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Faculty of Tropical AgriSciences



**Determinants of performance of smallholder
farmers in the cashew value chain. A case study
of the Coastal region of Kenya.**

MASTER'S THESIS

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Declaration

I hereby declare that I have done this thesis entitled “Determinants of performance of smallholder farmers in the cashew value chain. A case study of the Coastal region of Kenya independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to citation rules of the FTA.

In Prague, 6th August 2021

.....
Gold Juliana Omolola

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Abstract

Cashew is an important agricultural cash crop that has gained status in the international context. There is, however, a low yield of cashew in Kenya which has led the government of Kenya to announce its effort to increase the productivity of the cashew sector together with international donors. The main aim of this study was to analyze the factors that influence the performance of smallholder cashew farmers in the Coastal province of Kenya. The study also compared the enabling institutional factors, constraints, and government support of Kenya's cashew sector with the Ivory Coast and the United Republic of Tanzania. The study used a multistage sampling technique to select 262 smallholder cashew farmers in the coastal province of Kenya. The ordinary least square regression (OLS) method was used to analyze the factors that influence the performance (yield) of smallholder cashew farmers. The study revealed that the cashew value chain in the Coastal province of Kenya is underdeveloped and comprising of activities such as production by smallholder cashew farmers, processing by smaller processors and local major processing facilities in the province, marketing or selling to the local market, factory gate selling, and export. The study also reveals that the immense government support and close monitoring of the value chain in Ivory coast resulted in a more organized and better quality of their cashew value chains compared to that of Kenya and the warehouse receipt system promoted and improved the marketing and pricing system of cashew in the United Republic of Tanzania. The OLS showed that performance (yield) is influenced by age of trees, gender, price of cashew, and access to extension services.

Keywords: Yield, Value chain, Government support, Ordinary Least Square Regression, Kenya.

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List of the abbreviations used in the thesis

ADB: African Development Bank Group

CBT: Cashew Nut Board of Tanzania

CCA: Cotton and Cashew Council

FA: Farm Africa

FAO: Food and Agricultural Organisation

GDP: Gross Domestic Product

KES: Kenyan Shilling

MOFA: Ministry of Food and Agriculture

MT: Metric Tonnes

NCPB: National Cereal and Produce Board

OLS: Ordinary Least Square

RCN: Raw Cashew Nut

SACCOS: Savings and Credit Cooperative Societies

TSA: Ten Senses Africa

USD: United States Dollars

1. Introduction

Cashew is an important agricultural cash crop that has gained status commercially mainly because of the increasing demand for raw cashew nuts and because of the technological advancements of its propagation, production, and management. Interestingly, cashew production also has major relevance in the international markets and has the potential of boosting rural development and reducing poverty (Dendena & Corsi 2014). Cashew is being cultivated by as many as 28 countries both in Africa and globally. Generally, the world production of cashew remains strong and has been experiencing an exponential increase.

The agricultural sector of the Kenyan economy provides 18% of the total population formal employment through the blooming export of agricultural products (Kenya Agricultural Research Institute 2019). In addition, the exportation of non-traditional agricultural export mainly produced by small to medium scale farmers has 75% of the total export market and up to 70% of the total agricultural production in the whole of Kenya (Kenya Agricultural Research Institute 2019). Cashew has a great potential to generate foreign exchange, create employment, increase the income of smallholder farmers, and curb desertification. There is a large and growing domestic and regional market for cashew nuts as well as other cashew by-products.

Cashew is traded in two ways: as a raw cashew nut (RCN) or in processed form (mainly cashew kernel) (Tola & Mazengia 2019). Many authors reported that the cashew kernel is being considered as a high-value agricultural commodity with increasing and expanding demand in international trade (Harilal et al. 2006; Dendena & Corsi 2014). A study done by (Nicholson et al. 2019) for the African development bank group (ADB) in 2020 highlighted that there is a high correlation between the export of cashew and GDP

in Guinea-Bissau (cashew export account for about 90% of total export). Nicholson et al. (2019) also stated that cashew production significantly contributes to the economy of countries like Mozambique, Burkina Faso, and the Ivory Coast.

According to Muhammad et al. (2017), cashew is a nutritionally rich crop. Muhammad et al. (2017) stated that it can be directly consumed as snacks, roasted, and salted nuts alone or in a mixture with other nuts or used in recipes, or processed into different products. Many authors (Azam-Ali & Judge 2001; Runjala & Kella 2017) reviewed the health benefits of cashew and discoursed that almost all parts of the plant and their constituents are used for medicinal purposes against various human diseases.

Farmers in Kenya grow a significant quantity of cashew, but the yield of cashew in Kenya has experienced an abrupt decrease. The potential of cashew production in Kenya has not been fully reached and it can even be said to be underutilized. A study by Mwangi et al. (2013) disclosed that Kenya currently realizes only about 5-10% of its cashew nut production potential which is about 200,000 tonnes. This low yield of cashew production led the government of Kenya to announce in August 2020 its effort to increase the yield of cashew production as well as provide incentives to entice more farmers into cashew production.

The development of low yield in Kenya as well as the renewed effort by the government calls for an investigation into the factors that influence the performance of smallholder cashew farmers in the cashew value chain. In as much as some studies have been done on factors that influence the performance of smallholder farmers in Kenya (e.g., Gichangi et al. 2012), none of them focused on the factors that influence the performance of smallholder cashew farmers. This study, therefore, focused on analyzing the factors that influence the performance of smallholder cashew farmers in Kenya. The study further compared the enabling institutional factors, constraints, and government

support of Kenya's cashew sector with the Ivory Coast and the United Republic of Tanzania. This study seeks to add to relevant literature concerning the determinants of the performance of smallholder farmers by adopting the ordinary least square regression method.

The rest of the study will be organized as chapter 2 focusing on the review of relevant literature and theoretical background, chapter 3 on the aims of the study, chapter 4 on data collection and analytical methods, chapter 5 on the results and findings of the study, chapter 6 and 7 on the discussion of the results and findings, and conclusion and policy recommendations.

2. Literature Review

2.1. Value Chain Theory

The concept of value chain shows the full range of activities required to bring a product or service from conception, through the different stages of production until it reaches final consumers and final disposal (Kaplinsky & Morris 2000). The phrase was first introduced by Michael E. Porter in 1985 in his book where he described the value chain as the basic tool for diagnosing and enhancing the competitive advantage of a firm (Porter Michael 1985).

Value chains can be classified based on who drives the chain, that is producer-driven or buyer-driven. Producer-driven chains are characterized by capital-intensive and technology-oriented industries. However, Buyer-driven chains are common in labor-intensive-consumer goods industries characterized by retailers, merchandisers, and trading companies. Buyer-driven chains are common in the agriculture and cashew industry. Regardless of who pushes the chain, value-added should be reflected along the natural sequence of operations, from stage to stage (Abecassis-Moedas 2006). The competitive power and ability of a player to succeed depend on its position along the chain, and how much value it can create and capture.

Value chain analysis focuses on complex linkages within a network in which both the creating and capturing of value occurs in a system comprising of suppliers, distributors, partners, and collaborators, thus extending the firm's access to resources and opportunities (Amit et al. 2011). According to Kothandaraman & Wilson (2001), the creation of value is based on the ability to deliver high performance on the benefits that are vital to customers. Value instead of cost should be the basis for determining competitive position (Porter 1985).

2.2. Cashew Value Chain Organization in Africa

Pro-poor growth of smallholder cashew farmers is essential for value chain promotion in Africa. The objective of promoting cashew value chains in Cashew production is to generate greater added value within Africa and to improve the

competitiveness of locally produced cashews in national and international markets. The Cashew value chain in Africa is characterized by the following stakeholders.

Input suppliers: provide producers with inputs such as seedlings, herbicides, pesticides, fertilizers, processing equipment, etc. At the micro-level, very few chemical inputs are used. The main input is grafted seedlings of various varieties which are usually distributed through cooperatives or on the spot market via input dealers (Keller 2010; Koné 2010; Costa & Delgado 2019a).

Cashew producers: Production is mostly carried out by individual smallholder farmers. Each producer typically mixes cashew and food crops according to climate suitability and land available. In countries like Ghana, Ivory Coast, and Mozambique, the production is also carried out by farmer groups or cooperatives. However, the cooperatives that do exist are small (few members, small areas under cultivation) (Keller 2010; Koné 2010; Costa & Delgado 2019b).

Processors: In Ghana, the processing of cashew is mostly carried out by different actors outside Ghana. There are few small-scale processors in Ghana focusing on activities such as roasting, salting/seasoning, packaging, and labelling/branding (Keller 2010). Cashew processing and production in Mozambique has a long tradition, with a reputation as being the first in the world to operate virtually all available technology (Costa & Delgado 2019). In Mozambique, cashew processing has contributed largely to lift a significant number of rural dwellers out of poverty through wage-earning jobs (Costa & Delgado 2019). There is a growing interest in cashew processing, as reflected in the various initiatives taken to reverse the current trend, which is to trade in raw nuts (Koné 2010).

Distributors: The distributors of cashew in Africa include local traders, middlemen/intermediaries, buyer cooperatives, retailers, and exporters. The

middlemen/intermediaries of companies purchase raw cashew nuts by traveling from one marketing centre to another and sometimes travel to the farming communities themselves (Keller 2010). The transportation of cashews to ports and payment for the related costs are handled by middlemen and traders. Buyer cooperatives play a critical role in the distribution of cashew nuts in the Ivory Coast. The cooperatives buy the cashew from the members and producers who are not members and supply cashew nuts to traders and trading companies (Koné 2010).

Exporters: Export companies and export-oriented processing cooperatives are the final links in the chain, through which the raw nuts leave Africa for the export market (Keller 2010; Koné 2010; Costa & Delgado 2019b). Exportation of cashew is done on a seasonal basis by some export companies, while other export companies operate year-round. In either case, they aim to buy cashew nuts from producers or buyer cooperatives to export them, in most cases to countries in Asia (Koné 2010). Export cooperatives buy and export cashew nuts of their members' as well as from non-members to meet their export quotas. Factories (processing plants) are also involved in the export of cashew by exporting fresh and/or roasted kernels to Europe, Asia, and the Americas (Koné 2010).

Apart from the players highlighted, other players are involved indirectly in Africa. They include carriers, who transport the nuts from the farm to the port of lading and forwarding agents, who complete the shipping formalities (Keller 2010; Koné 2010).

