

The Potential Contribution of Value Chain Governance in the Reduction of Avocado Production Losses

**Case of Abogeta West Growers' cooperative association Ltd
Meru county, Kenya.**



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September 2022

Velp

The Netherlands

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TITLE PAGE

The Potential Contribution of Chain Governance in the Reduction of Avocado Production Losses
The case of Meru county, Kenya.

Research Project submitted to Van Hall Larenstein University of Applied Sciences,
In partial fulfilment of the requirements for the award of a master's degree in Agricultural Production
Chain Management, specializing in horticulture production chains

A research project submitted to
Van Hall Larenstein University of Applied Sciences
in partial fulfilment of the requirements for
the degree of MSc in Agricultural Production Chain Management,
specialisation Horticulture Chains.

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This research was carried out as part of the SIA-funded project "Food Waste Reduction and Food
Quality Living Lab (FORQLAB)"
of the professorship Climate Smart Dairy Value Chains.

By
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September 2022
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ACKNOWLEDGEMENTS

I would like to thank almighty God for his mercy, the miracles that He has done in my life and His protection of me and my family. My thanks go also to Nuffic which sponsored my studies in the Netherlands. My sincere gratitude is conveyed to all lecturers of Van Hall Larenstein, my course Coordinator Mr Marco Verschuur, all lecturers and my fellow students for their academic interactions and encouragement. I am very grateful to my Supervisor Professor Dr Rik Eweg for his commitment and nice guidance in thesis report writing. My thanks to the Government of Rwanda through the Ministry of agriculture and animal resources which allowed me to continue my studies and FORQLAB project for the financial and technical support during field activities. I convey also my appreciation to Abogeta West growers cooperative association Ltd and Meru University of Science and technology leadership for their assistance during fieldwork in Meru county and for accepting to take a valuable and bigger part of this research. Finally, I give my cheers to my family especially my three-month daughter NEZA HOGOZA Linda Elena and friends for their moral support during my study period. Thank you all indeed.

DEDICATION

To almighty God, the Most Merciful, for His divine protection throughout my studies and
To my beloved wife and daughter, I dedicate this thesis report!

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LIST OF ACRONYMS

3R: Robustness, resilience and reliability
AFA-HCD: Agriculture and food authority
CBI: Confederation of British industry
DFID: Department for International Development
DMC: dry matter content
FAO: Food and agriculture organisation
FAOSTAT: Food and Agriculture organisation statistic
FGD: Focus group discussion
FORQLAB: Food waste reduction and food quality living LAB project
GDP: Gross domestic product
Ha: Hectare
HCD: Horticulture crop directorate
HP: High production
IHEs: Institutes of Higher Education
KALRO: Kenyan agriculture and livestock research organisation
KEPHIS: Kenya plant health inspection services
Ksh: Kenyan Shillings
LP: Low production
MRL: Minimum residue level
MT: Metric tonne
NARIGP: National agriculture and rural inclusive growth project
NGOs: Non-government organisations
NL: The Netherlands
PCPB: Pest control and products board
SDGs: Sustainable development goals
USD: United States dollar
VHL: Van Hall Larenstein University of applied sciences
VTC: Vocational training centre
WPS: Work packages

ABSTRACT

The avocado production is considered as a main source of income for farmers who are Abogeta West growers' cooperative members in Meru County. In our days, the available previous studies showed that avocado losses account for 35% for the local chain and 15% for the export chain but there was a scarcity of literature showing the role of avocado value chain governance in that food loss and appropriate interventions. The document presents findings from a study to understand the potential contribution of value chain governance in the reduction of avocado production losses, identifying leverage points in the chain and appropriate and applied interventions for overcoming the gaps. The study was commissioned by the FORQLAB project together with Abogeta west growers' cooperative association Ltd. The chain governance was analysed by using the 3Rs stand for the robustness of value chain, reliability of institutional governance and resilience of innovation system.

The study design was a qualitative approach which used both data from desk and field research. Primary data were gathered from individuals, FGDs, and key informants' opinions through semi-structured interviews and research observation have been also considered. Secondary data have been applied in data triangulation to get reliable results. Avocado inputs suppliers, producers from Abogeta and Aboduguci cooperative members and other individual producers in Meru County and cooperative management team, brokers, middlemen and retailers were the major target group for the study. 28 interviews have been conducted in which 20 were farmers selected by classification of cooperative members based on gender and number of avocado trees owned followed by combined purposive and snowball methods and 8 were other important actors in the chain in the region. 11 Key informants from public and private institutions representatives were consulted and interviewed.

Data gathered were analysed by using different qualitative analysis tools notably chain map and business concept, grounded theory, PESTEC, SWOT, stakeholders' matrix and sustainability profile. The findings are presented in photos, texts, figures and tables.

The general observations findings on the robustness the of avocado value chain show that all necessary actors, supporters and enablers are present. The only gaps are in chain actors' coordination where only 30% of avocado farmers are members of cooperatives which are also young and avocado chain stakeholders do not have an active platform for empowering farmers and stimulating smooth information and product flow and strong and formal relations. There is no availability of adequate transport and storage facilities which can play a crucial role in the reduction of avocado production losses at the farm level. The research results show that the reliability of institutional governance faces challenges regarding policies and laws awareness and low supply of licenced Hass seedlings which pushes farmers to plant none licenced ones produced locally, thus, avocado quality and standards are in danger and informal at the farm level due to the chain supporters who have a shortage of staff, and this can affect the harmonisation processes. The study findings found that farmers claim to receive an insufficient and adequate extension and feel not allowed to receive financial services. The chain is not inclusive because only 4% of cooperative members are women and young people are only involved in broking and picking activities, this shows the inaccessibility of women and youth to production factors. In addition, the average age for men is 70 years old, thus, avocado value chain sustainability is in danger. All identified leverage points need to be ameliorated through partnerships.

Based on the study outcomes, the researcher recommends Abogeta cooperative and FORQLAB to play a key role in the application of proposed applied interventions which are in the 4Cs model that focuses on upgrading and sustaining: Chain coordination, Cooperative business model, Cooperation and strengthening stakeholders' platform and Control of temperature and humidity of avocado production.

CHAPTER I. INTRODUCTION

1.1 Back group information of avocado chain in Kenya

Avocado production and consumption have increased significantly in recent years, with a consistent expansion into new markets worldwide (Kourgialas, 2021). Kenya is regarded as one of the economic powerhouses of Eastern Africa, with the agri-food sector accounting for 34% of total national GDP and 65% of all export-related earnings, including avocado export earnings. More than 80% of Kenya's population is directly dependent on agriculture for food and income (Snel et al, 2021; IRERI et al, 2021).

Local, Hass and Fuerte are avocado varieties grown in Kenya. Hass is the most preferred variety in the international market, due to its long shelf life and less vulnerability to physical damage and susceptibility pests and diseases. Hass variety fetches higher prices on average (KES2.55) than Fuerte variety (KES1.55) Mwambi et al, 2016).

Kenya's economy is principally based on agriculture, with smallholder farming playing a significant role. Rural areas, on the other hand, have the highest concentrations of poverty and food insecurity. Furthermore, most farming activities in Kenya are on a small scale, and their problems are multifaceted, including sub-divisions and small farm sizes, resulting in diseconomies of scale and low productivity (IRERI et al., 2021), which is the same situation for the avocado chain. The avocado sector is one of the key areas for horticulture sector development in Kenya and it is prioritized in a series of development policies and county-level investments. Kenya is the world's seventh-largest producer of avocados and ranks eleventh on the list of largest exporters (World Bank, 2019; Imani, 2019). Since 2017 Kenya is Africa's leading avocado exporter (Avocado Society of Kenya, 2020). Avocados produced in Kenya are in high demand locally, regionally and internationally. Avocados are grown in several agroecological zones in Kenya, mainly by small-scale farmers, who grow them for subsistence and/or to sell in local and export markets.

According to FAOSTAT (2020), the area under avocado farming was 24,447 ha with 322,556 MT of production. Kenya is the first avocado producer in Africa seconded by Ethiopia with 245,336 MT and the third in South Africa with the production of 98018 MT (Figure 1).

