilifi being the leading production areas. FAOSTAT estimates Kenya's total cassava production at 1,187,800 MT. Figure 1 below shows some of the key production areas in Kenya.

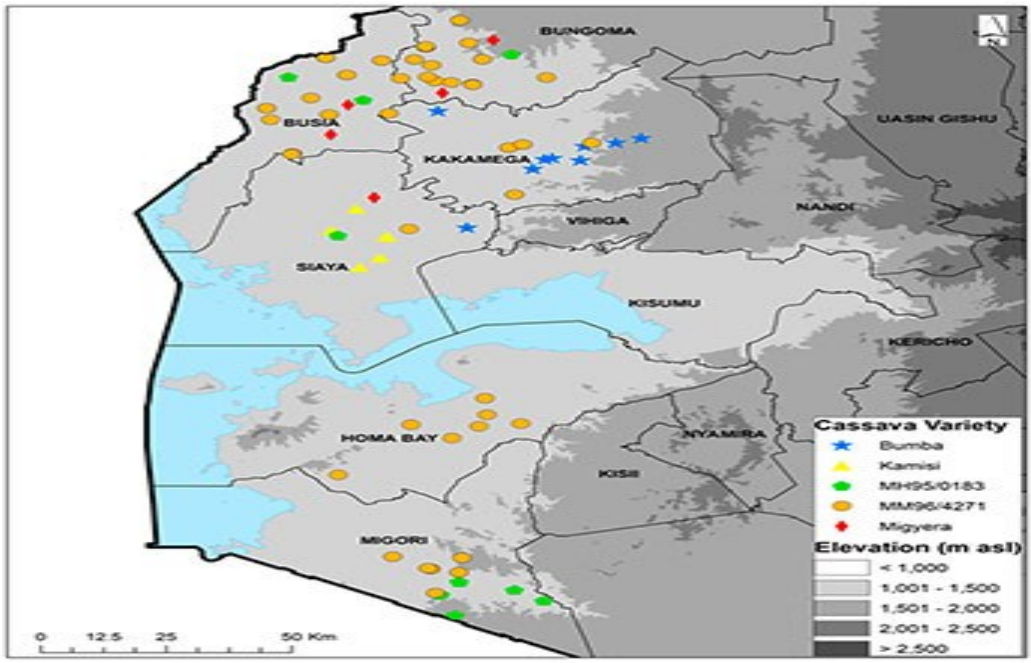

Figure 1: Geographic distribution of the top 5 cassava varieties cultivated in 2022 and 2023 in Western Kenya

The crop is predominantly grown by small-scale farmers, mainly for local fresh markets, with limited volumes sold to neighboring countries. A few processors source cassava from these farmers to produce cassava flour and chips, but value addition remains minimal due to challenges such as Cassava Mosaic Virus (CMV), inadequate processing infrastructure, and weak market linkages. A further challenge for the cassava value chain in Kenya is the low quality of seed material. IITA and KALRO have further intensified their research[4] and are working on the release of varieties that are more drought- and disease-resistant. However, the uptake of cassava production as a commercial opportunity is still limited, partly due to lack of awareness at the SHF level.

Despite its high potential for value addition and export, Kenya's cassava production stood at 775,000 metric tons in 2022, with exports remaining relatively low. In contrast, Nigeria, Thailand, and Vietnam dominate the global cassava trade, leveraging large-scale production and processing. Kenya, however, remains a net importer of cassava, having imported USD 99,500 worth of cassava in 2022, further underscoring the need to strengthen domestic production and expand export opportunities.

[4] https://www.iita.org/news-item/fighting-cassavas-deadliest-enemies-in-western-kenya/

5 Route To Market for Avocado, Red Chili and Cassava

The market route for avocado, chili, and cassava involves a network of stakeholders, including producers, brokers, processors, exporters, and final market destinations. Additionally, key enablers such as government agencies, extension service providers, input suppliers, financial institutions, sector associations, NGOs, analytical laboratories, and certification bodies play a crucial role in supporting the value chains.

5.1 Route to the market for avocado

The avocado value chain begins with smallholder, medium-scale, and large-scale producers who supply their harvest to cooperatives, exporters, or local processors. While some medium and large-scale producers export directly, most avocados are either sold fresh in domestic markets or exported, with Europe and the Middle East being key destinations. Figures 2 and 3 illustrate the market maps for smallholder and medium/large-scale avocado farmers, respectively.

Access to export markets depends heavily on compliance with quality standards, such as Global GAP certification, which opens doors to premium markets. Smallholder farmers typically sell their produce through brokers, who purchase avocados either at the farm gate or at collection centers before distributing them to various markets. Alternatively, some SHF collaborate with exporters as out-growers. In this arrangement, exporters source avocados from collection centers, transport them to grading warehouses in Nairobi, and prepare them for export. Exporters also assist farmers in meeting market quality requirements, including certifications like Global GAP and organic standards. Majority of large-scale farmers export their avocados directly without intermediaries.

Given the significance of avocados as an export commodity, the sector involves a wide range of enablers. These include government agencies, financial institutions, sector associations, extension services, NGOs, input suppliers, certification bodies, laboratories, and logistics and shipping companies, all of whom play a role in supporting the industry.

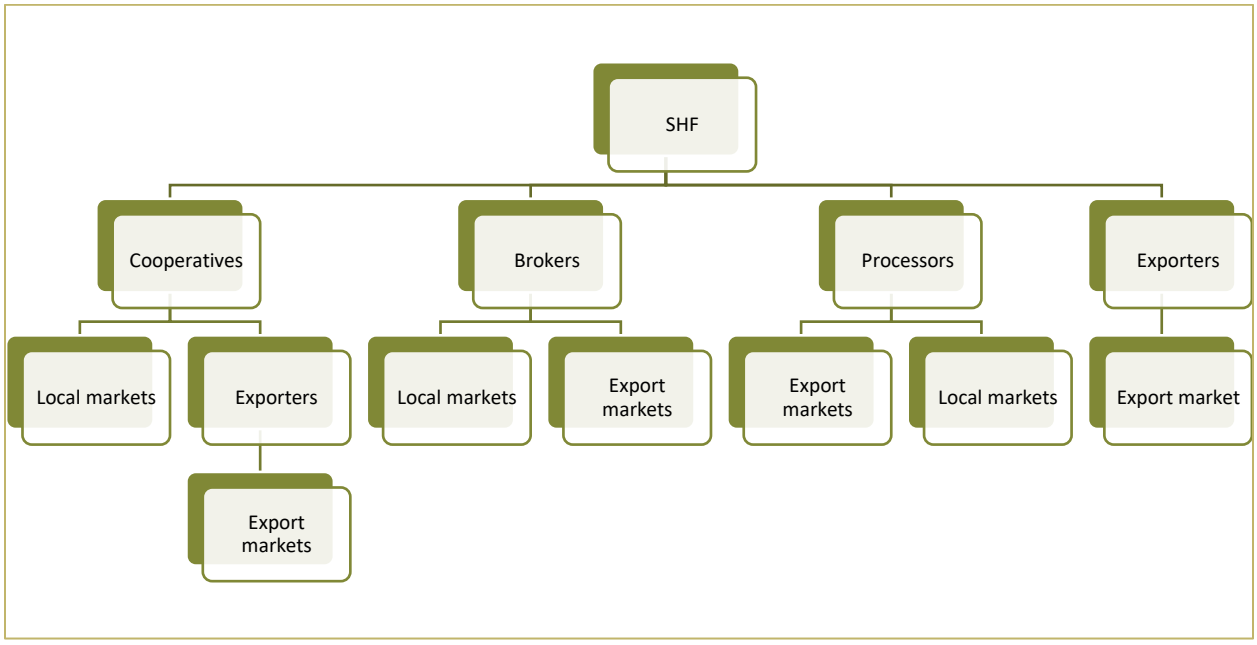

Figure 2: Basic avocado market map for smallholder farmers.

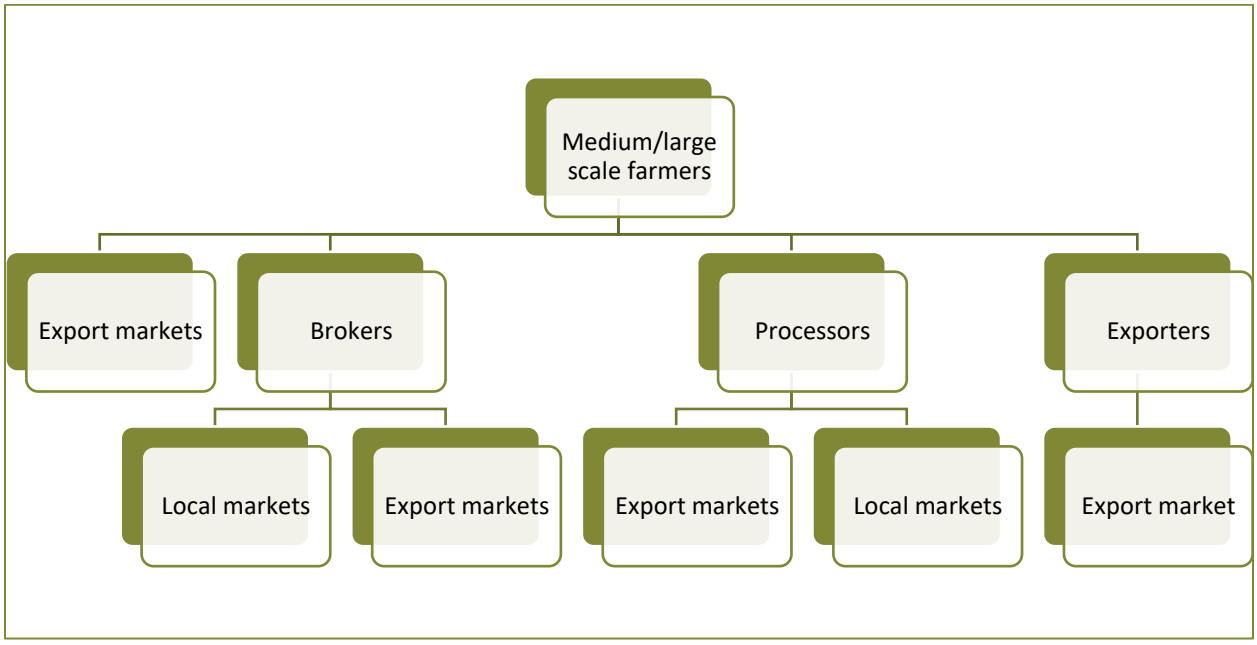

Figure 3: Basic avocado market map for medium and large-scale farmers

5.2 Route to the market for red chili

The red chili supply chain starts with smallholder and medium-scale farmers, who sell their produce directly to brokers, local markets, exporters, or processors (see figure 4). Unlike the avocado sector, the chili supply chain does not involve producer cooperatives. A significant portion of chili is sold fresh in both local and export markets, while processed chili (dried or ground) is supplied to spice manufacturers, exporters, and food processors.