There have been efforts by governments of Africa to support the cashew sector or value chain. One of the efforts is the introduction of the warehouse receipt system in the cashew value chain. A warehouse receipt system is a marketing system whereby a document issued by a licensed warehouse operator certifying the quality and quantity of a specified commodity is placed by a named depositor into a secure storage environment. The warehouse receipt system was introduced in 2007 in Tanzania. The cashew farmers

in Tanzania receive the receipt through the agricultural marketing cooperatives. The cashew farmers get part of the payment through bank financing based on the receipt. The warehouse receipt system has been positive in Tanzania by way of enabling the farmers to receive better prices for the raw cashew nuts (Kidando & Venkatakrishnan 2014).

Also, the government of Ghana through the Cashew Development Project of the Ministry of Food and Agriculture (MOFA) has given priority to the cashew sector. Through the Cashew Development Project in Ghana, over 40000 cashew farmers have received training and technical advice on cashew production in the last decade (Keller 2010). Ivory Coast doubled its production of raw cashew nuts to become a global leader in the last decade via support from government and development agencies. Public investment in research and development, provision of training and better farm management practices, and subsidy are among the factors that have propelled the Ivory Coast to be one of the global leaders in cashew production.

2.3. Cashew Production in Kenya

Cashew is already well established in the Coastal Province of Kenya and has a long history. Farmers are used to growing cashew and have significant experience with the production. Thanks to several involved cashew farmers, the sub-sector has huge potential to create employment through value addition and to fetch the exchequer billions of shillings through exports.

The marketing of raw cashew nuts has gone through many changes since the 1970s when Kenyan cashew production was at its maximum. At that time, the responsibility of buying raw cashew nuts was given to the Nation cereal and produce board (NCPB) as the sole government agent who also appointed cooperative societies

(members) as trading agents. However, in the 90s, the marketing was liberalized, and the system was opened to all other players such as agents (middlemen) and traders who purchased and sold the nuts to Kenya Cashew Nut Limited, the only major processor at that time. This, in combination with the spread of Powdery mildew cashew disease, brought about the collapse of the flourishing cashew industry in the Coastal province. The production went down from the original 30 000 MT in the 80s to 10 000 MT in 1996 (Hejkrlik et al. 2018).

Currently, the marketing of raw cashew nuts in Kenya involves simple linkages of farmers, processors, and exporters through middlemen. The processed products find their way to both local and international markets (however, the export quantity has been very limited in recent years), the tourism industry, and confectionary processors.

The demand for cashew nuts is however growing not only in the world but also in developed countries and especially from emerging countries such as China and India (Markets & Markets 2015). In line with that, there is a wide belief among local cashew actors that it is possible to renew production from the current 32 000 Ha of cashew production area. Because of more favorable economic conditions and the interest of the government and international donors, farmers have again become enthusiastic about the crop and have slowly started to invest money and labor in rehabilitating abandoned farms.

Figure 1 shows the yield of cashew in Kenya in Kilogram per hectare (KG/HA) between 1990 to 2020, the yield started growing slowly in 2012 and reached its peak in 2015. It has since then taken a downward turn; this is coupled with a highly volatile market.

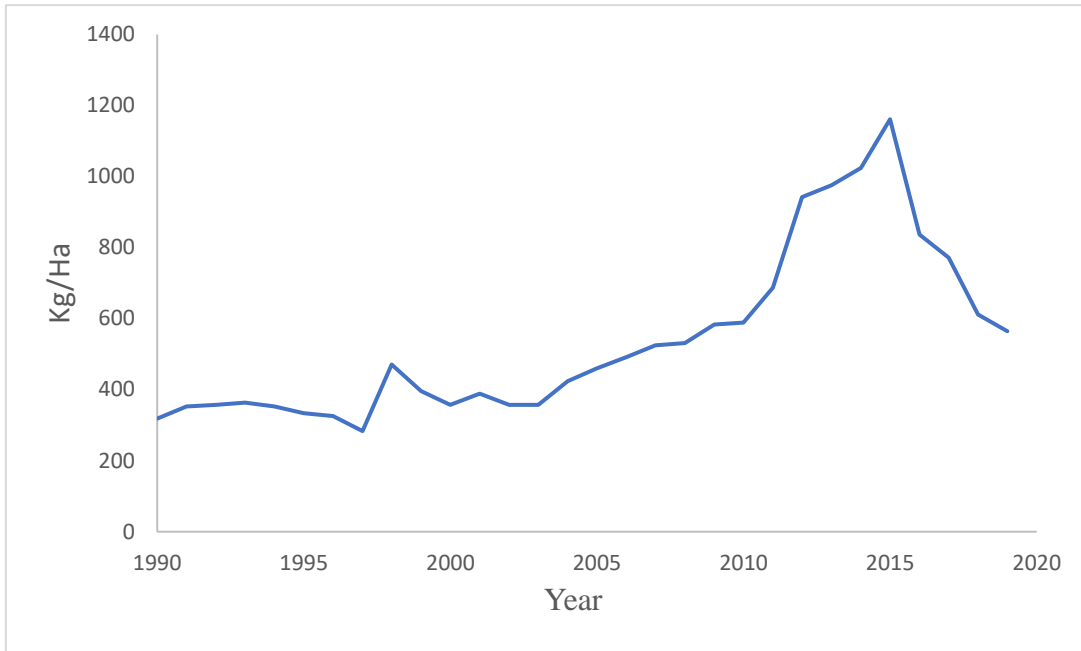


Figure 1. The yield of cashew in Kenya (FAO, 2021)

According to the data from the FAO (Figure 2), Kenya exported a high value of cashew in 2001, but then there was a significant drop to minimal export values since 2012, which indicates that most of the cashew is only for domestic consumption. Kenya still lags in comparison with other major world producers and exporters.

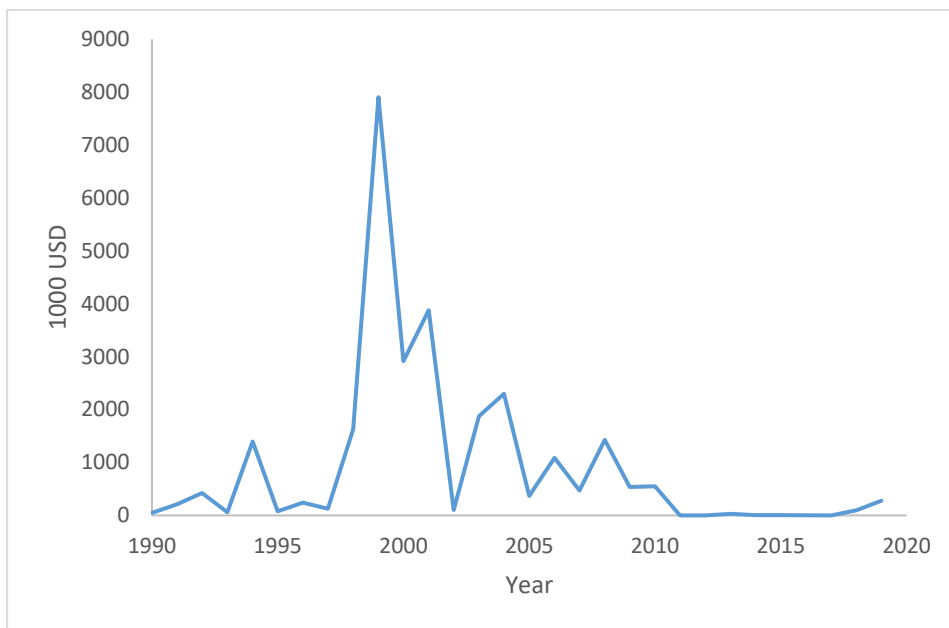


Figure 2. Kenya cashew export value in 1000 USD (FAO, 2021)

2.4. Kenyan Cashew Performance in International Context

Four producer countries, Vietnam, India, Ivory Coast, and Nigeria dominate the international cashew industry. The Food and Agriculture Organization (FAO) suggests a global output of 6 million tonnes per year. Figure 3 shows the share of the regional production quantity of cashew. In terms of regional production of cashew, the largest producer is the Asian continent, followed by Africa and the Americas.

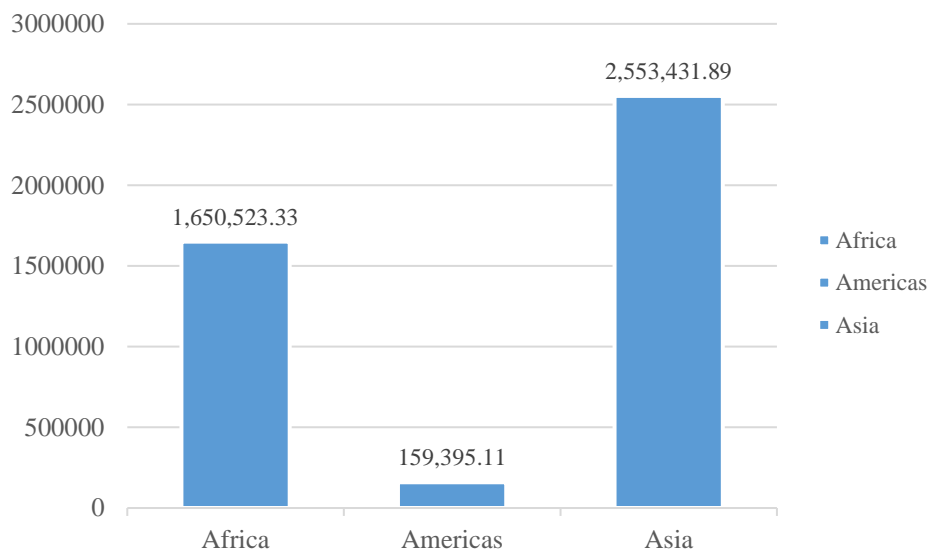


Figure 3. Regional Production of Cashew in tonne (source: FAO, 2021)

In Figure 4, Ivory Coast is the country with the highest production quantity in tonnes per area harvested among the main producers in Africa, followed by Tanzania with 225,106 thousand tonnes and Benin with 204,302 tonnes per area harvested in 2019.