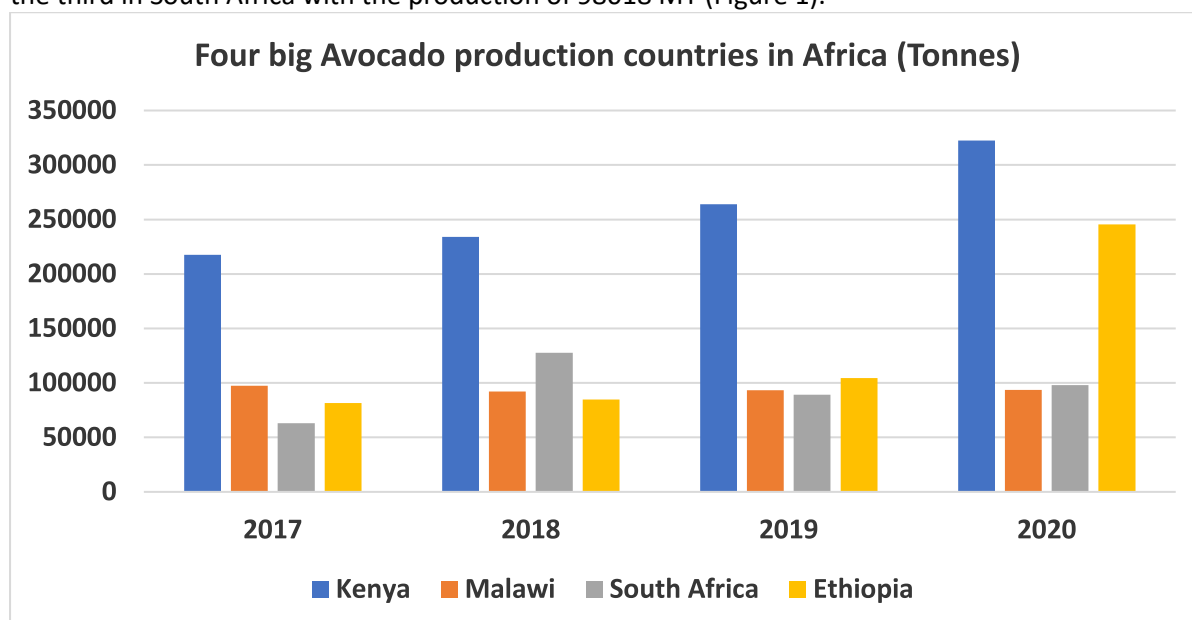


Figure 1: Four big African avocado production countries

Source: FAOSTAT, 2020

Figure 2 shows the avocado production market in Kenya. The vast majority (approximately 70%) is consumed domestically, while the remaining 30% is either freshly exported or processed. Commercial, marketable output (Hass variety) is estimated to be between 60,000 and 90,000 metric tonnes (produced on 7,500 hectares). As shown in Figure 3, 30% of avocado exports are transported to Europe (the Netherlands, France, and Spain). The Middle East, China, and India are also expanding export markets (World Bank, 2019).

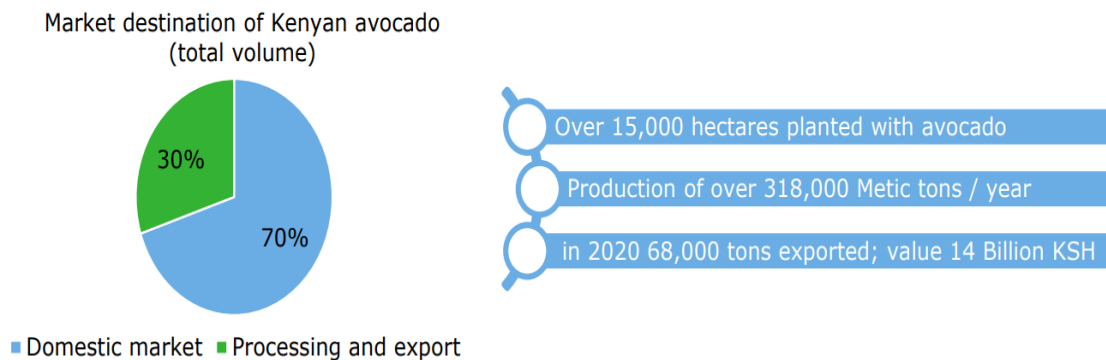


Figure 2: Avocado production market in Kenya
Source: Snel, et al., 2021

Figure 3: avocado production import countries from 2010 to 2020 in metric tons.

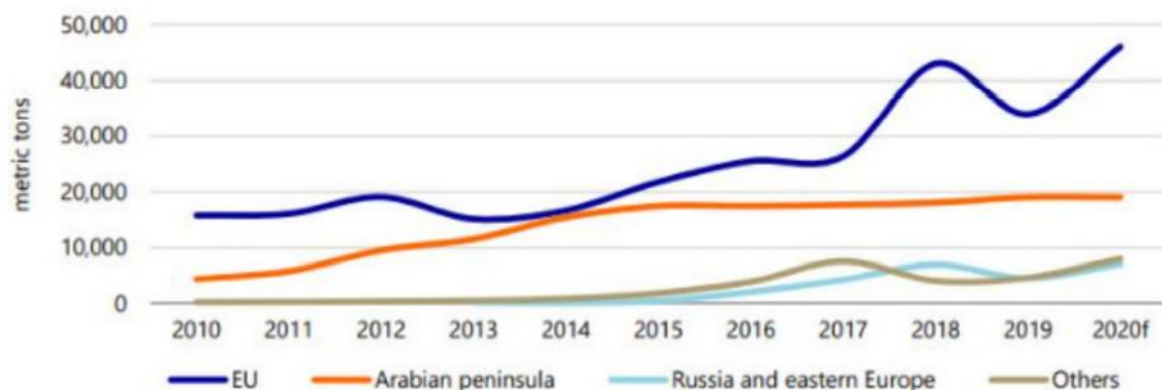


Figure 3: Avocado production import countries in metric tons
Source: Snel, et al., 2021

According to Mwambi et al. (2016), participation in export markets has positive effects on encouraging smallholder farmers to produce high-quality avocado production which is vital in increasing incomes and meeting their customers' requirements and hence alleviating poverty, in Sub-Saharan African countries including Kenya. However, the avocados from Kenya have poor quality mostly due to the inadequate knowledge of modern production practices on the part of smallholder producers, who have traditionally grown their trees for domestic markets or non-commercial purposes, and to the limited dissemination of market-preferred varieties. Avocado markets are poorly organised, most smallholder producers sell their products through middlemen, who may be legally certified, agents, or illegal brokers.

1.2 Research commissioner and FORQLAB project description

The research commissioner was Van Hall Larenstein University of Applied Sciences (VHL).

VHL is the most sustainable-friendly university of applied sciences in the Netherlands. VHL prepares students to be elevated, ambitious, and innovative professionals who help to improve the world. VHL gives direction to our education and research for the period 2022-2025 with the Strategic Plan of growing as experts in transition. In this context, VHL, in partnership with other NL and Kenyan universities of applied sciences, leads the implementation of the project, food waste reduction and food quality living LAB project (Annex 1).

Using the SDGs as a guide, the Living Lab project contributes to sustainability at VHL University of Applied Sciences. The SDGs as Compass method facilitates dialogue among stakeholders to reveal and reflect on their underlying assumptions and beliefs about sustainable development, detects blind spots, and has the potential to align strategies with sustainability transitions. Living Labs have been launched its Living Labs in 2012, most of them are in the Netherlands and were established in collaboration with partner universities.

Although various types of Living Labs exist among institutes of higher education (IHEs), the majority is defined as learning configurations in physical or virtual realities involving multiple stakeholders collaborating for the creation, prototyping, validating, and testing of new technologies, services, and products in real-life contexts (Maas et al., 2017). Witteveen et al. (2016) identified four design principles: 1. Encouraging inclusive 'quadruple helix' participation by multiple actors 2. Establish authentic learning environments centred on a sustainable future. 3. Increasing the reflexivity of learning and innovation for long-term sustainability 4. Make interaction, knowledge sharing, and open system management easier. The living Lab approach is used in business-to-business transactions and involves stakeholders. The private sector, government organisations, community-based organisations, and knowledge partners collaborate in applied research for sustainable development under the Living Lab approach. This will result in ongoing learning networks with partners active in Kenya's value chains.

The FORQLAB research is conducted in Kenya with Van Hall Larenstein (VHL) as project coordinator, working with a consortium of universities (2 Kenyan, 4 Dutch), commercial sector players, organizations supporting those chains, and associate partners who help the category through co-financing, guidance, and reflection. In addition, VHL students participated in the project by linking their research thesis to the dairy and avocado value chains in Kenya.

The consortium wishes to contribute to the structural reduction of post-harvest and food losses, as well as the improvement of food quality in Kenyan avocado and dairy value chains, using technical solutions and tools, as well as improved chain governance competencies. For both commodities, the FORQLAB project focuses on two places in Kenya: a rather well-developed chain in the central highlands (Meru and Kiambu counties) and a less-developed chain (Nandi and Bungoma counties) in Western Kenya.

The researcher contributed through thesis research to find out the leverage points in avocado value chain governance and to make suggestions to the project appropriate applied interventions for future chain improvement and governance competencies. This research was carried out in Meru County together with other two researchers (Angeline Atieno ONYANGO and Harriet ESEKENYE) who worked on the quantitative part of an avocado food loss audit and scaling mechanisms respectively. The project research aimed to contribute to the development of chain governance solutions and tools to be applied in business-to-business models as well as improved avocado chains.

The applied research was carried out in collaboration with all partners, with students from the consortium institutions doing most of the field studies and the other partners supporting and interacting according to the WPS. The following outcomes were anticipated: two knowledge exchange platforms (Living Labs) supported by hands-on sustainable food waste reduction implementation plans (agenda strategy); an overview and proposals for ready ICT and other tech solutions; communication and teaching materials for universities and TVETs; action perspectives; and knowledge transfer and uptake.

1.3 Problem statement

According to Snel, et al., (2021) food losses were 35% for domestic and 15% for export avocado chains and post-harvest losses are predominantly concentrated during the first mile after harvest (20%), and an additional 10% of losses occur during transport and packaging. Major causes of loss are improper handling, pest and diseases, and product deterioration due to lack of temperature-controlled storage and pre-cooling. All the constraints in the avocado value chain are affecting producers who are cooperative members of Abogeta West Avocado Growers Cooperative Society Ltd and Abuduguci avocado growers' cooperative society Ltd and other individual producers in Meru County. The main problem is there is a scarcity of information on the avocado value chain governance part and its role in avocado loss reduction in Meru County, Kenya.

1.4 The research objective

To assess the avocado value chain to identify leverage points in the chain governance and sustainability impact among producers for designing and recommending appropriate mitigation interventions to avocado cooperatives in Meru County and FORQLAB project for improving quality and reducing avocado losses and resulting in a sustainable avocado value chain.