Similar to avocados, exporters play a vital role in ensuring compliance with export market requirements, such as Global GAP certification, and often assist farmers in meeting these standards. The enabling environment for chili mirrors that of avocados, involving a range of stakeholders, including government agencies, financial institutions, sector associations, extension services, NGOs, input suppliers, certification bodies, laboratories, and logistics and shipping companies. These actors collectively support the development and sustainability of the chili industry.

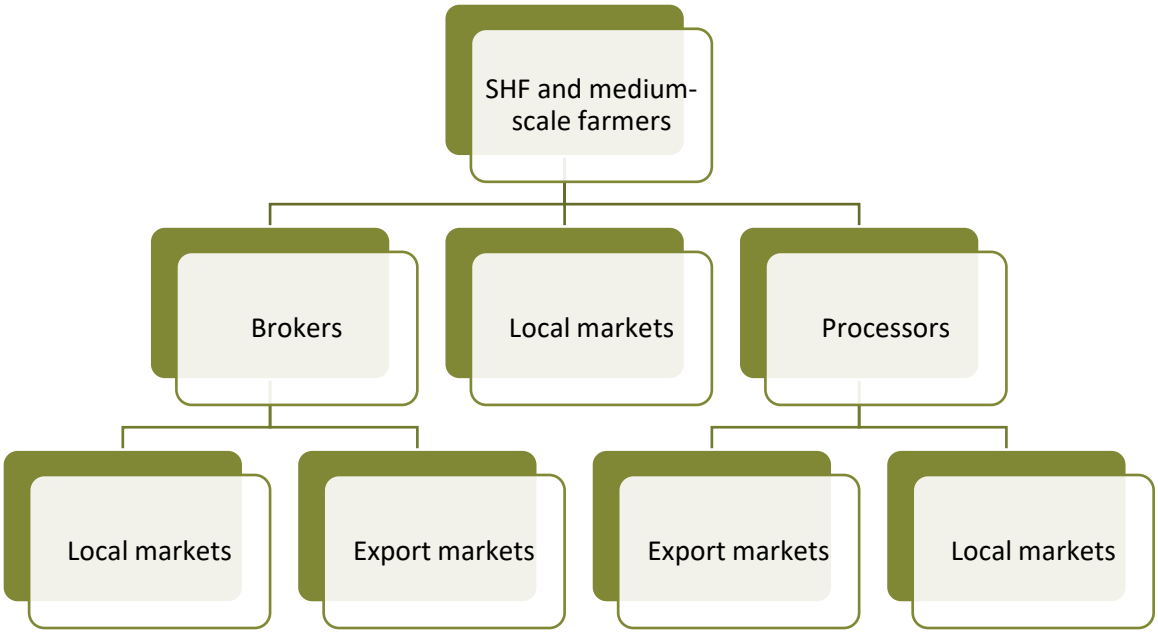

Figure 4: Basic red chili market map

5.3 Route to the market for cassava

The cassava market chain in Kenya is fragmented and informal but evolving (Figure 5). Smallholder farmers (often with <1 acre of cassava) form the base. They harvest and either sell fresh roots in local markets or to intermediaries. Middlemen/traders play a crucial role – they buy cassava at the farm gate and transport it to towns or processors, with a few exporting to neighboring countries. Because formal cassava cooperatives are rare, these middlemen fill the coordination gap[5]. Some regions have farmer self-help groups (10–20 farmers) that bulk their cassava harvest to negotiate better prices with buyers or to invest in simple processing (like communal drying). At the processing level, the chain includes small millers and cottage industries who might buy dried cassava chips from farmers to grind into flour. There are also instances of contract farming: processing

[5] Sustainable Agriculture Foundation – Africa (2023). *Kenyan Cassava Value Chain Analysis* (China-Africa Agr. Value Chain Opportunities Report)

companies contract farmers, provide training or improved cuttings, and guarantee purchase, thus integrating the chain from farm to factory[6]. After processing, distributors and retailers take over for flour and starch, while feed manufacturers integrate cassava meal directly. A notable dynamic is that cassava's value chain is increasingly dual-purpose – part of the harvest flows into human food channels and part into industrial/feed channels, sometimes from the same farmers. This duality offers farmers multiple outlets but also demands quality differentiation (e.g. food-grade vs feed-grade processing).

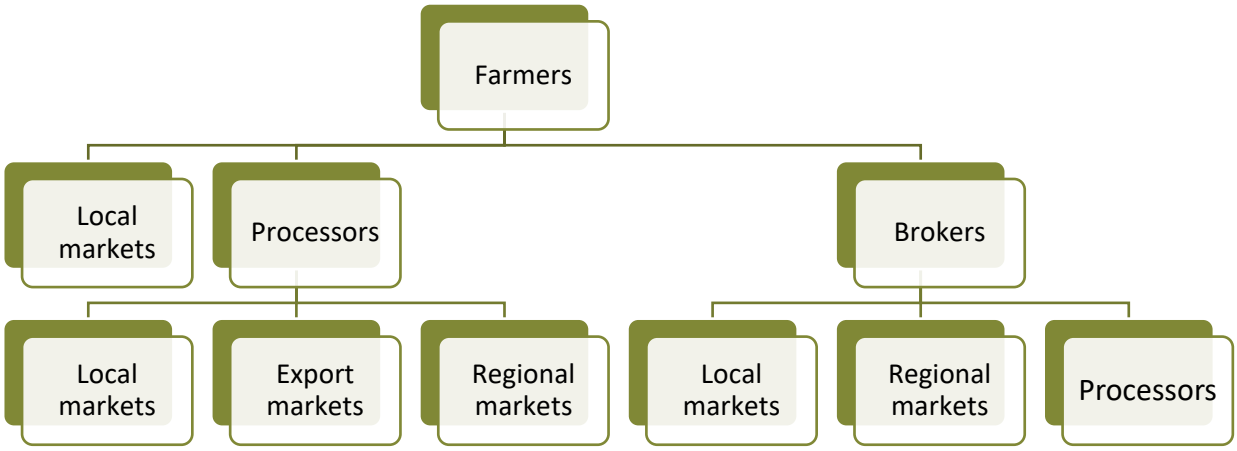

Figure 5: Basic cassava market map

Enablers: Government agencies, financial institutions, extension service providers, NGOs, research institutions.

The enabling environment for cassava in Kenya remains underdeveloped compared to avocado and dried chili, as cassava is not widely perceived as a high-value crop. Key stakeholders in the cassava value chain include government agencies like county governments and KEPHIS, financial institutions, NGOs, and research organizations such as KALRO, CGIAR, and IITA, which focus on variety development, seed multiplication, and other critical research areas. Collaborative efforts among these stakeholders will be essential to unlock cassava's full potential and drive its commercialization.

[6] Agribiz Kenya (2020). *Food processing company to add value to locally-grown cassava* – Agribiz Programme Success Story

In all three value chains, access to export markets is primarily determined by quality standards, postharvest handling, and processing capabilities. In contrast, the domestic market is driven by efficient linkages between farmers, intermediaries, and end consumers. Strengthening these connections and improving infrastructure can greatly enhance profitability and sustainability for both farmers and agribusinesses.

6 Farmer Segmentation and Needs

6.1 Profiles of smallholder farmers involved in avocado, chili, and cassava production

Agriculture in Kenya is diverse, encompassing small-, medium-, and large-scale farming, with smallholder farmers contributing over three-quarters of total production for some crops. The sector remains largely dependent on rainfed systems, with only about 7% of farmland under irrigation. Across the value chains of avocado, cassava, and red chili peppers, farmers of all scales play a critical role in ensuring production for both local and export markets.

However, the distinction between smallholder and large-scale farmers goes beyond land size, incorporating factors such as market orientation, level of mechanization, and scale of production.

Smallholder farmers typically cultivate plots averaging 0.47 hectares (about 1 acre), relying on family labor and focusing on food production for household consumption and local markets[7]. Despite this, they are key contributors to Kenya's export sector, often supplying export companies as out-growers or selling through brokers who then supply exporters, as observed in this study.

In contrast, large-scale farmers cultivate significantly larger tracts of land, often exceeding 40 hectares (100 acres), with mechanized operations primarily geared toward commercial cash crops for export. While smallholder farmers typically sell their produce through brokers, cooperatives, or as contract growers for export companies, medium- and large-scale farmers have more direct market access. Many medium-scale farmers sell to exporters or processors, and a few even engage in direct exports, though some still rely on brokers.

This study primarily focused on small- and medium-scale farmers, with landholdings ranging from 0.5–20 acres for cassava, 0.5–10 acres for chili, and 3–30 acres for avocado. Among avocado farmers, medium-scale producers often operated individually, while small-scale farmers were either part of small producer groups (10–30 members) or larger cooperatives (over 50 members). In contrast, chili and cassava farmers typically worked either independently or within small producer groups of 10–30 farmers, with no evidence of cooperative structures in these value chains. Notably, most farmers joined producer groups to access training, certification, market opportunities, and financing, yet they often preferred to sell their produce individually.

Market access, particularly for exports, varied by crop and farm size. Smallholder avocado farmers and some medium-scale farmers relied on linkages with exporters and brokers, while one medium-scale farmer was engaged in direct exports – interestingly, to

[7] World Bank Group Report Number 97887 of 2015

the Chinese market. The chili supply chain followed a similar pattern, with fresh red chili sold through exporters or brokers and dried chili primarily supplied through contract farming with processors or exporters. Cassava farmers, on the other hand, mainly sold their produce through brokers and processors, with the bulk of their harvest destined for the domestic fresh cassava market rather than exports.

These findings highlight the crucial role of smallholder and medium-scale farmers in Kenya's agricultural economy, particularly in supplying export markets through structured value chains. However, strengthening market access, improving know-how and support/extension systems, cooperative structures, and commercial viability remains key to enhancing their competitiveness and long-term sustainability.