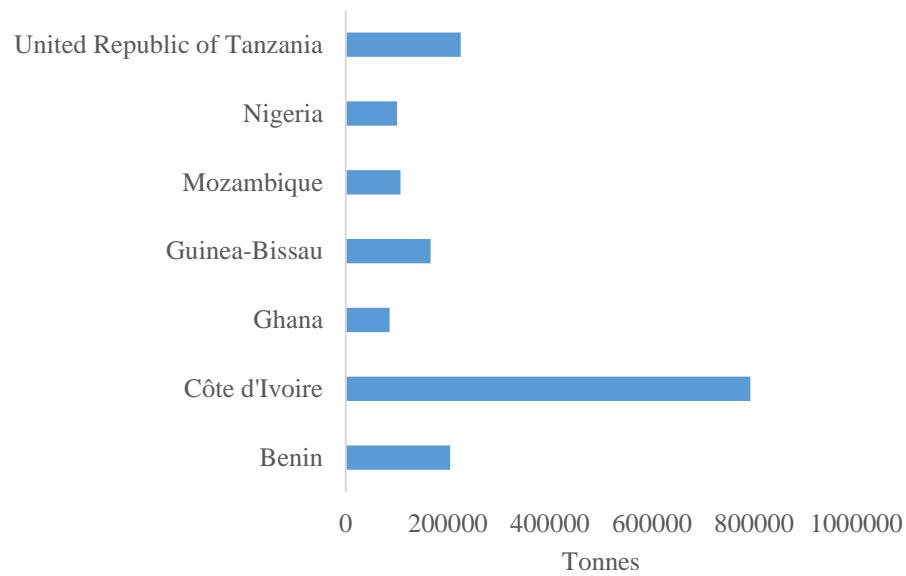


Figure 4. Africa production of Cashew (Tonnes) source: (FAO, 2021)

In figure 5, there is a total harvested area of cashew in 2019. Ivory Coast leads in the list of the selected African countries with an area harvested of 1,913,073 million hectares. The United Republic of Tanzania comes second with the harvested area of cashew in 2019 being 980,363 hectares.

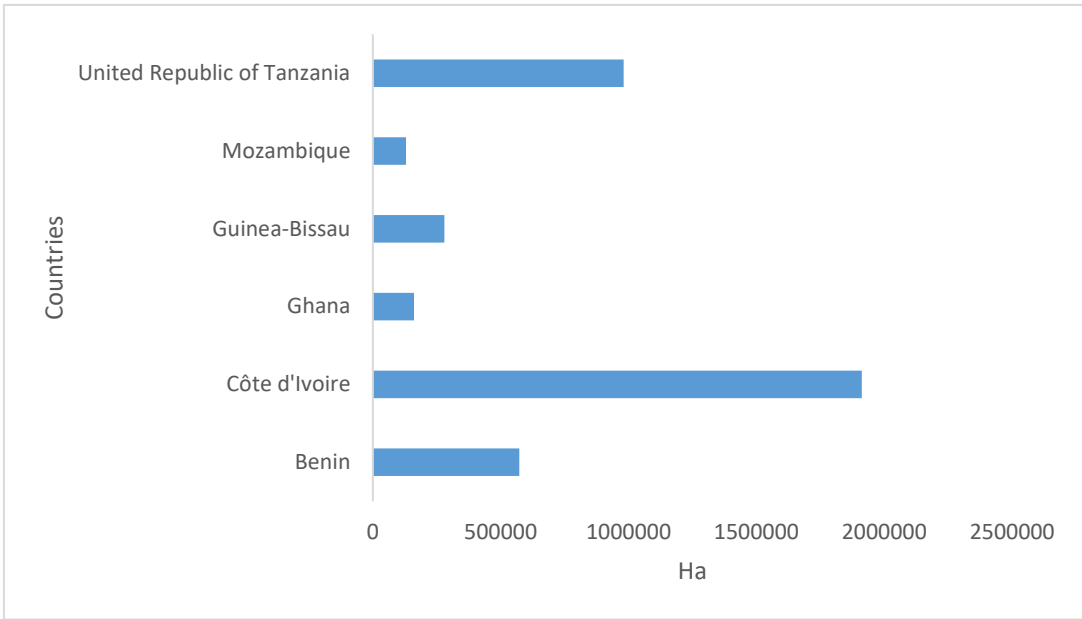


Figure 5. Harvested area of cashew (hectares) (source: FAO, 2021)

In Figure 6, the biggest exporter of cashew is Ivory Coast with a total export value of about 730 million USD in 2019. The export value of Ivory Coast is about 10 times more than the export value of Kenya.

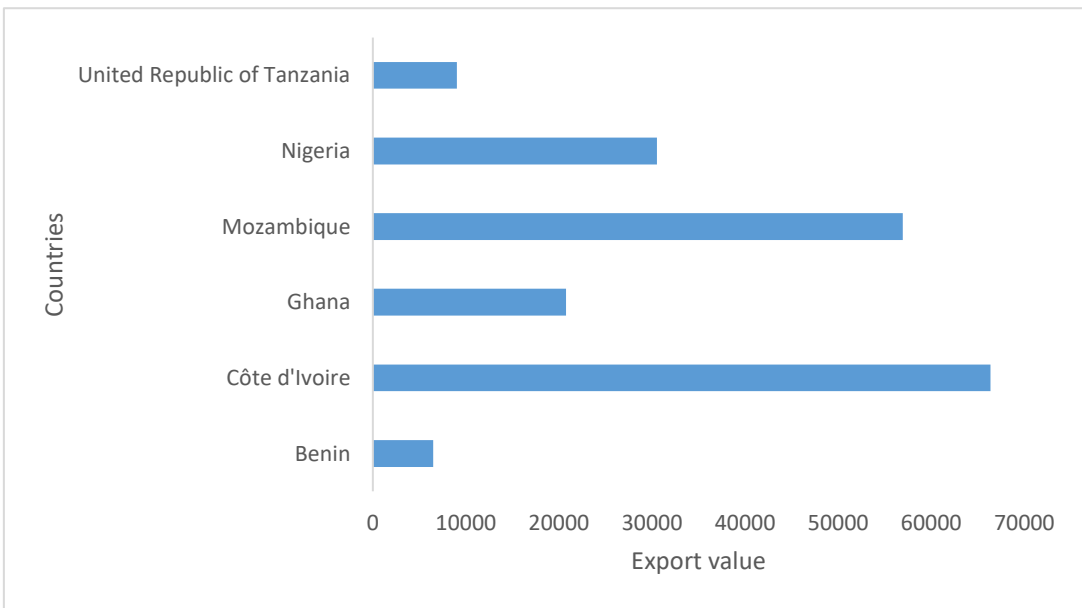


Figure 6. Cashew Export Value in 1000\$ (source: FAO, 2021)

2.5. Production Factors and Constraints of Cashew

The yield of smallholder farmers is affected by several factors comprising socio-demographic factors, external factors, and farm characteristics.

Socio-demographic factors

The gender of a farmer has been used by several researchers as part of the factors that influence the performance of smallholder farmers. Bello et al. (2017) and Onogwu et al. (2017) studied the factors that influence the performance of cashew farmers and maize farmers in Benin and Nigeria respectively and their results revealed that the performance of male farmers is higher than female farmers. In other words, there is a positive relationship between been a male cashew farmer and higher cashew yield (Bello et al. 2017).

Age of farmer is very crucial in the determination of yield of farmers. Some studies reveal a positive relationship between the age of farmers and productivity (Onogwu et al. 2017). The assumption behind the positive relationship between age and productivity is that older age is associated with more experience in farming operations. On the other hand, age can have also a negative relationship with productivity as found by other studies such as (Ayoola & Dangbegnon 2011; Birachi et al. 2011; Battese et al. 2017). The negative relationship may also be explained, this can be because youthful farmers are energetic to cultivate larger farm sizes and perform farm operations as compared to older farmers.

Another key socio-demographic characteristic of farmers that influences productivity is the level of education of the farmer. The assumption is that the more educated a farmer is, the more knowledgeable the person is concerning farming operations. An educated person can read about new practices and apply them on his or her farm to improve the output of the farm. It has been discovered that educational level

is positively associated with the yield and output of farmers (Ayoola & Dangbegnon 2011; Onogwu et al. 2017). Wongnaa (2013) and Bello et al. (2017) studies revealed a positive relationship between educational level and cashew output by adopting Cobb-Douglas production function and simple regression model respectively.

Farm Characteristics

The total number of labor used on the farm significantly influences the productivity of the farm. It is assumed that the higher the number of labor employed on the farm, the higher the yield or productivity. Birachi et al. (2011) in their study of factors influencing the productivity of smallholder bean farmers in Burundi found a positive relationship between labor and productivity. However, a negative relationship between labor and productivity was found in a study of factors influencing the productivity of smallholder cashew farmers in Ghana (Wongnaa 2013).

Farm size is very relevant in terms of factors that influence farm productivity. Several studies highlighted that the higher the farm size, the higher the yield ceteris paribus (Ayoola & Dangbegnon 2011; Wongnaa 2013; Battese et al. 2017; Bello et al. 2017; Onogwu et al. 2017). Ayoola & Dangbegnon (2011), Wongnaa (2013) and Onogwu et al. (2017) studies revealed a significant positive relationship between farm size and productivity. Apart from the farm size, the average age of trees and the number of cashew trees on the farm play critical roles in output and productivity (Bello et al. 2017). Also, Wongnaa (2013) opined that cultural practices such as pruning influence the output and productivity of cashew.

External factors

In terms of the institutional factors, access to extension services plays a major role in farm productivity. It has been found that there is a significant positive relationship between extension access and farm productivity (Wongnaa 2013; Bello et al. 2017; Onogwu et al. 2017). Extension agents provide farmers with vital information and education that have a significant impact on the yield of the farmers. Battese et al. (2017), on the contrary, found a negative relationship between extension access and productivity.

The market price of produce and distance to market are important determinants of performance. It was found by Birachi et al. (2011) that market price has a negative relationship with the quantity of beans supply to the market by farmers. Birachi et al. (2011) also found that distance to market has a positive relationship with the quantity produce and supply by smallholder cashew farmers. Similarly, Mensah et al. (2012) in their study of smallholder cashew cooperative members' performance highlighted that price offered by cooperatives plays a crucial role in the performance of smallholder cashew farmers.

Several studies have revealed the role of farmer groups on the yield of smallholder farmers (Wongnaa 2013; Mojo et al. 2017; Onogwu et al. 2017). There was a positive relationship between participation in farmer groups and the output of cashew farmers in Ghana by using the Cobb-Douglas production function (Wongnaa 2013). Mojo et al. (2017) and Onogwu et al. (2017) studies done in Ethiopia and Nigeria respectively also indicated that participation in producer groups significantly influences the yield of farmers. Farmers that belong to cooperatives get essential information about improved farm technologies, farm input subsidies, credit, and marketing, etc. as compared to non-members of cooperatives. In addition, farmers benefit from “farmer to farmer” education from their other members in the farmer groups. Some farmer groups also provide savings

and credit services which farmers get access to credit to purchase farm inputs. Through farmer groups, farmers can get input subsidies and get farm inputs at a cheaper cost.