1.5 Research question

1. What are the leverage points in the avocado value chain governance to reduce avocado losses?

- 1.1 What is the robustness of the avocado chain?
- 1.2 What is the reliability of institutional governance in the avocado value chain?
- 1.3 What is the current situation of the avocado chain support system?

2. What is the current status of avocado value chain sustainability aspects in terms of people, planet and profit for implementing SDGs goals in Meru County?

- 2.1 What are the chain actors' views of access to financial services and prices?
- 2.2 What is the status of the chain activities towards the proper use of chemicals, technology, disposal of waste and planet-friendly production methods?
- 2.3 What is the extent to which women and youth are involved in the chain and the contribution to food security among smallholder producers?

1.6 Definition of terms

Value chain: The whole range of operations required to bring a product (or a service) from the origin, through various stages of production; to delivery to final consumers and disposal after usage is referred to as the value chain.

Chain actors: Those participating in the production, processing, trading, or consumption of a specific agricultural commodity are known as chain actors.

Chain Governance: The structure of links and coordination mechanisms between value chain actors. It is described in terms of 3R (Robustness of the value chain, reliability of institutional governance and resilience of innovation support system) (Redemaker et al 2016).

Robustness of the chain: It refers to the efficient and trusted interactions, reducing transaction costs and the risks involved in enhancing product quality and safety and reinforcing the sustainability of value chain actors' relationship (Rademaker et al. (2016); Bebe et al, 2018).

The resilience of innovation support system: This is knowledge exchange, mobilising resources and coordinating co-innovation networks, supporting technical and technological, or institutional capacity development.

Food loss: Defined as a decrease in the mass/ dry matter or nutritional value /quality of food intended for human consumption. Inefficiencies in food supply chains, such as poor infrastructure and logistics, a lack of technology, inadequate skills, knowledge, and management capacity of supply chain actors, and a lack of market access, are primarily responsible for these losses and natural disasters also play a role (FAO, 2013).

Reliability of institutional governance: It is defined as how public-private cooperation, co-innovation and a public economic policy framework. I am all about policy and policy harmonisation.

Chain Sustainability development: is defined as chain development that meets the current needs of the chain without compromising future generations' ability to meet their own.

Chain stakeholders: It is described as any individual or group of actors, supporters and influencers who can affect or are affected by the achievement of the organisation's purposes. The stakeholders are people who have a vested interest in the result of a planning process or project. Organizations, groups, departments, institutions, networks, and individuals can all be considered stakeholders (FAO, 2006).

Market institutions: They are norms, rules, regulations, policies or services that shape how farmers and traders interact and are involved in the reliability of chain governance.

Chain Product flow: It is a system of interconnections between players in which no formal or informal interactions are required or desired, excluding when goods, services, and financial contracts are exchanged.

CHAPTER II. LITERATURE REVIEW

This chapter reviews other scholars' work on value chain governance, its potential contribution to reducing avocado production losses, and the negative and positive elements that affect avocado value chain governance. The material in this chapter allows the researcher to draw conclusions and appropriate recommendations about the subject.

2.1 Origin and production of avocado

Avocados are thought to have originated in Central and South America (*Persea Americana* Mill) (Chen, et al., 2009). The three subspecies are Mexican for sub-tropical, Guatemalan for semi-tropical and West Indian for tropical (Wasilwa et al., 2006). Kenya grows Fuerte, Hass, and Pinkerton cultivars, as well as some native types, for commercial purposes. Kenya is the world's seventh-largest producer of avocados and the eleventh-largest exporter (World Bank, 2019). The Portuguese imported avocado plants to Kenya in the 1930s for subsistence usage and commercial avocado growing began in Kenya in the early 1960s (Griesbach, 2005). Avocado is farmed by small-scale and large-scale growers across Kenya's many agroecological zones for subsistence, local markets, and export.

Avocados are high in nutrients like monounsaturated fats, dietary fibre, potassium and magnesium, as well as phytochemicals (Guan, 2021). Avocados are eaten fresh, squeezed for oil, and used in dessert drinks, guacamole, and salad dressings. Domestic avocado consumption in Kenya is around 1-2 kg per person per year, and it is rising as the public becomes more aware of the advantages of avocados. The fruit is high in palmitic, oleic, palmitoleic, and linoleic acids, as well as lipids (Lu et al., 2009). This fruit is abundant in minerals and vitamins and has twice as much protein as other fruits (Dreher, 2013, Schafer et al., 2013).

Avocado production is conquered by smallholder farmers who account for 85% of all avocado growers in the country. Kenya is a major avocado supplier to the European Union. Although Kenya has a distinct advantage over many other avocado exporting countries due to its production season, it also benefits from lower shipping costs than its African opponent, South Africa (Mulwa, et al., 2019). Avocados are grown in the Central and Eastern United States, with the former being the largest producer. Hass (20%) and Fuerte (20%) are the most common avocado cultivars grown at 80%. Hass varieties account for approximately 20% of exports, while Fuerte varieties account for 10% (Horticulture Validated Report, 2014). Avocado farmers are shifting production from Africa to the United States and Fuerte was changed to Hass in response to a shift in demand in the western European market, which favours ready-to-eat Hass avocados. Production is the key activity in the avocado sector's value chain, followed by cultivation, storage, sorting, packing, transportation, and marketing sales.

Kenya is a main avocado supplier to the European Union. Although Kenya has a distinct advantage over many other avocado exporting countries due to its production season, it also benefits from lower shipping costs than its African opponent, South Africa. Kenya's agricultural sector is the most important economic activity (Krell, et al., 2021).

In the past five years, Avocado production and area under farming are gradually increased. FAOSTAT (2021) states that the production area under avocado farming increased from 10,305 ha to 24,447 ha and production increased from 176,045 MT to 322,556 MT which means a decrease in productivity from 17.2 to 13.5 MT/ha. The study aimed to know the current position of the avocado chain governance in the scenario stated by the literature above.

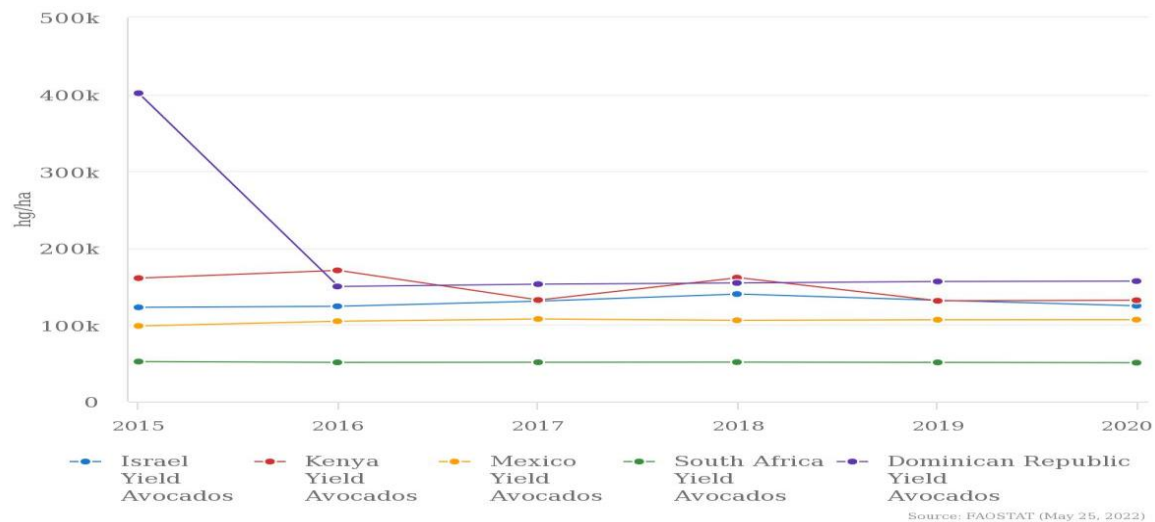


Figure 4: Avocado production in the World
Source: FAOSTAT, 2022

2.2 Value Chain Governance

Chain governance refers to the power dynamics between enterprises in a production network (Havice & Campling, 2017). Governance refers to the ability to regulate what happens in a value chain, including the policies that govern how chain operations are carried out as well as cross-stakeholder cooperation. An agreement that binds chain participants, product standards, self-regulation in value chains, government regulatory frameworks, and unwritten rules that determine who can join the chain are all examples of value chain governance.

The ability to exercise control along the value chain for a specific goal is what value chain governance is all about (Dietz, 2010). The concept of robustness, resiliency, and relevancy (3R) is used to define avocado chain governance. It focuses on strategies to strengthen the supply chain, partner cooperation, and trust, as well as reduce transaction costs (Trienekens, et al, 2007). Furthermore, governance is concerned with power and the ability to impose control at any point along the supply chain, as well as the connected issue of how much of the marketing margin is taken. It also refers to the organisations, institutions, and regulations, as well as the enforcers who create the rules (Engelin et al, 2013).

2.3 Robustness of avocado value chain in Kenya

The robustness of a supply chain is defined as "the extent to which the supply chain can carry out its functions despite some damage done to it" (Madzimore, 2020). KIT and IIRR (2008) argue that farmers seek to increase their position in the supply chain so that they may become full partners. This entails gaining more control over the structure of the chain. They require improved price and market information, as well as training, to make informed decisions.

2.3.1 Chain actors' relations

This topic depicts chain actor interactions and arrangements. Chain relations are about the organisation, trust, open communication, and collaboration for mutual development between two or more actors in the chain (KIT and IIRR, 2008). Strong chain relationships result in lower transaction costs and other hazards that stymie chain development. It is defined as a legal contract in which parties agree on production quality and quantity, delivery frequency, and payment methods to improve commercial cooperation (KIT & IIRR, 2008). Chain relations refer to the business relationships that exist between the many actors in the chain. According to KIT and IIR (2008), if suppliers and merchants agree to enhance their relationship, all stakeholders in the value chain will gain more.