6.2 Key needs, challenges, and emerging opportunities for farmers

Farmers interviewed in this study identified numerous challenges despite their vital role in agricultural production. Key concerns included limited access to high-quality planting materials and inputs, difficulties in complying with strict market requirements, inadequate training on best agricultural practices, limited financing for investment, and unreliable market access. While these challenges are prevalent across the three value chains—avocado, cassava, and red chili—their impact varies depending on the crop and target market. Importantly, these obstacles affect not only smallholder farmers, but also large-scale producers and exporters engaged in the export market.

6.2.1 Avocado

For avocado farmers, one of the most significant hurdles is meeting stringent export standards, particularly for markets like China (full list of requirements for export to China are found in annex 2). Compliance with quality and phytosanitary requirements remains a major challenge, leading to frequent rejection of consignments. One medium-scale farmer exporting to China recounted how an entire shipment was rejected after arrival due to failure to meet the required quality standards, resulting in significant financial losses, as the fruits could not be shipped back to Kenya. The most common issues cited include exceeding the maximum residue limits (MRLs) for pesticides, rejection at visual inspection (brown spots) and failing to control quarantine pests such as the false codling moth and fruit flies.

Another key concern for avocado farmers is the lack of critical infrastructure, including cold storage, grading, aggregation, and freezing facilities, which are particularly essential for those exporting to China. The high cost of certification and compliance further adds to their burden, making it difficult for many smallholders to participate in international trade. Additionally, logistical constraints, high freight charges, and limited access to affordable credit hinder their ability to compete effectively in global markets. At the production level, pests, diseases, and post-harvest losses remain persistent challenges that affect both yield and quality.

Exporting to China presents unique regulatory difficulties that set it apart from other markets. Farmers, exporters, and industry stakeholders have expressed concerns over China's stringent import requirements, which involve multiple layers of compliance.

Firstly, agricultural products, their originating countries and export companies must be approved as of the "permissible import" list. To be included in this approval list often takes years of technical trials, inspections and compliance and a significant level of diplomatic effort.

Crop commodities must meet strict phytosanitary measures to prevent the introduction of pests and diseases. Each shipment requires a phytosanitary certificate confirming that the produce is free from harmful organisms, and the pesticide residue levels must comply with China's Maximum Residue Limits (MRLs). In addition to these phytosanitary standards, China enforces strict quality grading standards that assess factors such as size, color, and ripeness. High-risk commodities undergo mandatory quarantine inspections, and certain crops require pre-approval and registration of the production regions or facilities in the exporting country. Furthermore, labeling regulations demand that all packaging display detailed product information, including origin, producer details, and expiration dates.

Beyond regulatory barriers, Kenyan avocado exporters to China face several additional challenges. One of the most contentious issues is the 7% import duty imposed on Kenyan avocados, whereas neighboring Tanzania enjoys a zero-rated tariff. The fumigation protocols required for exports to China have also been problematic, with some exporters struggling to comply properly, leading to spoilage and fruit rejection. The ongoing Suez Canal and Red Sea crisis has further exacerbated logistical challenges, forcing exporters to use longer, more expensive shipping routes, which negatively impact competitiveness, fruit quality and shelf life.

Another major issue is the slow process of updating the General Administration of Customs of China (GACC) website, which lists registered Kenyan farms, packhouses, and fumigation facilities. Delays in these updates have led to lost business opportunities, as exporters unable to confirm their registration cannot ship their products. Industry stakeholders also noted that the bureaucratic approval process for avocado exports to China was excessively lengthy, taking nearly five years. The process involved pest risk assessments by KEPHIS, evaluations by Chinese experts, protocol development, exporter sensitization, and multiple layers of certification and verification. Even after gaining approval, handling protocols remain a significant challenge. Mandatory fumigation at 27°C disrupts the cold chain, causing the fruit to brown and increasing the likelihood of rejection upon arrival in China. Cold storage is required at 5°C, but the transition between fumigation and cold storage remains problematic due to a limited number of authorized fumigators.

Interestingly, some of these challenges are unique to the Chinese market. Exporters noted that the European Union and Middle East markets do not impose fumigation requirements, high tariffs, or GACC registration delays, making them relatively more accessible and predictable.

6.2.2 Chili

Kenya's smallholder farmers are increasingly adopting dried red chili, particularly the African bird's eye variety, due to its high market value and drought tolerance[8]. Chili farmers face struggles, particularly regarding certification, quality control, and market access. Many smallholder farmers find it difficult to comply with pesticide residue limits, leading to rejection of their produce in export markets. The high cost of inputs, such as fertilizers and pesticides, adds to their burden, while pest and disease infestations pose additional threats to productivity. Access to finance remains a critical issue, preventing many farmers from investing in better farming practices or expanding their operations. Poor market access and price fluctuations make chili farming an unpredictable venture, and inadequate irrigation infrastructure further limits production potential.

One of the key needs for chili farmers is access to quality seeds and inputs, as many struggle to obtain certified, disease-resistant varieties. Training in good agricultural practices (GAPs), including nursery preparation, pruning, and fertilizer application, is also critical. Reliable irrigation solutions, such as drip irrigation and rainwater harvesting, can improve year-round production and stabilize yields. Furthermore, farmers require support in pest and disease management, as threats like thrips, FCM, whiteflies, and Fusarium wilt often cause severe crop losses. Post-harvest losses remain high due to inadequate drying and storage facilities, making investments in solar dryers and hermetic storage bags essential[9]. Additionally, improving market linkages through cooperatives and digital platforms can help farmers negotiate better prices and avoid middlemen exploitation.

Despite these challenges, emerging opportunities offer promising prospects. Growing local and export demand, particularly in Europe and the Middle East, presents lucrative market opportunities[10]. Value addition, such as drying, grinding, and packaging chili into spice products, can significantly increase farmers' earnings. Additionally, a number of NGOs provide extension support, financial support programs and market linkages to chili farmers. A number of digital tools exist that can enhance access to markets, agronomy and disease and pest management for farmers who have access to smart phones and internet.

[8] Farming in Kenya, *Chilli Farming Guide 2025* – overview of chili farming best practices, challenges (pests, climate, markets) and tips for profit maximization

[9] Farm Africa (2023), *Commercializing Chilli Production – Project Learnings* – highlights from a project in East Africa focusing on input systems (quality seeds, organic pesticides), use of solar dryers, and building farmer group capacity for chili value chains

Success stories such as the Mikahani Farmers Association in Kilifi, which shifted to chili farming and invested in drying and processing facilities, and Equator Kenya, which integrates smallholders into export markets through contract farming, demonstrate the potential for small-scale chili farming to become a profitable agribusiness. Moving forward, farmers should focus on improving production quality, adopting efficient irrigation and storage methods, forming marketing cooperatives, and leveraging digital platforms for market access to maximize profitability in Kenya's expanding chili sector.

6.2.3 Cassava

Many smallholder farmers lack awareness of the commercial potential cassava holds as such the level of investment in production technologies remains low, with most farmers practicing traditional production methods.

The cassava value chain faces key challenges in production and the market supply chain. The key value chain challenges include *inconsistent supply*, *quality control*, and *market information*. Farmers struggle with limited access to quality planting materials, resulting in lower yields. Pest and disease outbreaks, such as cassava mosaic virus (CMV), cassava brown streak disease (CBSD) and aphid infestations, further threaten production. Many smallholders continue to rely on traditional farming methods due to limited agronomic knowledge, which contributes to suboptimal yields. Variety differentiation is another issue, as farmers often mix different cassava varieties, affecting their suitability for processing and marketability. The absence of mechanized equipment, such as planters and harvesters, reduces efficiency, especially for large-scale farming. Poor cropping planning, largely due to reliance on rainfed agriculture, leads to inconsistent supply, making it difficult to sustain market demand. Additionally, without organized cooperatives, many farmers have little bargaining power and may not invest in growing cassava as a commercial crop.

Beyond production challenges, for cassava farmers, post-harvest losses are a primary concern due to the crop's highly perishable nature. Cassava is highly perishable in its untreated form, with its key attributes—including edibility—deteriorating significantly within just three days of harvest. However, recent trials by small-scale producers, supported by CGIAR, have introduced a new waxing technique that extends the tuber's shelf life to 30–40 days. This innovation not only addresses perishability but also has the potential to enhance the crop's sweetness, adding further value. The lack of proper drying and processing facilities exacerbates this issue, leading to significant spoilage.

Numerous efforts have been put in place by the government and NGOs to turn this situation around. For example, the government and NGOs are promoting certified disease-free cassava cuttings through seed trackers and nurseries and encouraging

farmers to view cassava as a cash crop. On the processing end, investments in dryers, mills, and storage are being made to improve capacity. The value chain is also benefiting from the introduction of mobile processing units (a concept tried in other African countries) which could be deployed in Kenya's cassava regions to process roots on-site, reducing spoilage. Overall, the cassava value chain in Kenya is gradually moving from a subsistence-oriented cycle toward a more commercial, integrated chain linking farmers with markets for flour, feed, and industrial products. Continued training, infrastructure (roads, electricity for rural mills), and formation of cassava farmer associations will be critical to scale up processing and meet market demand.

Cassava has drawn a lot of interest from government and NGOs with several recent trends and initiatives are shaping the future of cassava processing in Kenya:

- **Rising Demand and Policy Focus:** In the past few years, stakeholders have recognized cassava as a strategic crop for food security and industrial use. The National Cassava Conference 2023 highlighted that Kenya's cassava demand now exceeds production by over 200%, urging action to boost value addition[10]. Government officials, including the State Department of Crop Development, have since called for structured promotion of cassava – from identifying high-yield varieties to supporting processors – as part of reducing the national food import bill . This policy shift means cassava is getting more attention in agricultural programs (e.g. inclusion in subsidy schemes and extension services), which bodes well for processing growth.
- **New Processing Facilities:** There have been new cassava processing plants launched recently, especially through public-private partnerships and donor projects. In April 2024, a small-scale cassava factory opened in Kwale County (Coast) under the EU-funded Go Blue initiative[11]. This plant, powered by solar energy, can process 1MT of cassava flour per day and provides local farmers with peeling, drying, and milling services. It is one of three such facilities built on the Kenyan coast by the project[12]. Likewise, Busia County (Western Kenya) has been completing the Simba Chai cassava factory (initially funded in 2012–2013, now nearing operation), expected to commercialize cassava for thousands of farmers in that region[13]. These developments signal a trend of decentralized processing centers that bring value addition closer to producers. Additionally, some existing private investors have upgraded their capacity to meet growing flour orders, and other agri-tech startups have entered the scene with modern equipment (often sourcing machinery from abroad) to make cassava processing more efficient.