The cashew sector in developing countries is affected by several constraints with the most important ones being the deterioration in export crop quality and the corresponding decline in export unit values compared with other exports (Sarpong 2011). In general, the production and harvesting performance of the cashew nut sector is affected by the following factors; access to land and the availability of better planting materials and other farm inputs, farmers training and establishment of village-based nurseries operated by farmers, implementation of a comprehensive agricultural extension approach to complement the national extension service that was particularly aimed at promoting cashew nut production, and market liberalization of the cashew industry, whereby inputs, crop, and processing business were privatized with minimum interference from the government (Sarpong 2011).

3. Aims of the Thesis

The low cashew yield in Kenya as well as the effort by the government calls for an investigation into the factors that influence the performance of smallholder cashew farmers in the cashew value chain. In as much as several studies have been mainly on the factors that influence the performance of smallholder farmers in Kenya, none of them focused on the factors that influence the performance of smallholder cashew farmers. Therefore, the main aim of this study analyses the factors that affect the performance of smallholder cashew farmers while also benchmarking the performance and constraints of the cashew value chains in Kenya in the context of selected cashew value chains in Africa with higher productivity.

Specifically, this research will focus on the following objectives:

1. To describe the cashew value chain in Kenya.
2. To compare the enabling institutional factors, constraints, and government support of Kenya's cashew sector with the Ivory Coast and the United Republic of Tanzania.
3. To assess the socio-demographic factors, farm characteristics, and external and institutional factors that affect the productivity of smallholder cashew farmers in Kenya.

3.1. Hypotheses and Conceptual Framework

The yield was measured as the ratio of harvested cashew in kilogram to the number of cashew trees on the farm. Since the farmers in question do not have cashew plantations, measuring yield as output per farm size will be misleading. Hence, we measured yield as Kg per tree of cashew. The motivation to use yield was obtained from

(Wongnaa 2013; Olubode et al. 2018), however, these studies measured cashew yield as output per farm size.

Social and demographic characteristics of farmers influence the performance of smallholder cashew farmers. By taking inspiration from studies like (Wongnaa 2013; Olubode et al. 2018), the following hypotheses are made from the influence of socio-demographic characteristics on the performance (yield) of smallholder farmers.

H_{1a}: Age of farmer has a positive relationship with performance of smallholder cashew farmers.

H_{1b}: Male farmers have higher performance than female farmers.

H_{1c}: Higher educational level of the farmer has a positive relationship with the performance of smallholder farmers.

Further inspiration from studies like Olujenyo (2008), Abdul-Rahaman & Abdulai (2018), and Wongnaa (2013) revealed that there is a relationship between farm characteristics and practices and the performance of smallholder cashew farmers.

H_{2a}: The number of laborers used on the cashew farm has a positive relationship with the performance of smallholder cashew farmers.

External and institutional factors significantly influence the performance of smallholder cashew farmers. Following Olubode et al. (2018), Birachi et al. (2011), Olujenyo (2008), and (Farm Africa 2019), the following hypotheses were developed:

H_{3a}: Participation in the farmer group has a positive influence on the performance of smallholder cashew farmers.

H_{3b}: The price of cashew has a positive influence on the performance of smallholder cashew farmers.

H_{3c}: Access to extension service has a positive relationship with smallholder cashew farmers' performance.

The framework below shows the main concept of this study by highlighting the influence of social and demographic factors of farmers, farm characteristics and practices, and institutional and external factors on the performance of smallholder cashew farmer.

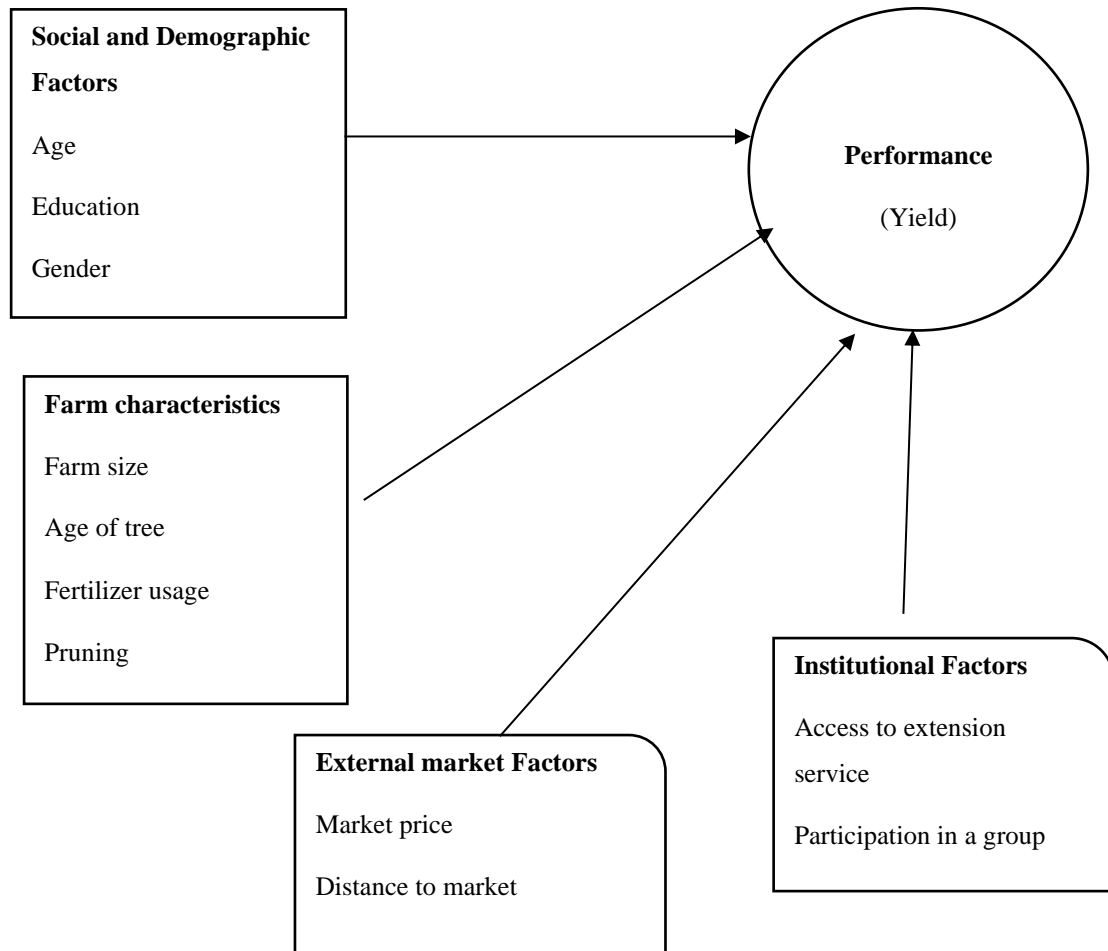


Figure 7. Conceptual framework of study

4. Methods

4.1. General Research Design

This study uses causal research to investigate the factors that influence the performance of smallholder cashew farmers in Kenya. The performance of cashew farmers was measured as the dependent variable which is explained by independent variables. Also, as a secondary method, the comparative design was used to analyze the Kenya cashew sector in the African context by comparing its performance with selected African competitors with better performance.

4.2. Study Area

The study area is Kenya, a country in East Africa with a country land area of about 58037ha. 27630ha of the total land area is used for agriculture. Kenya is located between latitudes 0.0236° S and longitudes 37.9062° E. The coastal region was chosen because the region has a higher concentration of cashew nuts trees than anywhere else in the country.

The coastal province of Kenya has 6 counties, namely: Kwale, Kilifi, Mombasa, Tana River, Taita Taveta, and Lamu. The province covers an area of approximately 83000 km² and a population of approximately 3.3 million people. The Coastal province is the second poorest region in Kenya with most people living below the poverty line.

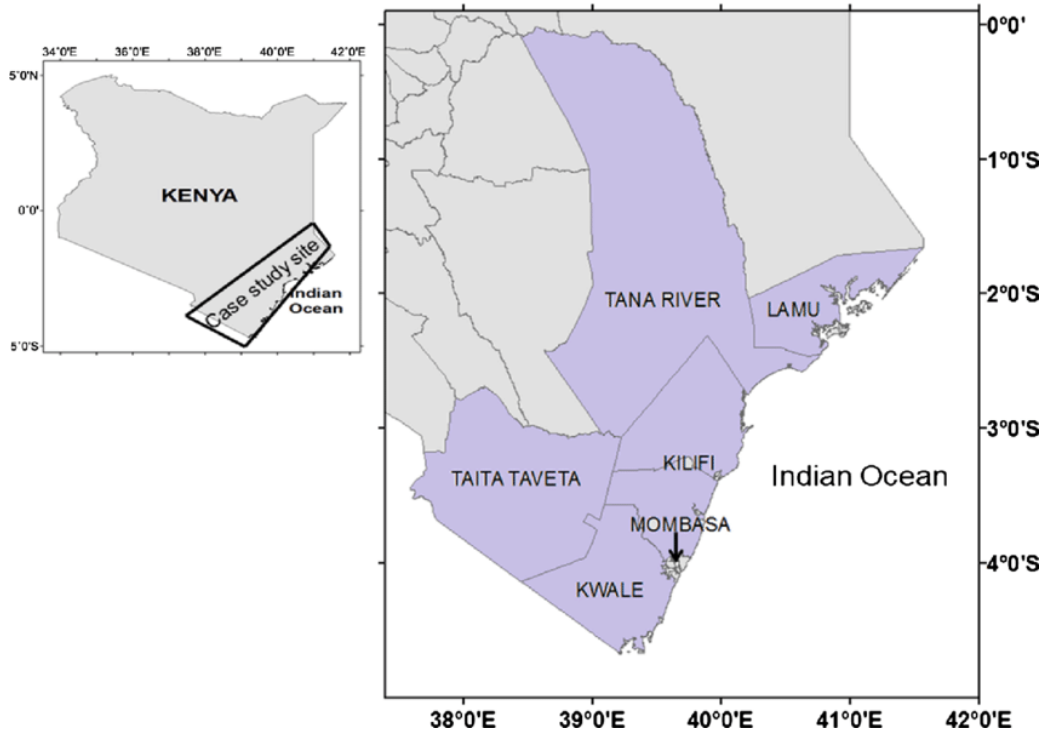


Figure 8. Map of the study area

The province is comprised of unique ecosystems with rich natural resources including marine fish, coral reefs, sea-grass beds, mangrove forests, and diverse cultural heritage. The climate of the coastal province varies with distance from the coast and it becomes drier towards the inland from the ocean and from south to north (Nicholson et al. 1999). The province is characterized by peasant farmers with small farms growing maize, rice, cassava and cowpea, coconut palm, and of course cashew for household consumption and commercial purposes (County Trak Kenya 2020).