2.3.2 Information flow

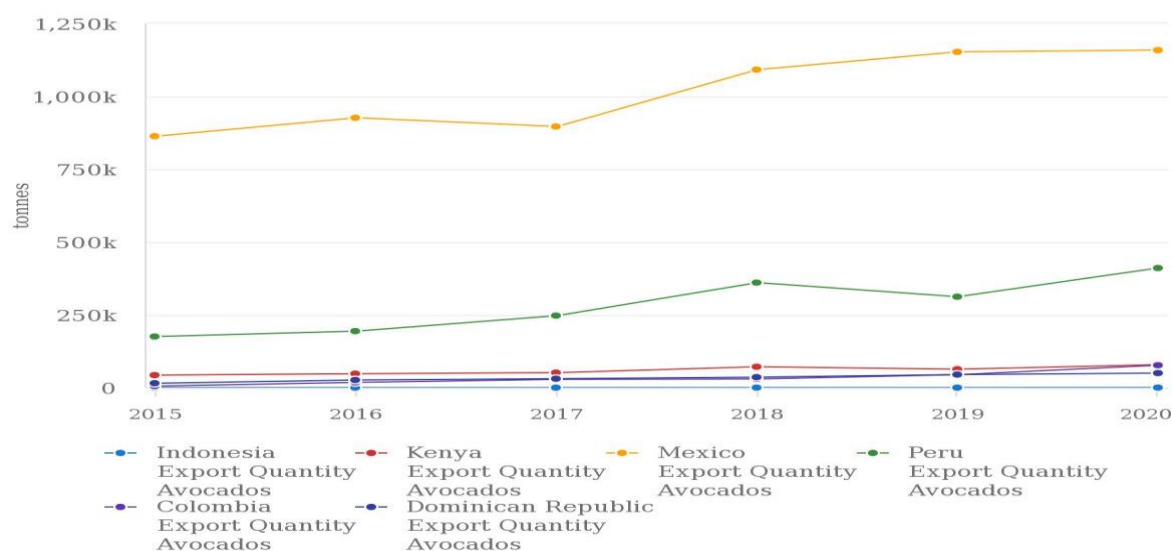
Good adequate information is vital when any business entity is dealing with perishable products. It shows the information flow from input suppliers to consumers (the end market). It shows how information flows between chain actors and supporters, the purpose of information flow is to improve the quality of the product and strengthen the relationship between actors themselves and enablers and supporters. In the value chain, most of the information shared between actors and supporters is extension services, price, volume of production to supply, production cost and season, money flows, market, production quality and standards and traceability.

2.3.3 Value share among actors

The avocado value chain's value share distribution among chain players analyses cost and margin to see if the business is a good source of revenue for smallholders or if each actor in the chain can afford it. Financial tendencies in the chain ensure future potential growth, both economically and for the disadvantaged. Economic growth boosts the incomes of all actors in the chain, but pro-poor growth results in higher gains in income and wealth for smallholder farmers (DFID, 2008). Farmers' profit margins have an impact on corporate profitability, and a larger net profit margin indicates that a company is good at converting sales into profit (Wilkinson, 2013).

2.3.4 Chain product flow

Farmers cannot sell their products if they do not know what buyers want or if no one knows about or is interested in what they have (PABRA, 2015). Avocados have become increasingly popular among middle- and upper-income groups in developed countries over the last two decades, resulting in a surge in global demand (Lourentzatos, 2021). They are a popular component on restaurant menus and recipe websites all around the world, whether spread over toast or tacos or transformed into sweet delicacies like ice cream and smoothies. Avocados have gone beyond their use as a health food and a favourite Super Bowl snack in the form of guacamole to become a vital ingredient in skin care products and a trendy theme in fashion and home décor.



Source: FAOSTAT (May 25, 2022)

Figure 5: Avocado export quantity for six world's top producers

Source: FAOSTAT, 2022

2.3.5 Availability and accessibility of transport and storage services

According to Paciarotti and Torregiani (2021), logistics is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods, including services and related information, from the point of origin to the point of consumption for meeting the needs of customers. Logistics encompasses customer service, transportation, storage, plant site selection, record control, order processing, distribution, procurement, materials handling, return goods handling, and demand forecasting (Lehmann, 2012). All processes include inbound, outbound, internal, and external movements. The goal of logistics is to meet market demand at the lowest possible cost and with the best possible use of capital, though also rising long-term relationships with customers (Houwens, 2021).

According to Kumar et al. (2020), the large number of intermediaries is a challenge for this sector because it complicates all processes. This study concentrated on avocado production transportation and storage services and their availability and accessibility, as well as how cooperatives and intermediaries are involved, to suggest an improved logistics strategy.

2.3.6 Farmer cooperatives

According to Bernard and Spielman (2009), farmers' cooperatives are among the most important formal organisations, and they are intended to be inclusive, as evidenced by a mandate to deliver services that are indispensable and beneficial to most rural households. The membership criteria allow any interested household to join the cooperative and a governance and management structure that encourages participatory decision-making. Farmer cooperatives may encourage agricultural technology adoption, increasing crop productivity and farmer income (Zhang, et al., 2020). Even though the evidence is always presented in the context of the developing world, cooperative membership is positively related to price, yield, quality, input adoption, and overall income. While encouraging, evidence of an unequal allocation of gains between small and large producers is developing. Almost all farmer cooperatives had open membership, one member one vote, and equity redeemability (Grashuis, 2019). Governments, non-governmental organisations, and other development agencies can successfully reach rural poor farmers who have dispersed thanks to this inclusive design.

Table1: Cooperative description of the impact on community development

<i>Key characteristics of the cooperative</i>	Rural development focus	Development and business focus	Business focus
<i>Main values</i>	Solidarity	Solidarity and Efficiency	Efficiency
<i>Orientation</i>	Community	Community and Market	Market
<i>Membership</i>	Open	Semi-closed	Closed
<i>Inclusiveness</i>	High	Medium	Low

Source: Bijman and Wijers, 2019

Avocado producers, exporters, and other value-chain participants in Kenya recently formed the Avocado Society of Kenya. The society's goal is to foster collaboration among value chain stakeholders and acquire access to new export markets (Snel, 2021).

2.4 Resilience of innovation in the avocado value chain

The value chain resilience is all about the chain innovation systems like knowledge exchange, technical support and capacity development.

2.4.1 Extension services

Agricultural extension services have been widely adopted as an institutional input for modernising agriculture and supporting rural development around the world. The agricultural extension services are the full collection of organisations that facilitate, and support people engaged in agricultural activities to solve difficulties and gain information, skills, and technology to improve their livelihoods and wellbeing. Extension services give timely and appropriate information that can help farmers solve problems and make better decisions in the field (Kassem, et al., 2021).

2.4.2 Financial, research, ICT and business plan services

Buyers and sellers are constantly in need of funds, whether for their enterprises or their families. They frequently offer each other informal credit if they know each other well. These loans flow up or downstream in the system, depending on market conditions. Traders may accept agricultural items on credit during harvest season when there is enough produce. During the lean season, when supplies are few, dealers may offer farmers advance money in exchange for the opportunity to purchase their products. These supply chain credit flows keep the firm rolling, which is in both the buyer's and seller's best interests. Formal financial institutions, such as banks, can help to facilitate agricultural trade, such as the avocado chain. To make a loan, banks demand their clients, particularly farmers, to have collateral (a large asset and land). Traders frequently have bank accounts, but due to a lack of collateral, they have difficulty obtaining loans. Microcredit programmes may be a viable option for some, but their reach is limited, frequently limited to urban areas, and they charge rather high-interest rates. One of the major constraints limiting the extent of business transactions and enterprise growth is the scarcity of formal financing for agricultural trading (KIT & IIRR, 2008). In this study, the researcher focused on availability, access and requirements for avocado chain actors to get financial, research, ICT and business plan services.

2.5 Reliability of institutions in the avocado value chain in Kenya

Chain reliability refers to collaborations between avocado value chain actors, supporters, and influencers/enablers. Stakeholders in the avocado value chain include actors, supporters, and influencers. These include input suppliers, small, medium, and large-scale avocado producers, bulk marketers, exporters, retailers, exporters, and consumers. Supporters of the avocado value chain are stakeholders who are not directly involved in seed production and its transition, but they contribute significantly to the product's value. However, the influencers of the avocado value chain are the regulatory institutions, certification agencies, and policymakers (Bitzer, 2015).

2.5.1 Policies and quality standards

The avocado industry is one of Kenya's most important areas for horticulture growth, and it has been prioritised in several development strategies and investments at the county level. Government support, in the form of targeted investments and enabling regulations, has been critical in developing and integrating the industry both horizontally and vertically, resulting in higher product quality, increased productivity, and the creation of a favourable environment for exporters. Kenya established a seedling nursery at the county Agricultural Training Centre to encourage the adoption of marketable types by selling seedlings for KSH 120 per piece and avocados are purchased by several exporters in Meru (Snel, 2021).

Standardization When someone buys food, they want to be certain of the quality, quantity, and safety of the product. The institutional procedures in place in Africa to assure accurate labelling, quality grading, objective weighing, and food safety are frequently insufficient (KIT and IIRR, 2008). Exporting agricultural products to North America and Europe requires high competition; the requirements related to food safety and phytosanitary standards should pass the Minimum residue level related to pesticide use (MRL) and be checked and certified for phytosanitary by a competent authority or supplying countries have an agreement with the destination country (Coronado, et al., 2015).