[10] Kilimo News (2023). *Demand for Cassava in Kenya Exceeds Production by 200%*
[11] The Star (2024). *Kwale farmers upbeat after launch of cassava processing plant*
[12] https://nairobi.aics.gov.it/en/2024/10020/
[13] Busia County Govt. (2024). *Simba Chai Cassava Processing Plant Project*

- **Improved Varieties and Inputs:** On the agricultural side, new cassava varieties and technologies are being rolled out, which will impact processing. KALRO, in partnership with IITA and others, has released disease-resistant and drought-tolerant cassava varieties that not only yield more but also have traits suitable for processing (e.g. higher starch content, slower post-harvest deterioration). The use of the Cassava Seed Tracker (a digital tool) is improving the distribution of clean planting material[14]. These efforts mean processors can expect a more reliable supply of quality cassava roots in coming years. There are also trials of mechanized cassava farming and improved harvesting tools in counties like Migori and Kilifi, which could increase production scale. For processors, better raw material supply reduces costs and allows consistent product quality, enabling them to serve larger markets.
- **Biofuel and Clean Energy Initiatives:** As noted, a major development is the push to utilize cassava for ethanol fuel production. The collaboration between Giraffe Bioenergy, USAID Power Africa, and ASU in 2024 aims to set up the first large cassava-to-ethanol refinery in Kenya[15]. This is aligned with Kenya's strategy to promote ethanol for clean cooking (to replace charcoal). If successful, it will create a new, high-volume market for cassava (tens of thousands of tons for a single refinery) and encourage more farmers to grow cassava as a cash crop. Moreover, the project's focus on semi-arid areas indicates cassava processing could expand to non-traditional regions, tapping unused land. The ethanol initiative is also spurring research into using cassava peels and waste for biogas, indicating zero-waste processing models on the horizon. These clean energy angles position cassava as not just a food crop but an industrial feedstock, attracting climate finance and innovation to the sector.
- **Value Chain Integration and Training:** Recent programs emphasize training farmers and processors to integrate the cassava value chain. For instance, the Go Blue programme and other NGO projects have trained farmers in value addition techniques and business skills, so they can run village-level processing (like making cassava chips or flour) and collectively market their products. Over 230 small-scale producers in coastal Kenya received business management training undergo Blue. Similarly, the government, through public-private partnerships, is encouraging formation of Cassava producer associations that can partner with processors or even acquire equity in processing ventures. This trend of capacity building is strengthening the overall chain – farmers better understand market requirements (such as proper post-harvest handling to meet flour quality standards), and processors in turn engage more with their supplier base. Ultimately, these developments aim to make the cassava processing industry more competitive, sustainable, and inclusive. As of early 2025, stakeholders remain optimistic that

[14] Kilimo News (2023). *Demand for Cassava in Kenya Exceeds Production by 200%*
[15] https://leaps.asu.edu/2024/06/ethanol-production-in-kenya/

cassava's dual role as a food security crop and an industrial raw material will be fully realized in Kenya, thanks to these concerted efforts and innovations.

For Kenya to expand cassava production and tap into export markets like China, it must establish a unique selling proposition (USP) to compete with established cassava exporters such as Thailand, Vietnam, and Laos[16]. This will require strategic efforts to improve quality, consistency, and market positioning.

6.3 Assessing the return on investment (ROI) for farmers

During the interviews, farmers were asked to highlight their major production cost items, with the most frequently mentioned expenses being land preparation, seeds/seedlings, fertilizers/manure, pesticides, labor, transport, and irrigation. Irrigation emerged as a significant cost factor for chili farmers, as chili cultivation is predominantly practiced in dry regions with low rainfall, necessitating supplementary irrigation to sustain production. Cassava had the lowest production cost as most farmers rely on traditional farming methods, avoiding expenses on soil fertility enhancement and pest or disease control products. Their costs are primarily limited to land preparation, planting cuttings, and labor for planting, weeding, harvesting and transporting the harvest to market or collection centers.

The cost of production and investment levels varied depending on the target market, with premium export markets requiring higher investments compared to local markets. However, these export markets also offered better returns. Additionally, market intermediaries played a crucial role in determining farmers' earnings along the supply chain.

The production cost, price, yield, and profit data obtained from farmers are largely estimates and difficult to verify, as most farmers do not keep records. This challenge was particularly pronounced among cassava farmers, many of whom were unable to provide this information. In contrast, avocado and chili farmers—especially those in contractual agreements or supplying exporters—maintained some records, which could also be corroborated by processors and exporters purchasing from them.

The following sections examine the production costs for chili, cassava, and avocado in Kenya, their selling prices across different markets, and the return on investment (ROI) for farmers.

[16] Thailand, Vietnam and Laos exported a combined 1.6B USD worth of Cassava to China in 2023 (https://oec.world/en/profile/bilateral-product/manioc-cassava-starch/reporter/chn)

6.3.1 Return on investment for Hass avocado

When asked about their per-unit cost of production and selling price, farmers provided varying figures, as shown in table 3 below. We then used the price and cost estimates to calculate the profit margins. While the accuracy of these figures cannot be fully verified, the data clearly indicates that farmers selling their avocados to export markets, whether directly or through exporters—achieve significantly higher prices compared to those selling to local markets or brokers.

This highlights the critical role of export markets in boosting farmer incomes and return on investment (ROI). Additionally, it underscores the impact of market intermediaries on profit margins, the more intermediaries involved, the lower the profits for farmers.

Table 3: Avocado cost of production, selling price and profit margin reported by farmers

Item	Farmers selling to local markets	Farmers selling to brokers	Farmers selling to exporters	Farmers selling directly to export markets
Production cost per kg	KES40-60	KES40-60	KES70	KES100
Selling price per kg	KES50	KES90	KES120-140	KES280
Net profit margin (Calculated)	0%	44%	46%	64%

Avocado exporters interviewed reported purchasing Hass avocados from farmers at USD 0.8–1.4 per kg and selling at USD 1.75–2 per kg (CIF), primarily to the Middle East and EU markets. Additionally, a medium-scale farm exporting directly to China reported a selling price of USD 2.2 per kg (CIF).

We conducted a Return on Investment (ROI) analysis for Hass avocado production, comparing profitability across premium export markets and the local market. The analysis utilized industry production cost estimates and insights from farmer-exporter reports to assess financial returns based on different market routes.

As indicated in table 3 above, production costs were found to range between KES 40 and KES 100 per kg, depending on the level of investment in quality control and compliance with market standards. Farmers targeting direct export and selling to exporters incur higher costs due to stringent quality and phytosanitary requirements, while those selling to brokers and local markets face lower production costs due to less stringent compliance needs.

By analyzing these cost and price variations across different market routes, we aimed to identify the most profitable options for Hass avocado farmers and provide insights into the financial feasibility of targeting higher-value markets. The ROI results are illustrated in figure 5 below.

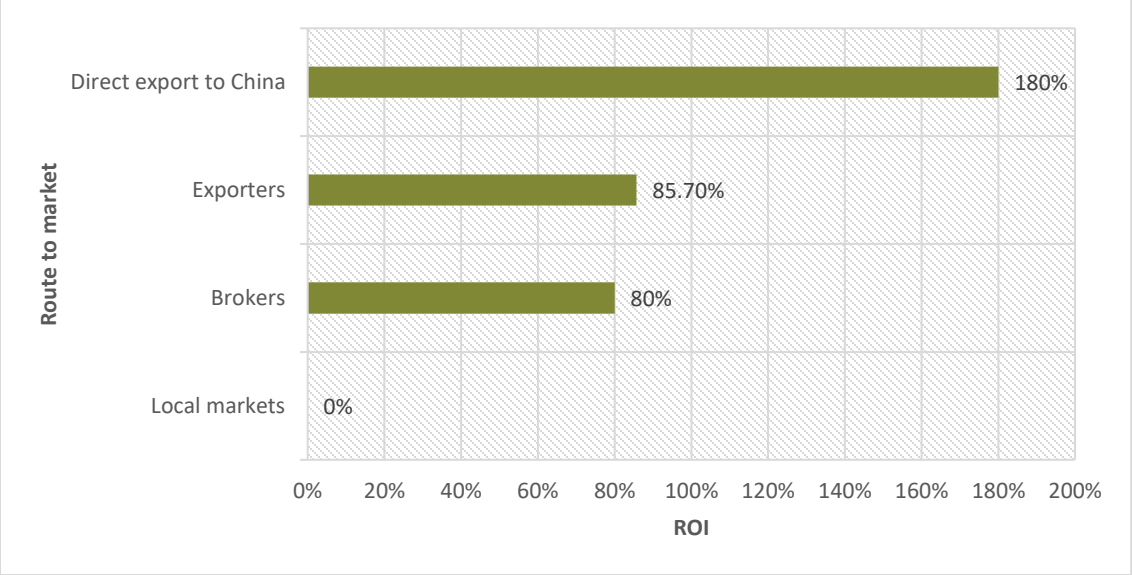

Figure 6: ROI analysis for avocado farmers taking different routes to the market

The ROI analysis reveals significant variations depending on the market channel farmers choose to sell their produce. Farmers selling to local markets break even with an ROI of 0%, as their production cost (KES 50 per kg) matches their selling price. This suggests that local markets offer minimal or no profit, making them the least attractive option.

Farmers selling to brokers achieve a higher ROI of 80%, benefiting from a better selling price (KES 90 per kg) while maintaining the same KES 50 per kg production cost. This indicates that working with brokers provides moderate profitability, likely due to bulk purchasing and reduced logistical burdens.

Farmers selling to exporters experience further improvement, with an ROI of 85.7%, as they receive KES 130 per kg while incurring a higher production cost of KES 70 per kg. This suggests that partnering directly with exporters yields better returns despite higher input and compliance costs.

The most profitable route is selling directly to the export market, where farmers earn KES 280 per kg, resulting in a 180% ROI despite the highest production cost of KES 100 per kg. This highlights the substantial financial advantage of direct market access, allowing farmers to capture a larger share of the value chain.

Overall, while local markets provide the least return, moving up the value chain through brokers, exporters, or direct exports significantly enhances profitability. However, higher

profits in direct exports come with increased operational complexities, including compliance with export regulations, certification, and logistical challenges. Farmers seeking higher returns should focus on upgrading their market access and investing in quality improvements and certification processes to maximize their earnings.