4.3. Target Group, Sample Size, and Source of Data

The data was collected in collaboration with Ten Senses Africa (TSA) and Farm Africa (FA) enumerators from farmers/growers in the coastline region of Kenya in 2018. The data was collected with the EU V4 project funded by Trust Fund for Africa. The project “Enhancement of livelihoods in the Kenyan Coastal Region by supporting Organic and Fair-Trade certification of smallholders” is implemented in accordance with the intervention program "Conflict prevention, peace and economic opportunities for the youth" (EUTF05-HoA-KE-18).

The target groups for this study were smallholder cashew farmers in the coastline region of Kenya. For data collection in the field, the multistage sampling approach was designed. The first step was stratified sampling done to identify the specific areas across the 3 counties. The sub-counties of focus have been guided by the areas of high cashew density; these are:

- Kilifi – Kilifi North, Kilifi South, Magharini and Ganze
- Kwale – Msambweni, Matuga and Lunga Lunga
- Lamu - Mpeketoni & Hindi

In the second stage, the sampling was based on the available list of farmers already contacted by TSA. The data was collected with the ODK data collection tool and uploaded to a smart mobile/tablet. Locally trained enumerators were used to collect the data.

The data collection exercise was conducted between 30th April and 5th May 2018. In total, 417 questionnaires were filled in the field. However, the dataset was later cleaned off wrong or missing data to 262 entries. The sample size used in this study, therefore, was 262. The sample size for the study was calculated as:

$$(z^2 * p * (1-p) / e^2) / (1 + (z^2 * p * (1-p) / e^2 * N))$$

Where Z is z score which is 1.96 for 5% confidence interval, e is margin of error, p is percentage picking a choice, expressed as a decimal (50%) and N is the population (approximately 15000 local cashew farmers are the two districts). Using a percentage of 5% and a margin of error of 5%, the sample size was supposed to be 375 so the sample size of 417 is representative of the population.

The data was collected using a semi-structured questionnaire. Data of interest was the social-economic and production characteristics of the cashew farmers (age, education, gender, size of farm, age of cashew tree, distance to market, access to extension services, practice of pruning, household size, group membership, fertilizer use and ownership of assets). Additional data of interest was on the total kilogram of cashew harvested per tree and per hectare on the farm, price of cashew, the quantity of cashew sold by the farmers in the year 2018.

Furthermore, qualitative data was also obtained using a semi-structured in-depth interview method. Interviews were conducted with a small number of key informants who had first-hand knowledge about the value chain system of cashew in the coastal province of Kenya. Each interview took about half an hour to one hour.

Main respondents for qualitative data collection:

- Interview with Kwale Agricultural Officer
- Interview with Kilifi Agricultural Officer
- Interview with Kilifi Cooperative Officer
- 15 unstructured interviews with female cashew farmers
- 31 unstructured interviews with male cashew farmers
- 2 unstructured interviews with sesame farmers
- Interview with 3 TSA/FA field officers
- Interview with 2 managers of Kwale and Kilifi TSA cashew nurseries

- Interview with a representative of Cooperative Union
- 2 focus groups discussion with local groups of cashew farmers
- Interview with a local broker (middlemen).

The secondary data relies heavily on an examination of existing, accumulated research, combining official government data with studies conducted by local and international organizations such as the 2009 report from the cashew nut revival task force “The Revitalization of the Cashew Nut Industry in Kenya” (Mumba et al. 2009).

Also, the data for the comparison of production characteristics were based on the following indicators as obtained from FAOstat.: the value of export, production quantity, and total harvested area from 2015 to 2018. Data for value chains comparison was based on a review of previous research is done about the cashew value chains in the Ivory Coast and Tanzania (Tessmann 2020; Tessmann 2017; Krepl et al. 2016; Kilama 2010; Martin et al. 1997).

4.4. Data Analysis

Objective 1 was achieved by presenting and describing the local cashew value chain and its stakeholders based on the qualitative data obtained from the key informant as described above.

Objective 2 was achieved by using simple descriptive statistics such as mean and charts. The criteria for the comparison were based on the development of the cashew chain in Tanzania and Ivory Coast as well as support and interventions from the government in the two countries. Additional quantitative data for this comparison was obtained from data from FAOstat and reviewing relevant literature.

Objective 3 which talks about the factors that influence smallholder cashew farmers' performance (yield) was analyzed by using the ordinary least square regression model (Wongnaa 2013; Kidando & Venkatakrishnan 2014). Stata version 14.0 and SPSS version 25.0 were used to analyze the data. The dependent variable for the ordinary least square regression model was the performance by taking inspiration from (Wongnaa 2013; Bassett et al. 2018; Olujen2008).

Mathematically, the yield was calculated as:

$$\text{Yield} = \frac{\text{Output (Kg)}}{\text{Number of trees on the farm}}$$

(Wongnaa 2013a; Bassett et al. 2018)

The independent variables for the model were the individual characteristics (age of farmer, gender, educational level), farm characteristics (farm size, average age of cashew tree, fertilizer usage, and pruning), market factors (distance to market, and price), and institutional factors (participation in farmer groups and access to extension service). Studies such as (Olujenyo 2008; Mwangi et al. 2013b; Wongnaa 2013b; Mwangi &

Kariuki 2015b; Fawole & Rahji 2016) influence the choice of the independent variables.

The empirical model for performance (yield) was specified as:

$$Y_{yie} = \beta_0 + \beta_{gen} + \beta_{age} + \beta_{edu} + \beta_{farm} + \beta_{agetree} + \beta_{ext} + \beta_{dis} + \beta_{group} + \beta_{price} + \beta_{fert} + \mu \quad (1)$$

where yie = performance (yield)

gen = gender of respondent

age = age of respondent

ext = access to extension

edu = educational level of respondent

dis = distance to market

μ = error term

Fsize = farm size

agetree = age of the trees

price = price of cashew

group = group membership

fert = fertilizer usage

4.5. Summary of Variables Used in this Study.

Table 1 below provides a summary of the variables that were used in the model.

Table 1. Description of variables

Variable	Description	Measurement	Mean (Std. Dev)
Yield	Kilogram per tree	Kg/tree	8.1 (13.9)
Farm characteristics			
Farm size	The size of the respondent's cashew farm	Ha	1.6(1.3)
Fertilizer	Whether a farmer uses fertilizer or not	1 for yes, 0 otherwise	0.2 (0.4)
Age of trees	The average age of cashew trees	years	17.7 (13.0)
Pruning	Farmer practiced pruning of the cashew trees	1 for yes, 0 otherwise	0.8 (0.4)
Social and demographic characteristics			
Education	Level of education of respondent	0 for no formal education, 1 for primary and 2 for secondary,	1.1 (0.8)
Gender	Sex of the respondent	1 for male, 0 for female	0.7 (0.5)
Age	Age of respondent	Years	49.7 (22.4)
Institutional and external characteristics			
Extension	Access to extension services	1 for yes, 0 for no	0.3 (0.4)
Group membership	Member of farmer group	1 for yes, 0 otherwise	0.4 (0.5)
Market factors			
Price	Price per Kg of raw cashew	KES	61.6 (32.3)
Distance to market	Distance to the nearest cashew market	Km	5.6 (3.4)

The mean yield of the respondents in the farming period 2018 is 8 Kg/tree. In the coastal province of Kenya, most of the cashew producers are males which is about 65% of this study and 35% females. Also, most of the respondents attained a secondary level of education and pruned their farms in the farming period. The Cashew trees in the coastal province are aged.

The Pearson correlation matrix shows that there is no problem of multicollinearity in the variables that were used in the model. None of the correlation coefficients was 0.70 or more (see table in appendix).

4.6. Limitation of Study

I acknowledge several limitations which could influence the reliability of the results and findings. I do not have full control as to how the data was collected and this may influence the reliability and accuracy of the data.

Also, the cost of inputs and total harvested output values were approximate figures but not from their bookkeeping records and such the accuracy and reliability of these values may be affected.

5. Results

5.1. Description of Kenya Cashew Value Chain from Production to Export

Production of Cashew

Smallholders collect cashew from the ground and load it in jute sacks to small and mid-size trucks, which are typically organized by the middlemen. The cashew apples are thrown away to rot without any use in the field. Most of the respondents sell their cashew to brokers, and only a small minority sells them directly to the market.