Extrinsic characteristics of the product, such as form, colour, size, weight, and flaws, are used in a variety of commercial quality distinction methods for perishable products. Avocado postharvest quality and shelf life are controlled by a variety of factors, including temperature, which rises during the ripening process, and avocado production of ethylene (Wright, et al., 2013). When actors utilise a carton with a poly sheet after the ripening phase, the avocado shelf life might be impacted by packing materials (Nardos and Wakgari, 2016). At the very least, they must be packaged in new, clean, and high-quality packaging to avoid injury and effectively safeguard the goods (CBI, 2017). A crucial aspect in retaining and strengthening both home and international markets is removing anomalies and offering what the consumer expects (CBI, 2017). Quality, according to Luning and Marcelis (2009), is defined as a product's capacity to meet customer needs, which encompasses both vital and extrinsic elements.

2.5.2 Market institutions

Each company's survival is dependent on the development of competitive goods, which is determined by examining the feasibility, intrinsic criteria, and manufacturing process. In any market institution, competitiveness should indicate that the market values the product, that the market price covers overall production costs, and that the market price does not act as a barrier to customers (Carbone et al., 2020). Market institutions might be written or unwritten, formal or informal, produced or growing (KIT and IIRR, 2008). Markets in industrialised countries are regulated by a complex system of laws, institutions, and formal organisations that coordinate and promote commercial transactions (Britwum, 2013). The study investigated the avocado-producing market institutions in Meru County.

2.6 Sustainability of avocado value chain

Our planet faces massive economic, social, and environmental challenges, according to UN Global Impact (2015). The Sustainable Development Goals (SDGs) define global priorities and aspirations for 2030 to battle these. They represent a once-in-a-lifetime opportunity to end extreme poverty and put the world on a sustainable path.

The concept of sustainability, as taught in university courses, ties together the planet, people, prosperity, peace and partnerships aspects (Heijmans and Eweg, 2022). Sustainable development is the development that meets current needs without compromising the ability of future generations to meet their own. This research section focused on the challenges in the avocado value chain from three aspects namely planet, people and prosperity.

Based on the Planet aspect, the research focused on the impacts of avocado value chain activities on Land, biodiversity, water and air pollution. People's aspect was dealing with equality and regal access of production factors and employment between women and men and inclusion of young, livelihood

and security in avocado production system while prosperity looked at a fair price, market and financial access for farmers (SDGs business indicators, 2022).

The production and distribution systems that have sprung up to meet the demand for this trendy fruit have had disastrous social and environmental consequences, including deforestation, biodiversity loss, water scarcity, pollution, displacement of indigenous populations, food insecurity, cartel violence, and human rights violations (Lourentzatos, 2021). Reducing food waste and losses relieved the strain on underutilised land and natural resources, as well as lessened agriculture's negative environmental implications (Snel, et al., 2021).

2.7 Food loss causes in the avocado value chain in Kenya

Wasilwa et al (2006) argue that food losses are caused by several factors including pre-and post-harvest handling practices, insufficient superior varieties or planting materials, poor tree crop management practices, poor roads and other infrastructures, poor market information, pests and diseases, and limited utilization. Furthermore, all food loss hindering factors are mainly associated with an uncoordinated chain.

The causal diagram illustrates the causes and effects of the main problem which is high avocado production losses. Low investment, Uncoordinated and limited extension services are the main root causes while low income for avocado producers' especial small-scale farmers and weak farmers' associations results in low inclusivity (gender and youth), environmental pollution, low access, availability, and affordability of avocado products for both domestic and international markets are the main effects of high avocado production losses in the avocado cooperative associations in Kenya (Figure 4).



Figure 6: Problem identification in avocado production in Meru County, Kenya
Source: Author

Fresh avocado fruits are perishable living products and count quality and quantity losses of around 50% which affects socio-economy, food security, and environmental food system outcome in Kenya (Snel et al., 2021). The results of avocado production losses are low income among the chain actors especially smallholder farmers, reduction of both export and domestic volume, undeveloped processing sector, low access to avocado products and decrease of land under avocado cultivation are indirect consequences of the problem.

Small-scale and commercial (large-scale) farmers, as well as middlemen, suppliers, distributors, merchants, exporters, wholesalers, consumers, and national governments, are all affected by food losses. Snel, et al., (2021) argue that food losses were 35% for domestic and 15% for export avocado chains. Reducing post-harvest losses improves the food system's efficiency, decreases waste, reduces agricultural production's environmental footprint, and increases the amount of food available, accessible, and affordable to consumers.

Kimaru et al (2020) state that the main causes of avocado losses are poor rootstalk, diseases, pests, abiotic influences, poor harvesting technology and handling of harvested fruits, and post-harvest diseases. Kimaru et al (2020) argue that Kenyan avocado production cannot be marketed because of the harm resulting from anthracnose and its low quality. Both the above kinds of literature show the necessity of setting upgrading strategies to reduce avocado production losses. For a deep understanding of the situation facing the avocado value chain and to suggest appropriate solutions to upgrade the coordination of the chain; the research conducted an assessment of the potential contribution of avocado chain governance in the reduction of avocado production losses in two avocado cooperative associations namely Abogeta West Avocado Growers Cooperative Society Ltd and Abuduguci avocado growers cooperative society Ltd and some other individual producers of Meru county, in Kenya.

2.8 Conceptual or research framework

The problem is conceptualized in figure 7; This research was based on one main core concept which is avocado chain governance divided into robustness, resilience and reliability three investigate through. This study contributed to finding out the role of avocado value chain actors, supporters and influencers to reduce production losses, the leverage points and the intervention to build up sustainable avocado chain governance.

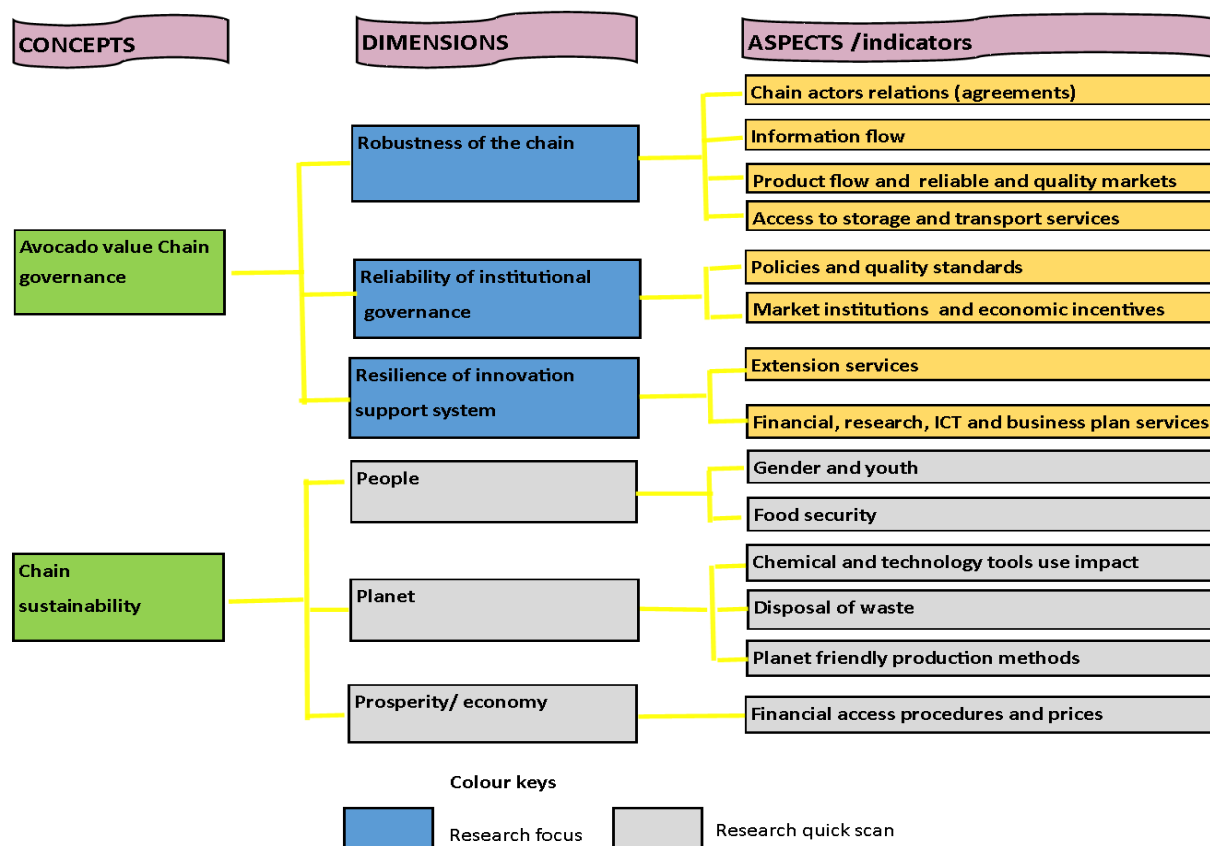


Figure 7: The conceptual framework of the avocado value chain governance

Source: Adapted by the researcher.

CHAPTER III. RESEARCH METHODOLOGY

This chapter focused on the research study area, research design, research framework, data collection, and data analysis. On primary data from interviews and secondary data from the literature, both qualitative and quantitative approaches were used. However, the research is primarily qualitative.

3.1 Area of study

3.1.1 Geographical information

Meru County is located on Mount Kenya's northeast slopes and is divided into sub-counties. The highlands (Meru Central and Meru North) have well-watered fertile soil, and great agricultural potential, while the lowland semi-arid areas (Meru South and Tharaka) have altitudes ranging from 300 to 5199 metres. The annual rainfall average is 380 mm in the lowlands and 2500 mm in the highlands, with a bimodal rainfall pattern from March to May and October to December (Hakizimana et al., 2017).