6.3.2 Return on investment for red chili

The data in Table 4 provides insights into the cost of production and selling prices for small and medium-scale chili farmers interviewed across different market segments. Production costs vary widely, with farmers targeting the local market incurring costs between KES 25-80 per kg, those supplying fresh chili for export facing costs of KES 25-70 per kg, and farmers selling to processors who export dried chili having the lowest cost at KES 20 per kg. The reduced production cost for farmers working with dried chili processors may be attributed to contract farming arrangements, where processors supply key inputs such as seeds, fertilizers, pesticides, and transportation, along with technical support. Selling prices also differ, with local market prices ranging from KES 40-120 per kg, fresh chili exporters offering KES 60 per kg, and dried chili exporters paying KES 70 per kg.

Table 4: Chili cost of production, selling price and profit margin

Item	Farmers selling to the local market	Farmers selling to exporters (fresh chili)	Farmers selling to processors (dried chili)
Production cost per kg	KES25-80	KES25-70	KES20
Selling price per kg	KES40-120	KES60	KES70

The Return on Investment (ROI) for chili farmers in Kenya was calculated using production cost and selling price data obtained during the study, supplemented with insights from exporters and industry production cost estimates. The analysis reveals significant ROI variations across different market segments as illustrated in figure 6. The dried chili export market yields the highest ROI at 71.4%, primarily due to its lower production cost (KES 20 per kg) compared to a higher selling price (KES 70 per kg). Farmers selling to the local market achieve a 34.4% ROI, while those supplying fresh chili to exporters have the lowest ROI at 20.8%, likely influenced by multiple intermediaries, price fluctuations, and market instability.

The high ROI for farmers contracted by dried chili processors can be attributed to economies of scale associated with contract farming, such as access to inputs (seeds, fertilizers, pesticides), extension services, certification support, and logistical assistance for product off-take. Additionally, a dried chili exporter reported a CIF selling price of KES 290 per kg, indicating that export markets—particularly for dried chilies—offer significantly

higher returns than fresh exports and local sales. The findings emphasize that chili farmers who target export markets, especially in dried chili, can achieve substantially higher profitability than those focusing on fresh exports or local markets. This underscores the importance of access to low-cost inputs, export access and value addition as crucial strategies for maximizing returns in chili farming.

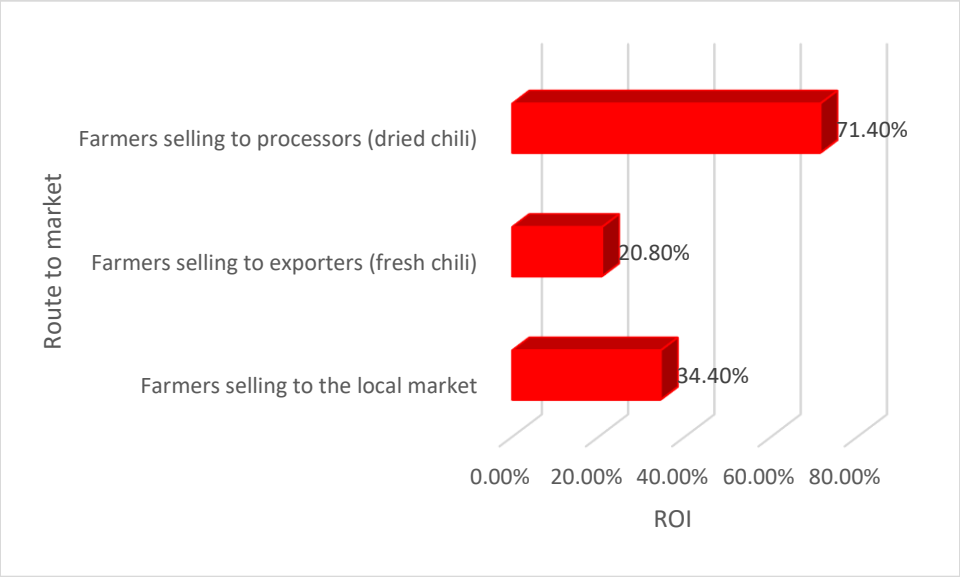

Figure 7: ROI analysis for chili farmers taking different routes to the market

6.3.3 Return on investment for cassava

Cassava farmers in Kenya face limited market options, primarily selling their tubers through local markets, brokers, or directly to processors where available. Among the smallholder farmers interviewed, most were unable to estimate their production costs, yield or profit margins, largely due to poor record-keeping. However, farmers in Busia County, who sell to both local markets and a local processor, reported a production cost of KES 5 per kg and a selling price of KES 50 per kg. Additionally, one medium-scale farmer reported a production cost of KES 6 per kg and sold at KES 55 per kg to brokers supplying local markets or exporting to Uganda. A processor interviewed stated that they purchase raw cassava from farmers at KES 16 per kg and process it into cassava flour sold at KES 180 per kg. These findings highlight the significant price gap between raw cassava and its processed form, emphasizing the high profitability potential of value addition in the cassava supply chain.

To further assess profitability, we calculated the ROI for fresh cassava tubers in Kenya using a worst-case scenario of KES 6 per kg production cost (as obtained from the study) and a KES 16 per kg selling price. These values closely align with the industry averages

of KES 8 per kg for production and KES 15 per kg for selling price[17]. The resulting ROI for smallholder cassava farmers is 166.67%, meaning that for every KES 6 invested, they generate a net profit of KES 10, yielding a return of more than 1.5 times their investment (see table 5).

Table 5: ROI for fresh cassava selling

Farmer category	Production cost/kg (KES)	Selling price/kg (KES)	ROI
Small-scale	6	16	166.67%
Medium to large scale	6	55	816.67%

In contrast, a medium-scale farmer reported selling raw cassava at KES 55 per kg, achieving a significantly higher ROI of 816.67%. This stark difference suggests that smallholder farmers, who often sell to processors or brokers at lower prices, face lower profit margins compared to medium-scale farmers, who command higher prices due to larger volumes and consistent supply, giving them stronger bargaining power. To improve profitability, smallholder farmers could explore higher-value markets, collective bargaining strategies, or value addition to increase their earnings and reduce their dependency on low-paying intermediaries.

One cassava company introduced a unique profitability model for smallholder farmers (SHFs), where it provides improved seed material for free, assists in proper bed preparation, and pays farmers KES 2,000 per acre per month for the first three months. This initial investment totals KES 15,000 per acre in the first quarter and increases to KES 30,000–40,000 per acre over the full nine-month growing cycle, covering harvesting and transport costs.

After nine months, the company purchases cassava from farmers at KES 5 per kg, generating an income of KES 75,000 per acre for farmers with yields of 12–15 MT per acre. Including the initial payments and in-kind support (seeds, labor, and transport), the farmer's total earnings reach KES 81,000 per acre. On the other hand, the company invests approximately KES 120,000 per acre, translating to a cost of about KES 10 per kg at harvest. After harvesting, the cassava tubers undergo sorting, cleaning, and transport, with selling prices to major Nairobi supermarkets fluctuating between KES 40–80 per kg, depending on the season. This model ensures a stable income for smallholders while allowing the company to capture value through post-harvest processing and market access.

[17] https://kilimonews.co.ke/agricultural-products/cassava-market-overview-in-kenya/?utm

7 Food Safety, Quality Standards, and Good Agricultural Practices

Ensuring compliance with international and Chinese market requirements is crucial for the success of Kenya's agricultural exports. Global markets impose stringent food safety and quality standards, including regulations on Maximum Residue Limits (MRLs), phytosanitary measures for pest and disease control, and certification under Global GAP. However, China presents additional strict requirements that exporters must meet to access this growing market.

In addition to food safety regulations, China enforces rigorous quality grading standards, evaluating factors such as size, color, and ripeness of produce. High-risk commodities undergo mandatory quarantine inspections, while certain crops require pre-approval and registration of production regions and processing facilities in the exporting country. Labeling regulations demand that all packaging clearly display product origin, producer details, and expiration dates. Furthermore, China mandates prequalification of exporters and associated facilities, including processing plants, storage units, fumigation centers, and cold storage facilities, all of which must adhere to strict compliance measures.

To support exporters in meeting these market requirements, the Government of Kenya has developed a robust institutional and policy framework governing food safety and phytosanitary compliance. This framework focuses on enhancing research, improving production systems, streamlining logistics, branding Kenyan products, and ensuring alignment with international standards. Several key government agencies play pivotal roles in this process. However, despite government efforts to establish a strong institutional and regulatory framework for the export industry, interviewed stakeholders—particularly exporters and industry associations—expressed the need for further improvements to enhance the efficiency and effectiveness of government institutions in fulfilling their mandates.

The Ministry of Agriculture develops policies aimed at increasing agricultural productivity and expanding market access. County Government Agriculture Departments provide direct support to farmers, helping them align with export requirements. Research and innovation efforts are spearheaded by the Kenya Agricultural and Livestock Research Organization (KALRO), which promotes advancements in sustainable farming, variety improvement, and pest control. Additionally, regulatory agencies such as the Agriculture and Food Authority – Horticultural Crops Directorate (AFA-HCD) and the Kenya Plant Health Inspectorate Service (KEPHIS) ensure that Kenyan agricultural products meet global quality and phytosanitary standards before export.

Kenya, through the Horticultural Crops Directorate (HCD), has established a network of cold storage and grading facilities (HCD depots) in key agricultural production areas across the country. These facilities are available for producers and exporters to lease for post-harvest handling before shipping. However, many of these depots are poorly equipped and require refurbishment and upgrading to meet industry standards. Additionally, the government has enlisted private accredited laboratories to conduct export-related laboratory tests, aiming to expedite the process and reduce backlog at KEPHIS laboratories.

Beyond regulatory compliance, Kenya also invests in export promotion and trade facilitation. The Kenya Export Promotion and Branding Agency (KEPROBA) plays a critical role in positioning Kenyan products in international markets, while the Kenya Investment Authority (KenInvest) provides investment incentives and tax breaks to support the agricultural sector, incl. domestic and international investors. Organizations such as KenTrade and Export Processing Zones (EPZs) facilitate logistics and trade-related incentives, helping exporters navigate international trade requirements effectively. Together, these institutions contribute to making Kenya a competitive agricultural exporter, particularly in emerging markets like China.