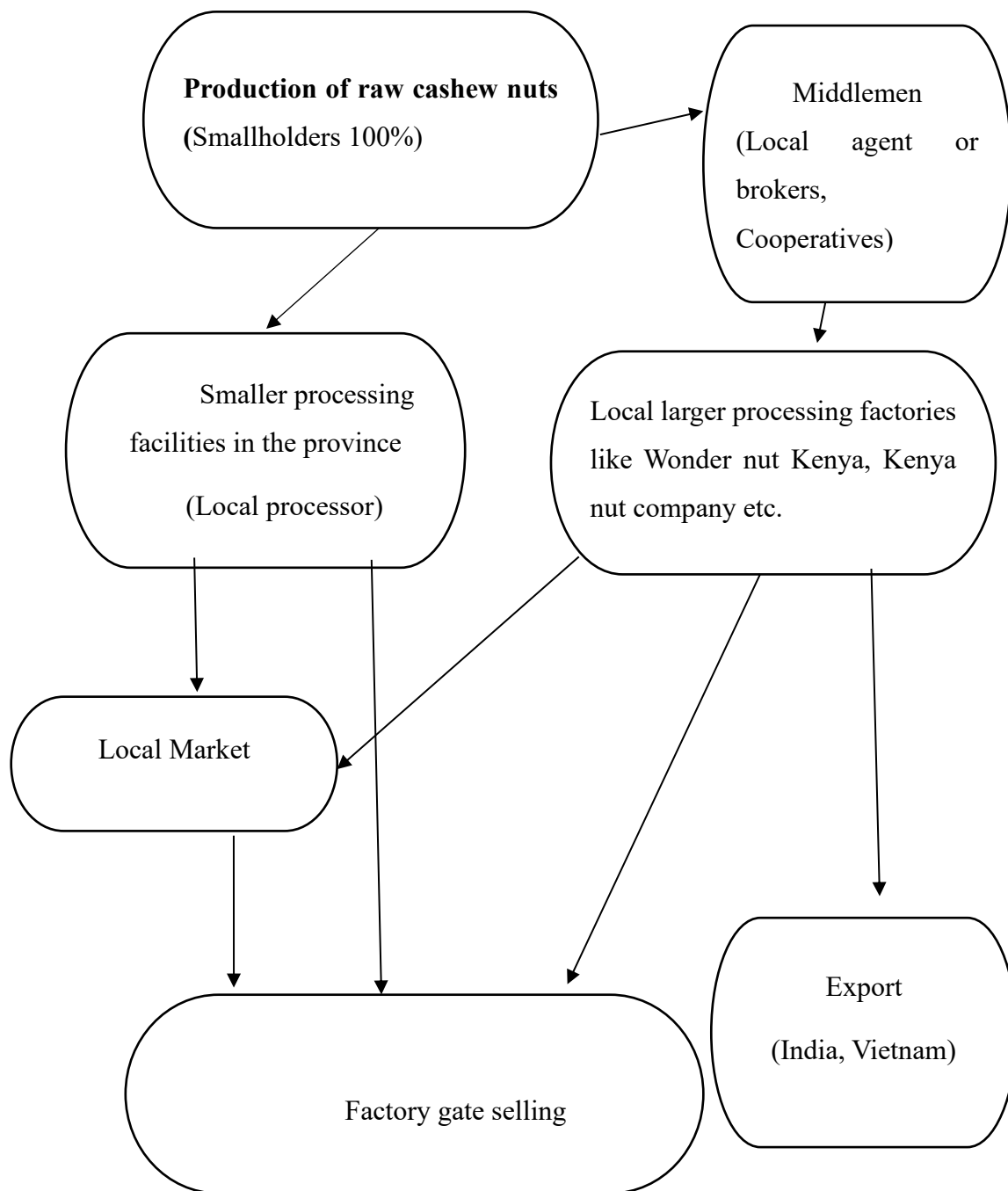


Figure 9. Kenya Cashew Local Value Chain and Its Main Stakeholders

Storing and Middle-Level Cashew Processing in the Coastal Province

The main harvesting of the raw cashew nuts is done for 8 – 10 weeks. Therefore, there is a need to purchase the entire crop from farmers within 12 weeks and store it in the warehouse for over 12 months for processing throughout the year before the new harvest. As the interview with one of the brokers revealed, presently the actors in the cashew subsector have inadequate working capital to purchase and store the entire crop.

There are several smaller and larger processing sites in the province. Smaller processing sites (small cottage industries) are usually owned by middlemen. They consist of very simple hand tools with limited processing capacity. Only a few nuts are steamed and peeled for the local market in these facilities. An example of such local broker (middlemen) that we interviewed is Teso Cashew nut Store and Processors, which trade with 1000 T/year. The owner uses a network of 30 agent-buyers, who operate in all the Coastal provinces from Kwale to Lamu. They receive a commission for each kg of nuts. They have no system of control of quality (or different pricing mechanisms) and some sort of grading is done only after the nuts are brought to the main store. The company then supplies all the major processors around. They sell processed raw kernels for 800 – 1000 KES/ kg. The company also operates a small processing unit.

Processing is the extraction of kernels from the shells through splitting (shelling). The shelling is either done traditionally or through industrial processing in a few bigger facilities. There are several industrial factories listed in Table 2. However, all of them seem to be operating below production capacity and their distribution and export are therefore limited. Our team couldn't visit any of those facilities for more detailed information.

Table 2. List of existing processing industrial factories in the Coastal province

Kenya nut company	www.kenyanut.com
Equatorial nuts processors	www.equatorialnut.com
Wondernuts Kenya ltd	www.businesslist
Jungle Africa	www.jungle.co.ke
Millennium management limited	
Kenya cashew nut limited	

Distribution

The cashew subsector has no stable logistical arrangements for distributing the cashew products at national, regional, or international levels. Even the medium size factories in the Coastal province do not have any sophisticated packaging, distribution, and marketing systems. There is no competitive brand name, which can be promoted. The present packaging equipment is not appropriate and adequate for international transactions. Most manufacturers sell cashew nuts ready for consumption at the factory gate only. Their customers usually buy only small quantities, and only a few buyers buy bulk volumes for local and regional shops. Sporadically, the cashew is sent to buyers in other provinces by sending the bags through small trucks or buses. Thus, the cashew subsector may benefit from professional expertise and logistical support to develop a cost-effective and competitive distribution system.

Building of Price within the Value Chain

Since the local value chains are seriously underdeveloped, the number of transactions is limited, and there are high transaction costs, the price building mechanisms are not functioning. The price of cashew nuts on the market is decided *ad hoc* by a few middlemen and processors and not by competitive market forces. The same is valid for the purchasing price of raw cashew nuts from farmers.

The price can vary slightly based on the quality. But usually, the processing sites buy whatever quality comes and only do sorting after the trucks bring the produce into the factory. Since there is no shelling done in communities, the processing industry must buy and transport all qualities and sizes of de-shelled nuts.

Prices of 1 kg of processed (raw as well as roasted) cashew nuts are around 800 – 1000 KES when nuts are sold at the factory-gate level. It is possible to buy local cashew nuts for example at the petrol station. For a 50g pack, the price is 90 KES (cashew PIMS Coastal Enterprise from Mombasa), or 50g for 110 KES (Out of Africa company, Nairobi). The price difference between farm-gate and retail price is, therefore, 20x times higher.

5.2. Comparing the Kenyan Cashew Value Chain with Ivory Coast and Tanzania.

The Kenyan cashew value chain as described in the first objective is simple and short and the communication is based only on personal contact. The Coastal province also lacks producer groups' development and popularity. Besides a few dairy and beekeeping cooperatives, functional marketing cooperatives are almost non-existent among farmers, and they exist only in memories of former members. The main problem frequently discussed in the interview with a representative of the Cooperative Union and Kilifi's cooperative officer was the lack of capital (also the membership contribution fees are very low).

Furthermore, the interviews with government officials revealed that the local government is not able to provide systematic support to the cashew industry. Besides two distributions of new seedlings (2008 – 50 000 seedlings; 2014 – 30 000 seedlings), there is no direct support of cashew farmers. In 2008-2009 the Ministry of Agriculture

established the Cashew Nut Revival Task Force composed of 4 national experts, which put together a comprehensible report and provided several important recommendations for the development of the cashew sector (Ministry of Agriculture of Kenya, 2009). However, this was the last initiative since then.

There is neither any active and wide-reaching national association of cashew producers, cashew commodity board nor any export promotion association, which is a common practice in major cashew producing countries.

5.3. The Tanzanian cashew value chain: Policy Interventions and Main Activities

Cashew nuts production in Tanzania is characterized by smallholders' farmers operating at subsistence level. Nevertheless, Tanzania is known to produce premium quality cashew nuts fetching higher prices in the world markets compared to cashew nuts from other countries in Africa. Such quality is attributed to favorable weather and soil conditions coupled with good agricultural practices exercised in the farms (Martin et al. 1997).

The Government of Tanzania assigned the Cashew nut Board of Tanzania (CBT) as a monitoring body. Tanzania is gifted with huge fertile and arable land where large plantations can be established to feed into processing factories and export markets. This opportunity is open to both local and foreign investors looking for areas to develop viable business ventures in agriculture. Furthermore, most of the production of cashew nuts in Tanzania is exported without being shelled. The main destination of exports is India where raw cashew nuts are either shelled for export or used in the country (Kilama 2010; Masawe 2011).

The labor force also provides Tanzania with a significant competitive advantage over other producers (Krepl et al. 2016). Figure 10 below shows the cashew value chain in Tanzania.

Furthermore, the warehouse receipt system being used in Tanzania was introduced in 2007 under the Agricultural Marketing Systems Development Programme (AMSDP). The scheme greatly promoted an improved marketing and pricing system of cashew in Tanzania, thus improving the incomes of farmers (Mashindano Oswald, Kayunze Kim, Lucia da costa 2011). According to William & Kaserwa (2015), the warehouse receipt system in Tanzania works effectively and the government has put in place regulation tools including the Cooperative Societies Act 2003 (currently Tanzania cooperative societies act 2013) and Cooperative Societies Rules 2004, Warehouse Receipt Act 2005, Warehouse Regulations 2006 and Tanzania Warehouse Licensing Board (WRS Regulations 2016.) to ensure a strong regulatory mechanism.

The warehouse operators accept the deposit of crops in the warehouses and provide a receipt to the farmers through primary cooperative societies and the farmers receive a part of the payments through bank financing based on these receipts (William & Kaserwa 2015; Kidando & Venkatakrishnan 2014)

Conclusively, the warehouse receipt system in Tanzania has resulted in the creation of an enabling environment for smallholder cashew farmers, the provision of proactive support to private operators, and farmers' cooperatives (organizations) and Non-governmental organizations who supply inputs and credit to smallholder farmers (Mashindano Oswald, Kayunze Kim, Lucia da costa 2011; Kidando & Venkatakrishnan 2014).