The county is located between 0° 6' North and 0° 1' South, as well as 37° West and 38° East. The annual temperature ranges between 10.50 and 24 degrees Celsius (Mukami, 2020). It is bounded to the north by Isiolo County, to the east by Tharaka/Nithi County, to the south by Nyeri County, and the west by Laikipia County. Meru County has nine sub-counties, a population of 1,545,714 people, and a population density of 221 people per square mile (city population, 2019).

Because of the country's climatic conditions, agriculture is the most important economic activity. According to (Selim, 2018), avocado is highly adapted to different precipitation amounts, and the average annual precipitation should be between 1000 and 1600 mm, and the average annual temperature for growing avocado is 21°C. (Caldana, 2019).

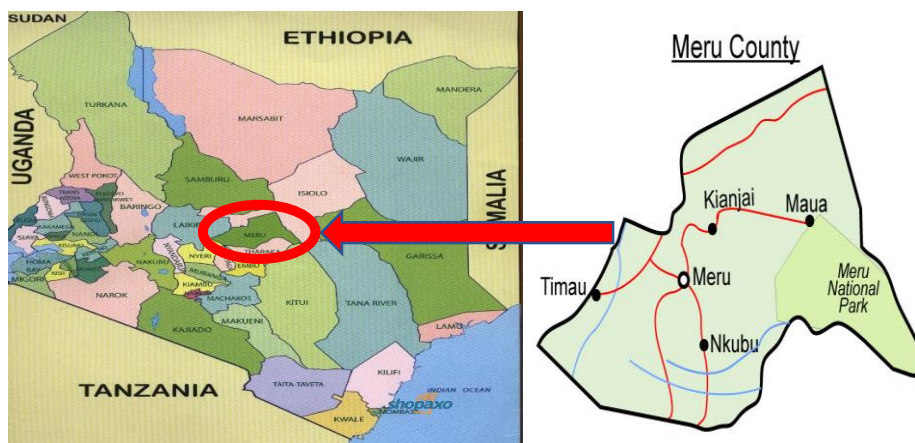


Figure 8: Study area

3.1.2 Avocado production in Meru County

Meru county is an agricultural basket that provides a high volume of export horticulture and subsistence food in Kenya. Most of Kenya's avocados thrive in Central and Eastern provinces which provide 70 per cent of the supply. Meru is one of the biggest producers in Kenya and the leader in the Eastern province in export tonnage. The crop grows between 1000 and 2000 meters above sea level especially Hass and fuerte, while other varieties like Puebla do well in the ranges above 2500 meters in the county (Celinawamucii, 2022).

3.1.3 Research approach

This study used a qualitative approach through data from desk and field research. Primary and secondary data were applied; individual, group, key informants' opinions and research observation have been considered as primary and desk research as secondary data and both helped in triangulation to get reliable results. Avocado inputs suppliers, producers from Abogeta and Aboduguci cooperatives and other individual producers in Meru County and cooperative management team, brokers, aggregator/ middlemen, input suppliers and retailers were the major target group for the study as they are the main chain actors. Key informants from public and private institutions: director of agriculture in Meru County, KEPHIS, NARIGP, KALRO, AFA-HCD, Avocado society of Kenya, Meru University of science and technology (innovation and entrepreneurship hub), Kaguru VTC, avocado oil extraction company and exporter company representatives were consulted and interviewed at the time of research. All respondents had been chosen due to their involvement roles in the production of avocado and the chain governance in Meru County.

3.2.1 Desk Study

The desk research had been carried out using existing secondary data from literature reviews, FAO official reports and publications on the current and prior investigations on avocado value chain losses and mitigation strategies in Kenya. The main database retrieved keywords consulted were detailed in table 2.

Table 2: database consulted, and keywords used

No	Database	Keywords
1	Online database: Google scholar and Greeni	-Avocado production in Kenya -Value chain governance (robustness of the value chain, reliability of institutional governance and resilience of innovation system) -Avocado losses, in Kenya -Cause of avocado losses in Kenya -Kenyan avocado export destination -the role farmers' cooperatives -Geographical information of Meru county -Avocado production in Meru county -Origin of avocado -Nutrition value of avocado -SDGs indicators
	FAOSTAT and FAO official reports	-World avocado production volume and area cultivated for 5 first countries -Africa has three big avocado producer countries and volume produces
2	Book: -Research for development, a practical guide (second edition)	-Population sampling, Data collection, researcher's behaviour in the field and data analysis.

3.2.2 The fieldwork

The Abogeta West Avocado Growers and Aboduguci avocado growers' cooperatives are private registered cooperatives of different crop producers including avocado growers, they are still young farmers' organisations. The research concentrated on avocado producers' cooperatives in Meru county to get insight into the chain governance situation and the leverage points to design appropriate measures to be implemented for reducing avocado losses.

3.3 Description and justification of data collection methods

The qualitative research interviews, semi-structured questionnaires and field observation, as well as focus group discussions, were applied to comprehend how avocado chain governance effects contribute to the reduction of production losses in Meru County.

A semi-structured interview was conducted by the researcher assisted by a translator, individual interviewee was asked a few predetermined questions on the topic, the rest of the questions were unplanned, and the researcher the notes. It allowed the researcher to probe the questions asked. The Semi-structured interviews applied, combined both structured and unstructured interview styles and that could provide benefits from both. They allowed for objective comparison of candidates while also allowing for spontaneous exploration of topics relevant to that candidate.

The individual interviews were applied in this research and covered 28 respondents (selection method in table 4) who are avocado value chain actors. Interviewees were sampled by using classification flowed by combined purposive and snowball sampling methods to collect a complete and wide variety of information about the study area (table 3). The sampling methods enabled the researcher to claim with confidence that the collected data were represented by the wider population.

Table 3 describes the source and reason of research data, both secondary and primary data. The research respondents are mainly avocado producers, production collectors, processors, exporters and key informants from the leaders in horticulture, society and agriculture research institutions.

Table 3: Description of data sources

Type of data	Source of data	Reason for data collection
Secondary data	Desk research: a review of different scientific research, Journals, books, report from government institutions and the online search engine (Greeni and google scholar) by searching some keywords: Chain governance, avocado production in Kenya, agri-food logistics, chain relationships, climatic conditions of Meru County, sustainable development goals, the origin of avocado and agriculture extension.	Checking previous research to gain an understanding of avocado chain governance, losses and their impacts on chain sustainability in general and particularly in Kenya.
Primary data	20 cooperative members, 3 middlemen, 2 inputs suppliers, 1 broker and 2 retailers were interviewed through individual interviews. Farmers were into three categories (small, medium and large-scale avocado producers) both male and female who are Abogeta West and Abuduguci avocado growers' cooperative members. 14 interviewees were small-scale (owned 1-50 trees and 3 were medium (51-150 trees and 3 large-scale farmers (151 and above trees. The selection was based on the number of trees owned via classification and to reach them, the combination of purposive and snowball methods was applied	To explore extensively the research topic and the interview are cheap and easy to process the collected data and give room to probe questions.
	Two different focus group discussions (one with farmers: and a cooperative management team were conducted	Avocado producers are empowered by contributing to data analysis via sharing their opinions and

		triangulation, where the studied farmers were actively involved in the research
	11 key informants' interviews (county director of agriculture, exporter, KALRO, MUST-innovation and entrepreneurship hub, AFA-HCD, Kaguru VTC, exporter, Avocado society of Kenya, NARIGP and KEPHIS) were conducted	To explore the topic at individual level about people's experiences and views on the research topic
	Direct Observations (the researcher)	Explore a topic with non-verbal by monitoring the behaviours, and status of avocado trees, infrastructures and landscapes

3.3.1 Feasibility of data collection methods

The research interviewees were from 20 cooperative members (14 smallholder, 3 medium and 3 large farmers), 1 broker, 3 middlemen, 2 retailers and 2 input suppliers were chosen by applying sample classification followed by the combination of purposive first and snowball sampling methods. Before starting fieldwork, FORQLAB project sent on field to inform cooperative about the research and I presented myself to the cooperative management team and request a members' list for choosing interviewees. The researcher together with cooperative chairman classified members into two main categories based on gender and the number of avocado trees owned. Seventeen males and three female's farmers and for other 8 actors (five were female and 3 men) were individually interviewed. Producers were categorised into small farmers, medium farmers and large farmers (table 3).



Figure 9: Large-scale farmer, a women smallholder farmer and Timau KEPHIS office coordinator interviewed

Respondents were interviewed from where they were, twelve farmers were invited to meet in the accessible centres near their local market and 8 farmers their avocado farms while other 8 chain actors' interview had been conducted from their working places where they were started around Meru County. Transport and communication expenses had been paid by researcher; the interview will be individual.

During individual interviews and focus group discussions, the local interpreter helped much because in Meru most of farmers speak Kimerurian language and it was mandatory to have someone from there. Researcher trained for one day, a graduated young man in education whose parent are also avocado growers for him to work smoothly as a translator mainly from Kimerurian to English during individual farmers and other actor selected interviews and farmers' and Abogeta cooperative

management team FGD, and he was paid on daily basis for fourteen days. Every interview was conducted in two hours maximum per respondent and to three minimum respondents per day: four days of fieldworks per week and others for data triangulation.