The private sector has also established several industry associations to support compliance and market access. Organizations such as the Fresh Produce Exporters Association of Kenya (FPEAK), Fresh Produce Consortium (FPC), Kenya Horticultural Council (KHC), and Cereal Growers Association (CGA) provide technical support to their members. They advocate for favorable trade policies, facilitate direct market linkages, and ensure industry-wide adherence to international quality standards. Beyond horticulture business associations, the Kenya Private Sector Alliance (KEPSA) and its agriculture working group ASNET also play a vital role in education and capacity building for the public and private stakeholders alike. They also facilitate round-table discussions to bring all relevant stakeholders in the FFV/export ecosystem together to lobby for improvements and their implementation.

Despite these efforts, challenges remain in fully meeting China's specific market requirements. Kenya has successfully exported fresh produce to the EU and Middle Eastern markets, but the Chinese market introduces additional hurdles that many exporters are still working to overcome. For instance, while some Kenyan avocado exporters have complied with China's standards, the mandatory fumigation requirement at 27°C disrupts the cold chain, leading to fruit browning and higher rejection rates upon arrival. The required transition from fumigation to cold storage at 5°C poses logistical difficulties, exacerbated by the limited number of authorized fumigation facilities in Kenya.

For other commodities, compliance challenges are even more pronounced. While dried red chili has been approved for export to China, large-scale exports are yet to take off due to inadequate drying and processing facilities. Similarly, the cassava industry struggles with low production capacity and a lack of processing infrastructure, preventing it from meeting China's import standards.

Several key gaps need to be addressed to improve Kenya's food safety and quality compliance for export markets. First, pesticide residue management in chili production remains a concern, requiring farmer training on Good Agricultural Practices (GAP) and stricter monitoring of chemical use. Second, Kenya needs significant investment in cold chain logistics for avocado exports to meet China's stringent requirements while minimizing post-harvest losses. Finally, the Cassava sector requires improvements in processing and aggregation facilities to enhance its readiness for export. In addition, the cassava value chain needs investment in education and off-take agreements, in propagation of clean seedling materials and distribution and in demand creation for processed products (starch, chips); ideally with a gustatory, nutritional or technical (e.g. shelf-life) USP.

To bridge these gaps, farmers need infrastructure support for post-harvest handling, including aggregation centers, grading units, and cold storage facilities. Additionally, training programs focused on export market requirements, certification processes, and compliance standards for the Chinese market would better equip farmers and exporters to succeed in this high-value market.

8 Processing Capabilities

Expanding value addition opportunities such as avocado oil extraction, chili powder processing, and cassava flour, chips and starch production has become a crucial strategy for enhancing the competitiveness of Kenyan agricultural products in the Chinese market. Processing these crops helps address challenges commonly associated with fresh produce exports, including quality inconsistencies, perishability, and stringent market restrictions. Furthermore, investing in value addition across these key sectors will enable Kenya to diversify its export offerings, minimize post-harvest losses, and boost the profitability of its agricultural exports in both Chinese and global markets.

Industry stakeholders, including processors and sector organizations, emphasized the urgent need for additional cold storage (freezing facilities) and fumigation centers for avocado exports. Expanding these facilities would increase accessibility for exporters and farmers, facilitating the scaling up of avocado exports to China. Further, avocado processing into oil and puree presents a significant opportunity to utilize the 30-40% of avocados that do not meet export-grade standards, as well as local avocado varieties that are not traditionally grown for export. Processing would help overcome some of the challenges related to size, color, and quality parameters that affect fresh avocado exports. While avocado oil processing is gaining traction in Kenya, greater investment in processing facilities is needed to support more farmers and increase production capacity.

The processing of chili into flakes and powder has demonstrated strong potential, particularly in the EU market, including the UK and Spain. Expanding processing capacity through investments in drying equipment and large-scale processing facilities would create new opportunities for Kenyan chili products in both European and Asian markets.

Cassava processing in Kenya remains underdeveloped, with most existing processors focusing on cassava flour and animal feed production for domestic and regional markets. However, there is a significant opportunity to enhance cassava drying and processing infrastructure to support the production of value-added products such as cassava chips, flour, starch, and animal feed for export to China and other international markets. Investing in modern processing facilities would improve the competitiveness of Kenyan cassava, allowing farmers to tap into high-demand global markets.

9 Market and Export Readiness

Kenya's export readiness for avocado, chili, and cassava varies significantly. According to HCD and FAOSTAT, avocado exports in 2023 reached 114,000 MT, valued at approximately USD 128 million. Chili exports totaled 1,347 MT, though their export value remains unverified. In contrast, cassava exports in 2022 were valued at USD 1.1 million, reflecting its relatively lower export scale. These figures highlight the differing levels of significance and preparedness of each crop in Kenya's export market. The following section provides insights into Kenya's market and export readiness for these three crops, based on input from various stakeholders and value chain actors.

Fresh avocado has a well-established export history to the EU and Middle East, with exports to China gaining momentum in recent years despite challenges in meeting China's stringent market requirements. Key areas requiring improvement include compliance with cold chain logistics and certification processes to ensure consistency in quality. Enhanced training in Good Agricultural Practices (GAP), Chinese export standards, and quality assurance would further strengthen market and export readiness, enabling more farmers and exporters to access international markets successfully.

On key bottleneck was that the entire process between the Kenyan Government, KEPHIS, Chinese authorities and importers to get Avocado exports from Kenya to China approved, took 5 years. There were many duplications and inefficiencies in the process.

Exports of dried red chili remain relatively low, with a few processors targeting the European market. A significant number of farmers have experience in supplying the fresh chili export market and dried chili processors, but challenges persist, particularly concerning pesticide residue levels (MRLs), pest and disease control, and quality consistency. However, with adequate support from exporters, government agencies, and industry stakeholders, these challenges can be effectively managed. To enhance export readiness for dried chili, greater investment in drying and processing facilities is needed, alongside farmer training programs to improve quality and ensure compliance with international market standards.

Cassava exports from Kenya have remained minimal, primarily serving markets in Africa and Asia, where it is used as a staple food and a key ingredient in processed products. Although cassava is approved for export to China, there is no specific data confirming shipments to this market. Currently, most cassava in Kenya is consumed fresh, with some portion processed into flour and animal feed for local and regional markets. To improve cassava's export potential, investment is needed in processing and aggregation

infrastructure, ensuring the production of high-quality, export-ready cassava products that meet international standards.

A number of strategies have been put in place to overcome the market barriers. These include continuous training and sensitization of farmers and exporters on Chinese market requirements by KEPHIS and continuous engagement with Chinese government to improve bilateral trade agreements. Another initiative worth supporting is the National Horticulture Taskforce (NHT), a government-led initiative in Kenya aimed at addressing challenges and promoting the growth of the horticultural sector. It brings together stakeholders from various sectors including farmers, industry experts, government bodies, and exporters to enhance the development of horticulture in the country. The taskforce focuses on improving production, quality, market access, and sustainability within the sector, as well as supporting innovation and policies that will drive the growth of horticulture as a key contributor to Kenya's economy. Some of NHT's current focus value chains are avcado, mango and vegetables.

By addressing infrastructure gaps, enhancing compliance with export requirements, and improving processing capacity, Kenya can strengthen its position as a reliable exporter of avocado, chili, and cassava in high-value global markets, including China.

10 Challenges and Opportunities in Exporting to China

Kenya faces several challenges in expanding its agricultural exports to China, primarily related to product variability in quality, logistics, regulatory compliance, and market awareness. High logistical costs due to freight expenses, cold chain infrastructure limitations, and lengthy shipping routes have made it difficult for exporters to maintain fresh produce quality. Additionally, China's complex regulatory requirements, including strict Maximum Residue Limits (MRLs), phytosanitary controls, and mandatory fumigation at 27°C, pose significant hurdles for Kenyan exporters. These stringent requirements disrupt the cold chain, increase rejection rates, and create compliance difficulties, especially for smallholder farmers who lack adequate training and resources to meet these standards.

There was a lack of understanding among Chinese importers on how the Kenyan avocado is produced and the resulting quality variations. The quality of Kenyan produce often varies significantly due to the nature of its production, as the majority of the fruit is grown by smallholder farmers, leading to considerable variability during cultivation.

The lack of established market linkages and insufficient knowledge about Chinese consumer preferences further exacerbate these challenges. Kenyan exporters need enhanced market intelligence to navigate China's diverse demand dynamics and to position their products competitively against major suppliers. The slow approval of registered exporters and fumigation facilities by China's General Administration of Customs (GACC) has also hindered the smooth flow of trade.

Despite these challenges, there are significant opportunities in China's increasing demand for health foods, which aligns well with the nutritional benefits of avocado, chili, and cassava. The rising interest in organic and functional foods creates a promising market for Kenyan produce, provided that exporters can comply with China's stringent quality and safety standards. Additionally, trade agreements and Kenya's growing diplomatic and economic ties with China present an opportunity for bilateral discussions to ease trade barriers.

Public-private partnerships (PPPs) can play a key role in expanding Kenya's export footprint in China. Collaborative efforts between government agencies, exporters, research institutions, and financial service providers can help improve compliance mechanisms, strengthen cold chain logistics, and enhance processing infrastructure. Investment in value addition for avocado (e.g., oil and puree), chili (e.g., flakes and powder), and cassava (e.g., flour and starch) can also help overcome challenges related to fresh produce perishability and stringent quality control measures.

11 Recommendations and Way Forward

To enhance Kenya's export readiness for avocado, chili, and cassava, a multi-pronged approach is required, focusing on infrastructure investment, farmer capacity-building, and policy alignment with Chinese market requirements. The following key recommendations are proposed:

1. **Strengthening post-harvest and processing infrastructure**
   - Develop and set up shared postharvest handling facilities, including cold storage and fumigation units, to meet China's strict fumigation requirements and reduce rejection rates. This can be achieved by upgrading and modernizing existing HCD depots in key agricultural regions, as well as collaborating with county governments to integrate these facilities into the industrial parks currently being established across various counties.
   - Invest in chili drying and cassava processing units to meet export standards and reduce post-harvest losses. Mobile processing units for cassava and chili can help smallholder farmers access value addition services at the farm level.
   - Aggregation and Grading Centers: Establish collection hubs in key producing regions to enhance product uniformity, traceability, and bulk marketing opportunities for smallholder farmers.
2. **Enhancing farmer training, payment systems, and export compliance**
   - Expand training programs on pesticide management, proper post-harvest handling, and compliance with China's Maximum Residue Limits (MRLs) to reduce rejection rates.
   - Provide smallholder farmers with targeted training on phytosanitary requirements, traceability systems, and certification programs such as Global GAP
   - Strengthen private and public extension services with better funding, digital tools, and farmer-focused training modules to enhance compliance with export standards.
   - Introduce mechanisms for timely payments and competitive pricing to encourage smallholders to prioritize high-quality production for export markets.
3. **Strengthening market linkages and trade agreements**
   - Engage the Chinese government to address trade barriers, including the 7% import duty on Kenyan avocados, and streamline the General Administration of Customs of China (GACC) approval process.
   - Establish trade missions, organize business forums, and facilitate direct linkages between Kenyan exporters and Chinese buyers to boost market penetration.