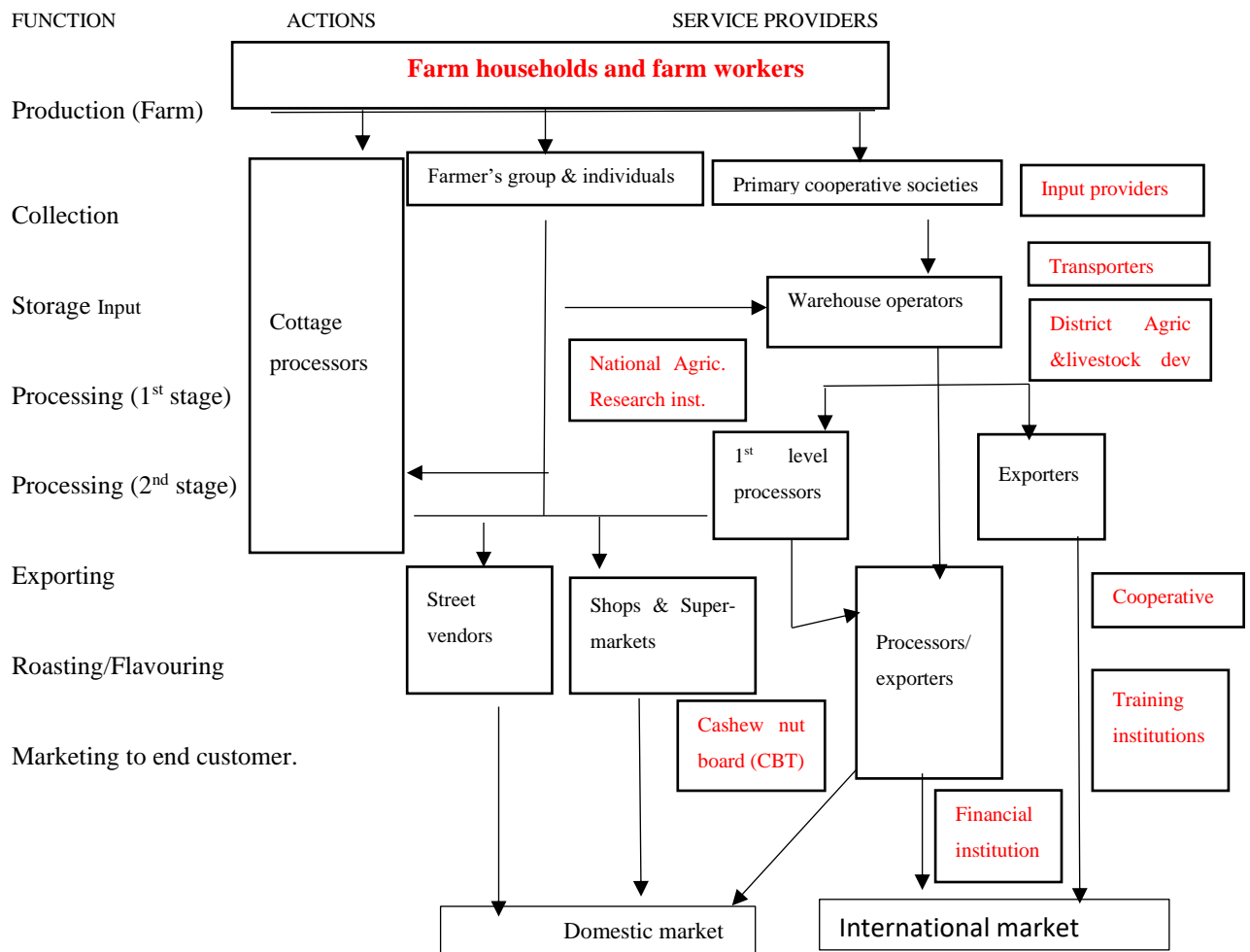


Figure 10. Cashew value chain in United Republic of Tanzania

5.4. The Ivorian cashew value chain: Policy Interventions and Main Activities

In Ivory Coast, the cashew sector is regulated by the Cotton and Cashew Council (Conseil du Coton et de l'Anacarde CCA). This council is designated to increase the local value addition in the sector. The council was tasked in 2013 to increase the rate of local processing and regulate the domestic value chain and create synergies between primary producers and buyers (Koné 2010; Tessmann 2020). The Cotton and Cashew Council (Conseil Coton Anacarde, CCA) projected total exports had hit 725,000 tonnes in 2016, although adverse weather conditions may have reduced the final harvest numbers. Figure 11 shows the cashew value chain in Ivory Coast.

The Ivorian cashew value chain is closely monitored by the CCA, they combine regulative and facilitative measures with public-private partnerships to ensure benefits for everyone on the value chain. They employ various measures to improve the quality of raw cashew nuts, they designate service providers to ensure quality control at the ports. Sometimes exports are even refused if the moisture level exceeds 10% (Obrist 2016; Tessmann 2017, Tessmann 2020).

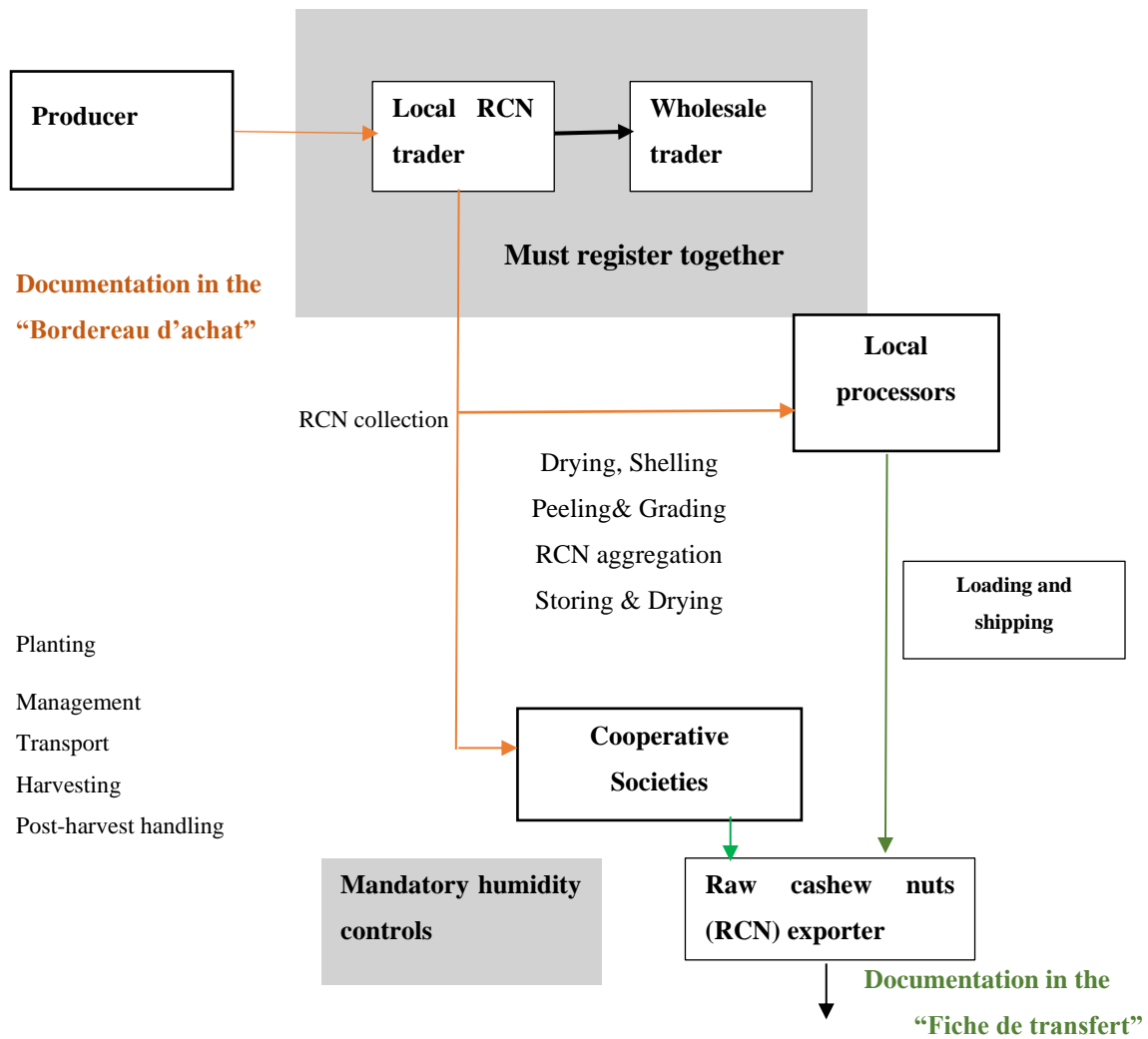


Figure 11. Cashew value chain in Ivory coast source:(Tessmann 2020)

Cashew production is still in its nascent stages in Ivory coast, with an estimated 95% of raw cashews export to Vietnam or India for processing. Even though some important international and domestic players such as SITA and Olam have built processing facilities in the country, there is a potential for expansion of value-added production. The government also announced plans to process 100% of Ivorian cashews in the country by 2020.

5.5. Comparing cashew production in Kenya with Ivory Coast and Tanzania.

Kenya must face several important competitors that have significantly improved their production capacities in recent years. In Figure 12 and following we can see some of Kenya's main African competitors. Ivory Coast and the United Republic of Tanzania were selected due to some recent dynamic changes in one of the indicators.

Ivory coast harvested about 130 thousand ha in 2001 (Figure 12), but in just 15 years, the harvested area is several times more than in Kenya. There is an increase to almost 1.6 million ha, the country achieved the ambition to increase the cashew nut production and value addition (Tessmann 2020).

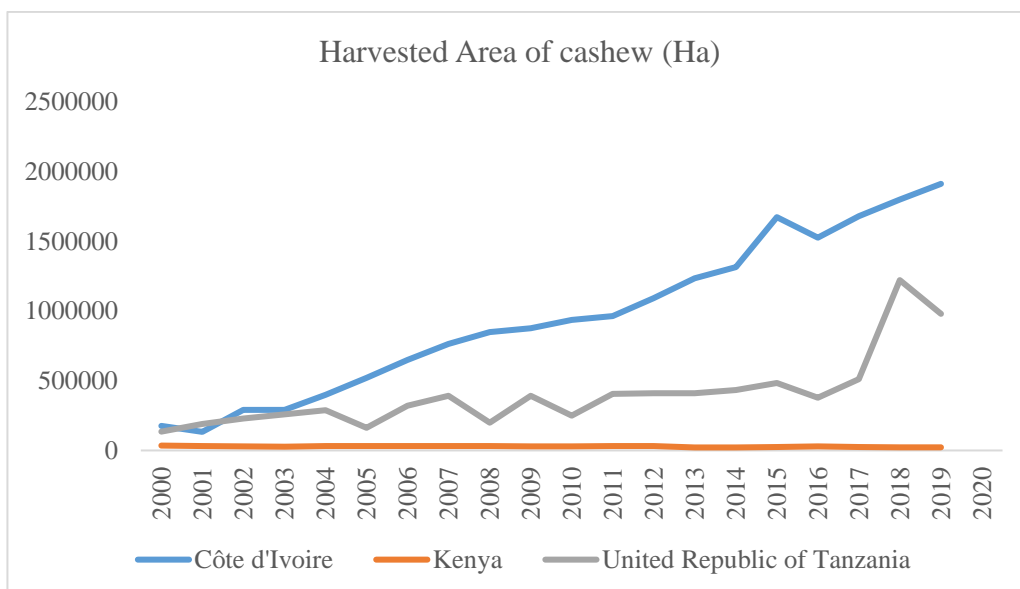


Figure 12. Harvested Area of Cashew in Ha (source: FAO, 2021)

Ivory Coast cashew nuts production reached 792678 million tonnes in 2019, compared to 377,780 tonnes in 2015 (Figure 13). The Government still aims to triple cashew nuts production over the next four to five years. In comparison to Kenya, this is a great success story (Kilama 2010).