Two focus group discussions were conducted in Menti sub county and Abogeta west ward areas arranged by the researcher based on field information after sampling, participants availability and with different categories of actors (producers: middle, medium and large and cooperative management teams). First focus group discussion was with 5 cooperative management team member and second was with 7 farmers who are Abogeta west cooperative, every FGD was done in five hours and time and transport costs were compensated by the researcher. Each FGD participants was contacted two days and two hours before FGDs.



Figure 10: Focus group discussion in the meeting room and in field and community house in Abogeta West

3.4 Confidentiality and anonymity

According to Laws et al. (2003), respondents should have the right to remain anonymous and have their privacy and confidentiality rights respected. Before starting the interview and recording with all respondents, the researcher explained about the research and its purpose and requested to all respondents if their functions, pictures and locations can be published or not and their rights were consented to and compromised accordingly. Before visiting a respondent at working place, the researcher had to make an appointment, and the interview was conducted based on the respondent's availability.

3.5 Data analysis plan

All collected data was triangulated. Table 3 highlights procedures from data collection and data analysis. Grounded theory is a methodology of developing inductive theories that are grounded in systematically gathered and analysed data. Data collection, analysis, interpretation, and theory development proceed interdependent and iterative.

Table 4: Data analysis plan

Sub-question	Unit of analysis	Data collection method	Sample Selection method	Analysis methods	findings
1.1	-20 farmers -1 broker, 3 middlemen , 2 retailers and 2 input suppliers	Individual interviews	Classification and purposive sampling	Chain map concept	-identification of avocado chain stakeholders -Leverage points

1.2	-20 farmers -1 broker, 3 middlemen , 2 retailers and 2 input suppliers	Individual interviews	Classification and purposive sampling	Chain map and business economic s concepts	-Avocado chain information flow and its providers, source and ways of flow -Avocado selling prices
1.3	-20 farmers -1 broker, 3 middlemen , 2 retailers and 2 input suppliers	Individual Interviews	Classification and purposive sampling	Grounded theory analysis	-Ways of avocado production demand and supply -Relationship between avocado producers and buyers -Avocado products in Meru County
1.1	2 FGDs and 11 key informants	FGDs and interview (checklist)	Researcher observations , interviews and discussions	Grounded theory and SWOT analysis	-Positive and negative factors influencing chain robustness
2.1	2 FGDs and 11 key informants	Semi-structure interview (checklist)	Purposive	Stakeholders' matrix	-Chain multi-stakeholders' activities -How multi-stakeholders are linked
1.2 and 2.2	2 FGDs and 11 key informants	Semi-structure interview (checklist)	Purposive	Grounded theory	-Policies, quality and standards aimed to reduce avocado losses
2.3	2 FGDs and 11 key informants	Semi-structure interview (checklist)	Purposive	PESTEC and Stakeholders matrix	-Avocado market institutions and their role in the reduction of production losses
2.3	2 FGDs and 11 key informants	FGDs and interview (checklist)	Researcher observations , interviews and discussions	Grounded theory and SWOT analysis	-Hindering and supporting factors of avocado chain reliability
1.1,2&3	2 FGDs and 11 key informants	Semi-structure interview	Purposive	Grounded theory	-Existing services aimed to reduce avocado losses -Extension services providers
1.1,2&3	2 FGDs and 11 key informants	Semi-structure interview (checklist)	Purposive	Grounded theory and SWOT analysis	-Availability and accessibility of transportation and storage services -Avocado production supply intermediaries' activities
1.1,2&3	2 FGD and 11 key informants	FGD discussion and interview (checklist)	Researcher observations , interviews and discussions	SWOT analysis	-Hindering and supporting factors of avocado chain resilience
2.1	Researcher environmental scan, 2 FGD and 11	Quick scan after fieldwork and	Researcher observations , interviews	Sustainability profile	-Quick scan on achievements and gaps towards SDGs economic indicators: access to financial services for disadvantaged people

	key informants	observation	and discussions		(avocado producers), market (local and international)
2.2	Researcher environmental scan, 2 FGD and 11 key informants	Quick scan after fieldwork and observation	Researcher observations, interviews and discussions	Sustainability profile	-Quick scan on achievements and gaps towards SDGs ecological indicators: (Emissions of ozone-depleting substances (ODS): use of chemicals and their impact and disposal of waste. Use of technology (Number, type and impact of physical infrastructures and technological tools)
2.3	Researcher environmental scan, 2 FGD and 11 key informants	Quick scan after fieldwork and observation	Researcher observations, interviews and discussions	Sustainability profile	Quick scan achievements and gaps towards SDGs social indicators: (Social inclusion): Gender, youth (percentage of women, men and youth reached by production factors: land, inputs, and extension services) (UN-SDGs indicator, 2022)

Source: The Author

3.5.1 Summary of interview and FGDs participants

Table 5 summarise the details of individual interviews, focus group discussions and key formants participants and gender.

Table 5: Summary of interviews and FGDs participants

Parameters/Subjects	Number of respondents	Gender	
		Female	Male
Farmers interviewed	20	17	3
Broker	1		1
Middlemen	3	2	
Exporter	1		1
Retailers	2	2	
Input supplier	2		2
Small scale farmers	14	11	3
Medium farmers	3		3
Large scale farmers	3		3
Key formants	11	9	2
Farmers' FGD	7	6	1
Cooperative management team	5	4	1

3.6 Research framework

Figure 9 of the research frame shows the study's flow chart. The research process began with the formulation of the research problem, objectives, and research questions. In addition, to lay the groundwork for the study and provide additional evidence, the literature was reviewed. Data collection, analysis, and interpretation were used to reach conclusions and make recommendations later.