- Support and strengthen the National Horticulture Taskforce (NHT) with funding for core operations, promotion of its services to local and international stakeholders and increase its awareness with Chinese counterparts
- Position Kenyan exporter representatives at Chinese ports of entry to oversee inspections, reduce rejections, and facilitate smoother trade transactions.

4. **Supporting smallholder farmers and exporters**
    - Encourage farmers to form cooperatives or engage in contract farming to improve bargaining power, benefit from bulk purchases, and secure long-term market commitments.
    - Expand access to low-interest loans, grants, and tax incentives to help farmers and processors invest in export-compliant infrastructure and inputs.
    - Promote investments in avocado oil extraction, chili powder production, and cassava starch manufacturing to reduce dependency on fresh produce exports and enhance profitability.

12 Conclusion

This study has highlighted the opportunities and challenges facing Kenya's avocado, chili, and cassava sectors in their quest to penetrate and expand in the Chinese market. While avocado is already enjoying export to China and chili is nearly export-ready, cassava requires further investment in processing, drying, and aggregation infrastructure to meet China's import standards. All three crops (and others) need ongoing diplomatic efforts to reduce barriers, hence expanding the portfolio of exportable crops.

Kenya's agricultural exports to China present immense growth potential, particularly as demand for healthy foods rises. However, logistical challenges, regulatory barriers, institutional capacities and limited market intelligence must be addressed to fully capitalize on this opportunity.

To achieve sustainable export growth, Kenya must focus on policy alignment with China's standards, increased investment in cold chain and processing infrastructure, and stronger support systems for smallholder farmers. Additionally, enhancing bilateral trade relations, improving compliance with phytosanitary regulations, and fostering public-private partnerships will be critical in unlocking Kenya's full export potential.

By implementing these strategic improvements, Kenya can position itself as a leading supplier of avocado, chili, and cassava to China, benefiting farmers, exporters, and the broader agricultural sector.

13 Annexes

13.1 Annex 1: questionnaires used for data collection

13.1.1 Questionnaire 1: focus group discussions
Questionnaire for farmers, producer groups and cooperatives

Introduction

This study is commissioned by Amena Africa Limited on behalf of Sustainable Africa Farming Limited (SAF-Africa Limited, formerly Syngenta Foundation). Its primary objective is to evaluate the readiness, challenges, and development potential of Kenya's agricultural produce for export to China, ultimately facilitating lucrative opportunities for smallholder crop exports.

SAF-A is preparing to implement the China-Africa Agricultural Value Chain Opportunities Project, which seeks to foster sustainable agricultural partnerships between Africa and China. The project focuses on the avocado, dried chili, and cassava value chains in Kenya and Tanzania, with the overarching goal of benefiting smallholder farmers.

We understand that this process requires the valuable input of key stakeholders like yourself. We kindly request about 45 minutes of your time to provide insights on a few areas by responding to the questions below. Please rest assured that all responses will be handled with the utmost confidentiality.

Additionally, we request your permission to take photographs during the interview. Do you consent? YES / NO (please tick as appropriate)

Thank you sincerely for your time and feedback.

Name of enumerator/facilitator	
Date of meeting	
Name of group/cooperative	
Gender composition	Male: _____ Female: _____ Youth: _____
Names and contact of participants	Fill in the registration form
County	
Village	

I. Crop and production details

1. What is your crop of interest: avocado, cassava, or chili?
2. What is the average acreage under the crop?
3. What are your current production levels?
4. How much (tons/kgs) on average do you sell in a year/season?
5. What are the primary costs associated with your farming operations (e.g., seeds, fertilizers, labor, equipment, water)? List them.
6. What is your average cost of production per kg of product?
7. What is the average price per kg of product?
8. What is the percent profit margin for your crop of interest?
9. Do you meet the quantity and quality requirements for export?" "If not, what specific improvements are needed?

II. Market access and export experience

1. What is your main market?
2. Do you sell to the local or export market?
3. If export, to which countries/market destinations?
4. How is the export experience in terms of requirements/conditions and returns/price?
5. Any experience selling to the Chinese market? If yes, how was/is the experience in terms of requirements/conditions and price/returns?
6. If no export experience, would you be interested in export and, in particular, selling to China? Why?
7. Have you collaborated with exporters, processors, or government agencies to explore export opportunities? How was the experience?
8. Are you aware of the quality and safety standards required for exporting your crops to China? If yes, what are they?
9. Have you received any training or guidance on meeting export standards? Specify.
10. Do you have any certification for export market (e.g. HACCP, Global GAP etc.)? What were the challenges in obtaining it? How has been the experience?
11. What specific quality requirements have buyers or exporters asked you to meet?
12. Have you ever had a crop rejected due to quality or compliance issues? If yes, what were the reasons?
13. Has selling to exporters increased or stabilized your income?

III. Challenges and risks

1. What production challenges do you face?
2. If you are selling for export, what challenges do you face?
3. If you are not selling for export, what are the main barriers preventing you from exporting?
4. What risks do you associate or have you encountered when producing for export markets?

IV. Infrastructure and support needs

1. Do you have access to the necessary infrastructure, such as aggregation, postharvest handling, cold storage, transportation, or processing facilities, to support exports? Specify. What are the gaps and challenges of accessing such infrastructure? If not, what infrastructure would help you improve your product's quality for export?
2. Are you able to access finance/credit for your farming needs? What are the challenges?
3. Are there any additional requirements that you needed to meet to align with the export market (e.g., training, financing, inputs, certification, testing, infrastructure/hardware, etc.)? Quantify the investment. How long did it take to recoup this investment?
4. Do you receive any government or NGO support for export-readiness training? What kind of support? Are there any gaps?
5. What support do you expect from the government, cooperatives, or private sector to enable successful export participation?

V. Future aspirations and additional insights

1. Would you consider increasing production to meet demand for exports, especially to China?
2. Any additional information that you would like to share?

13.1.2 Questionnaire 2: Key informant interviews
Questionnaire for industry associations

This study is commissioned by Amena Africa Limited on behalf of Sustainable Agriculture Foundation - Africa (SAF-Africa, formerly known as Syngenta Foundation). Its primary objective is to evaluate the readiness, challenges, and development potential of Kenya's agricultural produce for export to China, ultimately facilitating lucrative opportunities for smallholder crop exports.

SAF-A is preparing to implement the China-Africa Agricultural Value Chain Opportunities Project, which seeks to foster sustainable agricultural partnerships between Africa and China. The project focuses on the avocado, dried chili, and cassava value chains in Kenya and Tanzania, with the overarching goal of benefiting smallholder farmers.

We understand that this process requires the valuable input of key stakeholders like yourself. We kindly request about 30 minutes of your time to provide insights on a few areas by responding to the questions below. Please rest assured that all responses will be handled with the utmost confidentiality.

1. What is your evaluation of the current status of Kenyan agricultural exports to the Chinese market, particularly focusing on avocados, dried chili, and cassava?
2. What opportunities exist in the Chinese market for Kenyan agricultural commodity exporters? In your opinion, what can be done to enhance the exploitation of these opportunities?
3. What regulatory, financial, and logistical barriers hinder Kenyan agricultural exports to China?
4. What is your assessment of Kenyan smallholder farmers' readiness to meet the quantity and quality standards required for the Chinese market?
5. What value addition opportunities exist for Kenyan agricultural products to make them more competitive in the Chinese market?
6. How does your association support its members in accessing export markets like China?
7. Are you engaged in partnerships or initiatives with Kenyan or Chinese entities to promote Kenyan agricultural products? What lessons have learnt from the partnerships?
8. What investments or improvements are necessary to boost Kenyan agricultural exports to China (e.g., logistical infrastructure, certification and standards, training, marketing events such as trade expos, trade missions etc.)?
9. What upcoming initiatives or policies are expected to impact Kenya-China trade?
10. What strategies do you recommend for connecting Kenyan exporters with buyers in China and strengthening Kenya's export position in the Chinese market?
11. What recommendations do you make to increase the participation of Kenyan smallholder farmers in agricultural production for the Chinese market?
12. Do you have any additional information that you would like to share?

13.1.3 Questionnaire 3: key informant interviews
Exporters/processors questionnaire

This study is commissioned by Amena Africa Limited on behalf of Sustainable Agriculture Foundation - Africa (SAF-Africa, formerly known as Syngenta Foundation). Its primary objective is to evaluate the readiness, challenges, and development potential of Kenya's agricultural produce for export to China, ultimately facilitating lucrative opportunities for smallholder crop exports.

SAF-A is preparing to implement the China-Africa Agricultural Value Chain Opportunities Project, which seeks to foster sustainable agricultural partnerships between Africa and China. The project focuses on the avocado, dried chili, and cassava value chains in Kenya and Tanzania, with the overarching goal of benefiting smallholder farmers.

We understand that this process requires the valuable input of key stakeholders like yourself. We kindly request about 30 minutes of your time to provide insights on a few areas by responding to the questions below. Please rest assured that all responses will be handled with the utmost confidentiality.

1. Could you briefly describe your business, including the main commodities you export or process and your target markets?
2. Have you previously exported to China? If yes, which commodities, and what were your experiences? What changes in regulations or buyer preferences have you noticed over time?
3. What opportunities do you see for Kenyan agricultural products in the Chinese market?
4. What challenges have you faced or anticipate in accessing the Chinese market, such as regulatory compliance, certification, tariffs, infrastructure, or logistical constraints? How do Chinese quality and safety regulations compare to other markets you export to?
5. Have your products ever been rejected when trying to export to China? If yes, what were the main reasons?
6. What support services do you provide to farmers to ensure product conformity for processing or export?
7. What investments, support, or incentives from the government, financial institutions, or trade organizations would help your business scale up exports to China or other markets?
8. How has your experience been in sourcing from smallholders? What challenges or opportunities have you encountered, and how can smallholders be better supported to engage meaningfully in export value chains?
9. On average, what is your unit buying price from farmers, and what is your average per-unit selling price to the export market?