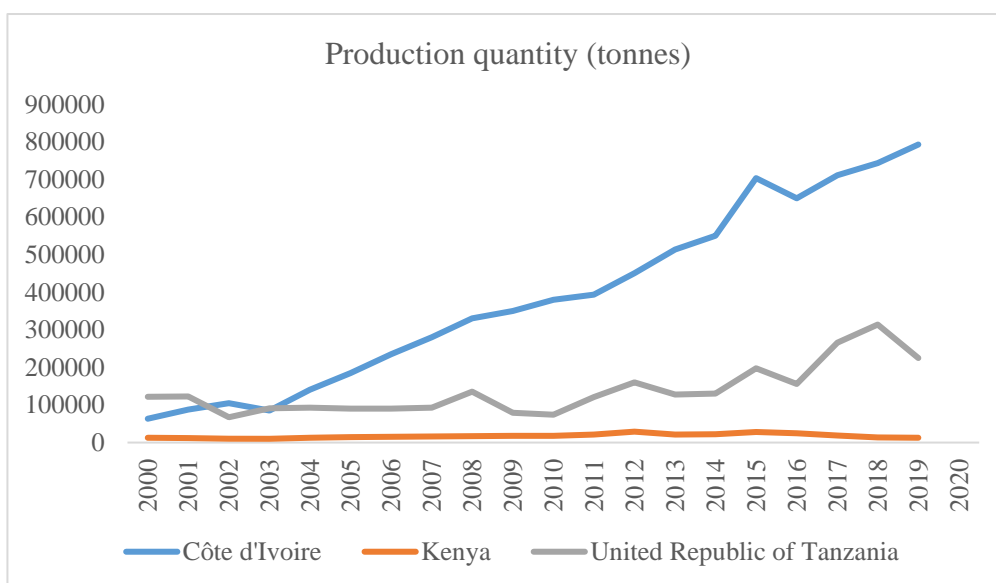


Figure 13. Production quantity of Cashew Nut with Shell (tonnes) (source: FAO, 2021)

The export value of the Ivory Coast is also about 10 times more than the export value of Kenya (Figure 14). The cashew industry in Ivory Coast has a long history of relationship with India and other major importers of cashew, the government regulates and ensures a well-organized structure of the cashew supply chain and proper regulation of the quality of cashew in the Ivory Coast (Tessmann 2020).

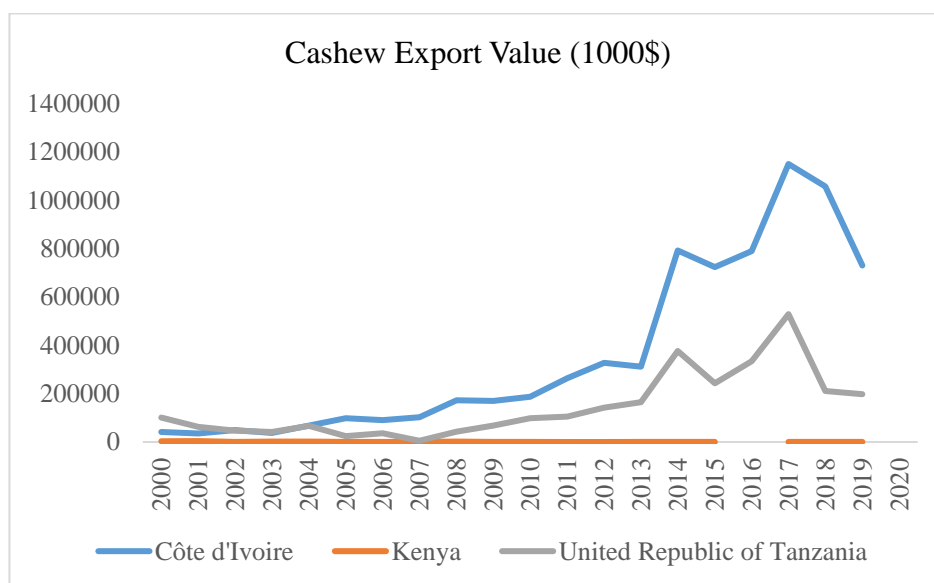


Figure 14. Cashew Export Value in 1000\$ (source: FAO, 2021)

5.6. Determinants of the Performance of Smallholder Cashew Farmers

5.6.1. Determinants of Yield of Smallholder Cashew Farmers

The OLS shows that farm size, age of trees, price of cashews, and group members have a statistically significant positive relationship with the yield of the cashew farmers (see table 3).

All the goodness of fit indicators shows that the ordinary least square regression is a good fit model. The R^2 of 0.575 shows that the model is a moderately good fit model (Israeli 2007; Akossou 2013), and the p-value of the model is significant at 1% probability.

Table 3. Multifactorial regression of factors that influence yield.

Yield (Kg/Tree)	Coef.	t-value	p-value
Farm size	-0.326	-0.46	0.648
Fertilizer usage	0.71	0.35	0.729
Age of trees	-0.14**	-1.99	0.047
Pruning	0.903	0.43	0.668
Educational level of respondents	-0.677	-0.56	0.123
Gender	3.101*	1.66	0.098
Age	0.108	1.55	0.575
Extension access	4.014**	1.95	0.011
Group membership	0.528	0.27	0.787
Price	0.075**	2.55	0.052
Distance to market	-0.06	-0.25	0.8
Constant	1.039	0.22	0.825
R-squared	0.575	Number of obs.	262
P-Value	0.000		

Note: ** and * represents 5% and 10% significance levels respectively

6. Discussion

The cashew value chain in the Coastal province is very short and underdeveloped with no dominant stakeholders fully controlling or governing the chain. Only a few farmers collect cashew from their trees and bring it for further processing to a few existing processing facilities. Most of the cashew is not harvested at all. The cashew market in general is very unorganized. Currently, the process involves simple linkages from farmers to processors (and sometimes exporters) through middlemen (local agents or brokers). The communication in the value chain is based only on personal contacts. However, the contacts are irregular, and they are formed *ad hoc* from the side of middlemen. There are no written contracts or agreements specifying trade conditions, quality, or prices in place. The lack of long-term and formal commitments is also a reason why the spread of knowledge and innovation in the supply chain is very limited.

The yield and production area of cashew in Ivory Coast and Tanzania are higher because the cashew value chain in these countries is supported by the governments, that is Cotton and Cashew Council (CCA) in Ivory Coast and the Cashew nut Board of Tanzania (CBT) in Tanzania. The council also ensures tight regulation of the domestic marketing system and puts measures in place to ensure fairness and income distribution while also strengthening linkages with foreign buyers and technology providers. Exporters are also restricted to purchasing cashew from licensed traders or approved cooperatives. This improves transparency and formalized inter-firm exchanges (Obrist 2016; Tessmann 2017, 2020).

Application of warehouse receipt system and regulations in the cashew value chain is essential for the cashew sector. The applications of these policies in Tanzania and the Ivory Coast have led to substantial development in the cashew value chains in the two

countries. For example, in Ivory Coast, to attract investment, the government is offering incentives to potential investors, these incentives will include the exemption of export taxes for any cashews processed locally. Also, in 2016 the government offered a bonus payment of CFA400 (€0.60) for every kilogram of processed cashew export, a measure which will be offered for the next five growing seasons, with the possibility of a two-year extension.

From the model, the average age of the tree also has a significant negative relationship with yield. It was highlighted by Bello et al. (2017) that age of tree play critical role in the output and productivity of cashew. There is however the situation where older trees are not able to produce more fruits hence productivity per tree is reduced. This implies older trees should be cut and be replaced with new ones since older trees tend to affect yield negatively. The results correspond to the effort made by the Kenyan government to cut all aged trees by giving the farmers new cashew seedlings.

Also, the gender of a farmer has a significant positive relationship with the yield of cashew. The significant relationship may be implied from the fact that there are more males in cashew production. Also, in terms of buying inputs and fertilizers, the males would have the resources to purchase as compared to the females. . Bello et al. (2017) and Onogwu et al. (2017) studies in Benin and Nigeria revealed similar results concerning gender and crop yield.

Extension access as an institutional factor has a significant positive relationship with the yield of cashew from the ordinary least square regression model. It can be opined that farmers who get access to extension agents receive training and knowledge about good cashew practices. Also, such farmers can discuss the problems they encounter in their cashew farm to extension agents who can easily recommend solutions or offer

suggestions about the best course of action. Wongnaa (2013) and Bello et al. (2017) studies also found a significant positive relationship between extension access and productivity of cashew.

In terms of the external factors, there was a significant positive relationship between the yield and the price of cashew. The result of price showing the positive relationship is consistent with (Mensah et al. 2012). The assumption is that a higher price for cashew helps the farmers to gain more income and this may serve as a motivation for them to plant more cashew trees. Also, a higher price would mean that the farmers can have the income to buy inputs such as fertilizer.

7. Conclusions and Policy Recommendation

The main aim of the study was to analyze the factors that influence the performance of smallholder cashew farmers in the coastal province of Kenya. The study further described the cashew value chain of Kenya and compared the performance of Kenya with Ivory Coast and Tanzania in the African context. The study operationalized the performance of cashew farmers as yield (Kg/tree). The multistage sampling technique was used to select 262 smallholder cashew farmers in the Coastal province of Kenya. The ordinary least square regression model was used to assess the factors that influence the performance of smallholder cashew farmers.

The description of the Kenya cashew value chain showed that the cashew value chain in the coastal region is a short chain with fewer activities and stakeholders. Production is done mainly by smallholder cashew farmers, processing by smaller processors and major local processing facilities in the province, marketing or selling to the local market, factory gate selling, and export market. The local chains are seriously underdeveloped, the number of transactions is limited, and there are high transaction costs, and the price building mechanisms are not functioning. Also, a few middlemen and processors decide the price of cashew nuts in Kenya but not by competitive market forces.

Comparing the performance of Kenya with Ivory Coast and Tanzania in the African context, Ivory coast is the highest performer followed by Tanzania in terms of the total cashew area harvested, production quantity of cashew, and export of cashew. Unlike Kenya, the governments of Ivory Coast and Tanzania have established councils responsible for the regulation of the cashew value chain. Also, there are incentives and policies such as a warehouse receipt system and bonus for processing cashew in Tanzania and Ivory Coast.

The results of the ordinary least square regression indicated that age of trees, gender, price of cashew, and access to extension services have a significant relationship with the yield of smallholder cashew farmers.

Based on the results of this study, the following recommendations are made:

- Age of tree is a very significant determinant of the yield of cashew and as such this study recommends that the government should provide new cashew seedlings and encourage the farmers to cut their very old trees since such trees cannot bear many fruits. One of the ways to achieve this is by transplanting the seedlings harvested from the cashew farm so that when the seedlings grow, the farmers can then cut the aged cashew trees.
- Since extension access and the price of cashew has a positive significant relationship with yield, the government should improve and increase the means through which farmers get in contact with extension agents. Also, agricultural extension agents should encourage the farmers to form agricultural cooperatives. Participation in agricultural cooperatives can provide the farmers with education and training on good agricultural practices, and the establishment of demonstration farms. Also, participation in cooperatives can help the farmers negotiate for better prices in the value chain. Furthermore, the government can oversee the cashew value chain by appointing a regulatory body like in the case of Ivory Coast and Tanzania. The government should also make an effort to adopt the warehouse receipt system in the cashew industry to help farmers get access to liquid assets easily by presenting the warehouse receipt to banks to obtain loans.

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