10. In your opinion, how can farmers' return on investment (ROI) be improved?
11. Do you have plans to venture into the Chinese market or expand your operations or product offerings for this market? If so, what is driving this decision?
12. Do you have any recommendations on how Kenya-China agricultural commodity trade can be enhanced?
13. Do you have any additional comments or suggestions regarding Kenya's agricultural export trade to China?

13.1.4 Questionnaire 4: key informant interviews
Questionnaire for government and regulators

This study is commissioned by Amena Africa Limited on behalf of Sustainable Agriculture Foundation - Africa (SAF-Africa, formerly known as Syngenta Foundation). Its primary objective is to evaluate the readiness, challenges, and development potential of Kenya's agricultural produce for export to China, ultimately facilitating lucrative opportunities for smallholder crop exports.

SAF-A is preparing to implement the China-Africa Agricultural Value Chain Opportunities Project, which seeks to foster sustainable agricultural partnerships between Africa and China. The project focuses on the avocado, dried chili, and cassava value chains in Kenya and Tanzania, with the overarching goal of benefiting smallholder farmers.

We understand that this process requires the valuable input of key stakeholders like yourself. We kindly request about 30 minutes of your time to provide insights on a few areas by responding to the questions below. Please rest assured that all responses will be handled with the utmost confidentiality.

1. What is the role of your agency in supporting agricultural export trade?
2. What is your assessment of Kenya-China agricultural export trade, with a focus on avocado, cassava, and dried chili?
3. What are the main regulatory requirements that Kenyan agricultural exporters must meet? Are there any current efforts to make compliance easier?
3. What are the key opportunities for Kenyan farmers and traders in the Chinese agricultural commodity market? What trade agreements or negotiations are in place to facilitate agricultural exports to China? Are there any ongoing discussions to improve market access?
4. What do you perceive as the major challenges Kenyan farmers and agricultural commodity exporters face when exporting to the Chinese market? How do these challenges compare to Kenya's agricultural trade with other major markets?
5. What are the most common reasons for Kenyan agricultural products being rejected in China? How is the government working to address these issues?
5. What investments and initiatives are required to enhance agricultural commodity trade between Kenya and China?
6. What strategies can be considered to diversify the range of agricultural products exported to China and ensure sustainability in trade? Are there any crops currently under review for Chinese market entry?
7. What can be done to build the capacity of smallholder farmers and exporters to meet the demand and quality standards of the Chinese market? Are there any ongoing efforts?
9. How can private sector players and international organizations collaborate with the government to enhance Kenya's export potential?

10. Do you have any additional comments or recommendations on how Kenya-China agricultural commodity trade can be enhanced?

13.1.5 Questionnaire 5: Key informant interviews

Questionnaire for extension service providers

This study is commissioned by Amena Africa Limited on behalf of Sustainable Agriculture Foundation - Africa (SAF-Africa, formerly known as Syngenta Foundation). Its primary objective is to evaluate the readiness, challenges, and development potential of Kenya's agricultural produce for export to China, ultimately facilitating lucrative opportunities for smallholder crop exports.

SAF-A is preparing to implement the China-Africa Agricultural Value Chain Opportunities Project, which seeks to foster sustainable agricultural partnerships between Africa and China. The project focuses on the avocado, dried chili, and cassava value chains in Kenya and Tanzania, with the overarching goal of benefiting smallholder farmers.

We understand that this process requires the valuable input of key stakeholders like yourself. We kindly request about 30 minutes of your time to provide insights on a few areas by responding to the questions below. Please rest assured that all responses will be handled with the utmost confidentiality.

1. What is your evaluation of the current status of Kenyan agricultural exports to the Chinese market, particularly focusing on avocados, dried chili, and cassava?
2. What opportunities exist in the Chinese market for Kenyan agricultural commodity exporters? In your opinion, what can be done to enhance the exploitation of these opportunities?
3. What barriers or challenges are most common for Kenyan exporters or farmers when exporting to China, and how can they be addressed?
4. What is your assessment of Kenyan smallholder farmers' readiness to meet the quantity and quality standards required for the Chinese market? What are the major capacity gaps? What are the challenges in acquiring the necessary certifications?
5. What investments or improvements are necessary to boost Kenyan agricultural exports to China (e.g., logistical infrastructure, certification and standards, training, marketing events such as trade expos, trade missions etc.)?
6. What strategies do you recommend for connecting Kenyan exporters with buyers and strengthening Kenya's export position in the Chinese market?
7. What recommendations do you make to increase the participation of Kenyan smallholder farmers in agricultural production for the Chinese market?
8. Do you have any additional information that you would like to share?

13.2 Annex 2: Protocol for export of fresh avocado from Kenya to China (source: Kephis).

1. General Provisions

Kenyan fresh avocados (Persea americana Mills.) intended for export to China must fully comply with Chinese phytosanitary laws, health and safety regulations, and quarantine pest control requirements as outlined in Annex 1. This protocol specifically addresses phytosanitary requirements; however, additional food safety and human health standards such as China's national food safety regulations (e.g., GB2762, GB2763, etc.) may also apply.

2. Registration

- All orchards, packing houses, and fumigation facilities involved in avocado exports to China must be registered with KEPHIS and approved by both KEPHIS and GACC (China's National Plant Protection Organization).
- Registration details must include the name, address, and unique code of each entity to ensure traceability in case of non-compliance.
- KEPHIS must submit an updated list of registered facilities annually for approval by GACC before the start of the export season.

3. Orchard Management

- Good Agricultural Practices (GAP) must be applied in all registered orchards, including sanitary measures and prompt removal of dropped fruits to minimize pest risks.
- Integrated Pest Management (IPM) programs should be implemented, incorporating pest monitoring, chemical or biological control, and other mitigation strategies.
- Regular pest monitoring must be conducted under KEPHIS supervision, with technicians trained by KEPHIS or authorized institutions.
- Orchard records must be maintained, documenting pest monitoring activities and any chemical or biological pest control applications, including active ingredients, dosages, and application dates. These records must be made available to GACC upon request.

4. Control Measures for Quarantine Pests

4.1 Fruit Flies and False Codling Moth

- Integrated pest control measures for Mediterranean fruit fly (Ceratitis capitata), Mango fruit fly (C. cosyra), Natal fruit fly (C. rosa), and False Codling Moth

(Thaumatotibia leucotreta) must be implemented in avocado-producing regions. These include:

  - Use of fly traps
  - Chemical and biological control methods
  - Mating disruption techniques

- All fresh avocados exported to China must undergo Methyl Bromide fumigation before shipment, with the following treatment parameters:
  - Methyl bromide concentration: 32 g/m³
  - Duration: 2 hours
  - Temperature: 21.1°C or above

4.2 Scales and Other Quarantine Pests

- Other pests, such as scales (Ceroplastes rusci, Ceroplastes stellifera, etc.) and black spot (Pseudocercospora purpurea), must be monitored biweekly from the blooming to harvesting period.
- Immediate pest control measures must be applied if symptoms or infestations are detected to maintain low pest prevalence.

5. Processing and Packaging

- Processing, packaging, storage, and transportation must be supervised by KEPHIS officials.
- Avocados must be thoroughly washed, brushed, sorted, and inspected during packaging. Any overripe, deformed, discolored, or pest-damaged fruits must be removed.
- Packaging materials must be new, clean, and compliant with Chinese plant health and sanitary regulations. Any wooden packaging materials must meet ISPM 15 phytosanitary standards.
- Storage of packaged avocados must be done separately to prevent cross-contamination and pest infestation.
- Each box must be labeled in English with the following details:
  - Fruit name
  - Production region (county and district)
  - Orchard name or registration code

  - Packing house name or registration code
  - Text in English or Chinese: “Exported to the People’s Republic of China” (输往中华人民共和国)

- Containers used for export must comply with China’s sanitary requirements.

6. Pre-Export Inspection and Quarantine

- For the first two years (starting from January 6, 2022), KEPHIS must inspect 2% of each shipment, with a minimum of 1,200 fruit per consignment.
- If no quarantine issues are detected within two years, the inspection sample size may be reduced to 1%, while maintaining a minimum sample size of 1,200 fruit.
- If live quarantine pests are found, the entire shipment will be rejected, and the relevant orchard, packing house, or fumigation facility may be suspended until corrective actions are taken.
- After inspection, KEPHIS will issue a Phytosanitary Certificate confirming compliance with the phytosanitary protocol.
- The Phytosanitary Certificate must specify the fumigation details, including:
  - Methyl bromide dosage
  - Treatment duration
  - Temperature and facility details
- Copies of the Phytosanitary Certificate must be submitted to GACC before trade begins.

7. Entry Inspection and Quarantine in China

- All authorized Chinese ports and airports may receive Kenyan avocado shipments.
- Upon arrival, China Customs will review documents, verify product identity, and conduct quarantine inspections.
- Avocados from unregistered orchards, packing houses, or fumigation facilities will not be allowed entry.
- If live quarantine pests or unreported quarantine pests are found, the entire consignment will be returned, destroyed, or treated.
- GACC will notify KEPHIS and may suspend exports from the affected orchard, packing house, or treatment facility for the remainder of the season.

- KEPHIS must investigate and implement corrective measures before GACC considers lifting the suspension.

8. Compliance Inspection

- In the first year of protocol implementation, GACC may conduct an on-site or remote compliance inspection in Kenya, with KEPHIS facilitating the process.
- All costs related to this inspection (travel, accommodation, etc.) will be borne by the Kenyan side.

9. Retrospective Review

- GACC reserves the right to conduct an additional risk analysis based on pest occurrences in Kenya or interceptions in China.
- Adjustments to quarantine pests and control measures may be made following consultations between GACC and KEPHIS.
- After five years of trade, GACC will review Kenya's compliance, including conducting on-site inspections, and may amend the protocol as needed based on mutual agreement.

Annex 1: Quarantine Pests of Concern to China

1. Ceratitis capitata (Mediterranean fruit fly)
2. Ceratitis cosyra (Mango fruit fly)
3. Ceratitis rosa (Natal fruit fly)
4. Thaumatotibia leucotreta (False Codling Moth)
5. Ceroplastes rusci (Fig wax scale)
6. Ceroplastes stellifera (Red wax scale)
7. Lopholeucaspis cockerelli (Japanese baton-shaped scale)
8. Selenaspidus articulatus (West Indian red scale)
9. Pseudocercospora purpurea (Black spots of avocado)