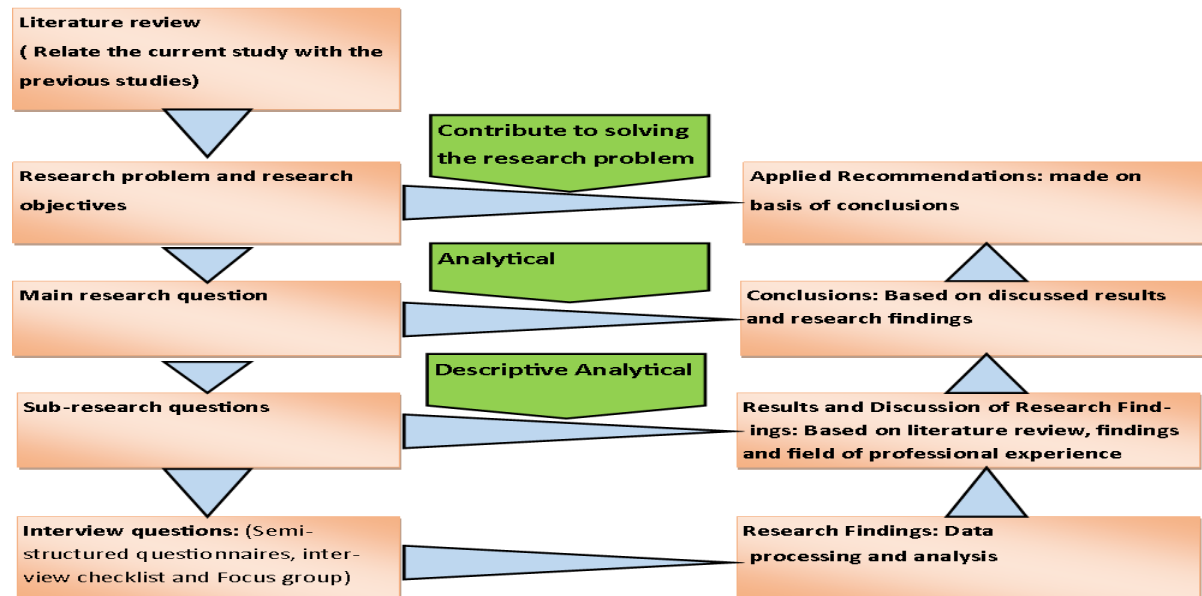


Figure 11: Research framework

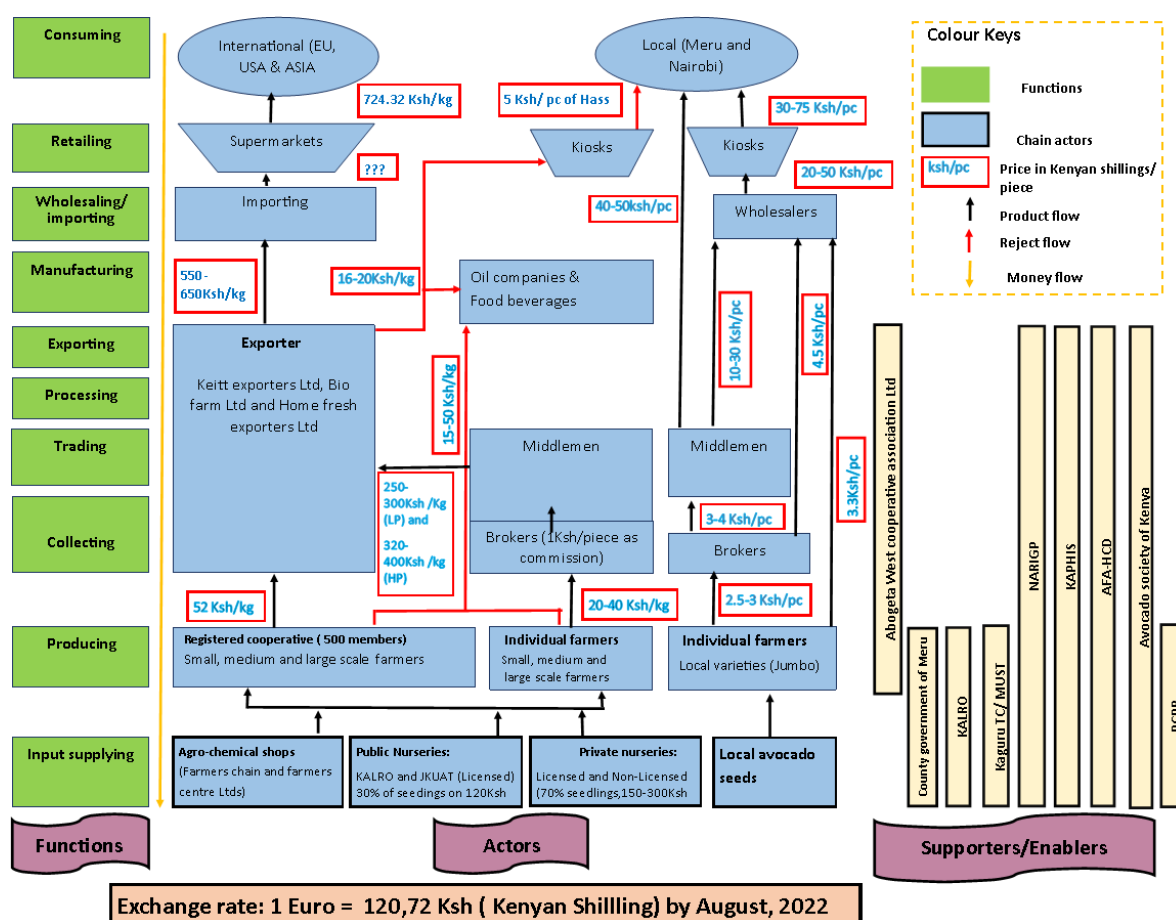
CHAPTER IV: RESEARCH RESULTS

This chapter includes the results of the interviews with avocado producers who are mainly Abogeta cooperative association Ltd and some from Abodoguci avocado grower's cooperative, brokers, middlemen, input suppliers, retailers, key informants and focus group discussions about the potential contribution of chain governance in the reduction of avocado production losses in Meru County, Kenya.

4.1 Robustness of the avocado value chain in Meru County

4.1.1 Avocado value chain flow from farmer to consumer

Figure 12 shows the flow of avocado from production to consumer. There are two chains (export chain and local chain) based on varieties of avocado produces in Meru County. The export chain produces Hass and Fuerte varieties which have high demand at international market, and more farmers are joining the chain. The local chain grows and produces local varieties, and the production is locally consumed. The research is more focussing on export value chain.



4.1.2 Actors, supporters, influencers and their roles

Regarding potential actors, supporters, enablers and their roles, the study revealed their spatial presence as shown the table 6.

Table 6: Current avocado value chain actors, supporters and enablers and their roles

No	FUNCTIONS	ROLES	Categories
Avocado value chain actors			
1	Input dealers: Private nursery growers sell locally seedlings and agrochemical shops sell fertilizers, pesticides and fungicides and there are private nursery growers. Public institutions and individuals produce and sell avocado seedlings. Seedlings from public institutions are in 95Km far from farmers, are licensed, accessible at 30%. Licensed seedlings are free of diseases, pure variety and have KEPHIS certificate. None licensed seedlings are locally grown, not pure (either Hass or Fuerte), not certified and they are more accessible by farmers at around 70%	-Supply of inputs such as seedlings, fertilizers, pesticides and fungicides	-Public and private institutions. -Agrochemical shops are owned by men, but waiters are 80% female
2	Producers: Farmers individually produce mainly Hass and some Fuerte avocado varieties for export production 40% and local varieties call Jumbo for 60%.	-Production and all agronomic management of orchards	Small (1-50 trees) Medium (51-150 trees) Large (151 and above) -Local varieties (individual farmers) own 1 and above trees
3	Brokers/ Pickers: individual young people in the production area. They get commission fees from middlemen which is 1 Ksh/piece (4Ksh/ Kg)	-Identification of avocado farms -Link middlemen with farmers -Harvest and pre-grade -Aggregate/collection from various farmers	Men (Individuals)
4	Middlemen: informal traders mainly from Nairobi	-Trading -Transport to grading points -Coordinate with brokers to find the products	Men and women (individuals).
5	Exporters: companies which buy avocado from Meru County	-Collection -Transportation -Processing such as: -Washing -Grading -Waxing -Packaging -Labelling storing -Exporting	Private companies: -Exporters -Keitt exporters Ltd, Bio firm -East Africa fresh fruits -Key exporters Olivado (All exporting companies are owned by men but

Export

			85% of workers are women)
6	Manufacturing: Companies	-Collecting -Transporting -Oil extracting	-Oil extractors e.g., soul fruit Ltd and Keitt exporters Ltd (own by 2 Indians and 1 Kenyan men)
7	Wholesalers: Companies for export chain and individuals for a local chain	-Sell in bulk to retailers and consumers	Women and men (individuals)
8	Retailers: National supermarkets like NAIVAS and open markets in Nairobi and local in Meru County	-Sell to consumers	Women: locally called Mama Mboga (individuals in open local markets called Gakurumone, Mukutano and Kiosks)
9	Consumers	-Consume final avocado products -Funding of AVC	Local and international (both women and man)
Supporters and enablers			
10	Abogata West (including five farmer groups locally called clusters) and Abuduguci avocado growers cooperative society Ltd	-Train farmers in GAP -Identify potential market -Negotiate prices with exporters and sign farming contracts	Farmers (mainly men, very few women and no youth)
11	The county government of Meru	-Advocate and promote avocado production -Offer extension services e.g., training -Develop county policies -Partners with communities -Develop and maintain infrastructure	Public institution (Director is a man)
12	KALRO	-Train farmers on best agronomic practices -Conducting Research for finding suitable seedlings -Provision and supply of certified Hass avocado seedlings	Public institution (found a women)
13	HCDA	-Registration and compliance -Offer technical and advisory services -Conduct market research and product development for the horticulture sector -Monitor compliance	Government body (region office coordinator is a man)
14	Avocado Society of Kenya	-Offering extension services (GAP)	-NGO (Growers, exporters and other value chain players)

		<ul style="list-style-type: none"> -Linking growers with exporters who are members and exporters with international buyers -Helping Farmers and exporters to comply with market requirements on food safety and social standards -Training partners on pre-certification audits -Lobbying government for conducive policies and always playing an advocacy role in the opening of more international barriers to trade 	-The leader is a man but 70% of officer in the office are women.
15	NARIGP	<ul style="list-style-type: none"> -Offer advisory services -Lobby for funding such as abogeta west packhouse -Partner with other institutions for the development of AVC 	Government project (50% are women)
16	Kaguru VTC/ Meru university (Innovation and entrepreneurship Hub)	<ul style="list-style-type: none"> -Provide extension services to farmers through farmer field schools and e-extension -Hass seedlings production and distribution services 	Public institutions and around 75% are men
17	KEPHIS	<ul style="list-style-type: none"> -Ensure internal and external market compliance -Conduct inspections -Offer phytosanitary and safety certificates -Provision of extension services 	Government regulatory and certification body and 60% workers are women, but the region office coordinator is a man
18	PCPB	<ul style="list-style-type: none"> -Regulation export and import of chemical products -Advising farmers about chemical internationally required in avocado production 	Men are more employed

4.1.3 Findings on avocado chain actors' relation

Interviewees and FGDs stated that there is no trust between chain actors for both export and local chains because the information especially regarding price and market is not smoothly shared among actors. 70% export avocado producers are not in cooperative and farmer groups, 30% are either direct or indirect members of Abogeta West cooperative and indirect member are grouped in clusters which are direct members of cooperative. The brokers are the bridge that links individual farmers with middlemen and exporters where 60% of avocado production and mainly middlemen set the farmgate price of the production. The exporters have high power in the export chain for which farmers are in the cooperative, they are trusted and there is a farming contract between farmers and exporters. The middlemen have more power in the informal export chain where farmers are not in any producers' groups and sell their production to middlemen without any contract or verbal agreement. Farmers have right to compare and sell their avocados to the middlemen that pay best price based on information from different brokers. There is no trust, and most middlemen are women and brokers are mostly young men. Farmers who are in the Abogeta West cooperative sell avocado production based on a farming contract signed with exporters at the beginning of the season, the sell per piece and most of the time the price is static.

The avocado chain has supporters and enablers who are not coordinated in platforms; they collaborate with farmers independently and based on farmers' demand or farmer groups' application/demand. The horizontal relations are based on extension, registration, advocacy, and financial services from supporters while chain enablers relations are based on enforcement of national and international quality and standards and food safety requirements, setting rules and regulations for the chain. Farmers who are vulnerable in the chain and key informants confirmed the trust and good information flow in horizontal relations. More farmers are joining the avocado chain and others are expanding their avocado farms and they are replacing tea plantations with avocado. There are enough avocado chain actors and supporters but with a gap in coordination. Avocado losses are high at the farm level due to diseases, pests, fungi, mechanical damages and delay in picking which lead to quality defects.

4.1.3 Information flow in the avocado chain

After conducting interviews with farmers, key informants, and FGDs, it has been found that the information regarding avocado production flows very well between actors but in one direction (from farmers to consumers) but extension, financial and price information are not smoothly shared among chain actors and supporters. Middlemen and brokers manage informal avocado flow information and exporters do the same for formal avocado flow. The information flow between supporters and enablers is improved but between farmers, supporters and enablers is limited as it flows based on farmers' demand and events which requires a long process due to insufficient field staff according to the interview results from public institution key informants. Avocado producers said that they receive insufficient information concerning price, extension and financial services and both supporters and enablers said that they have few staff.

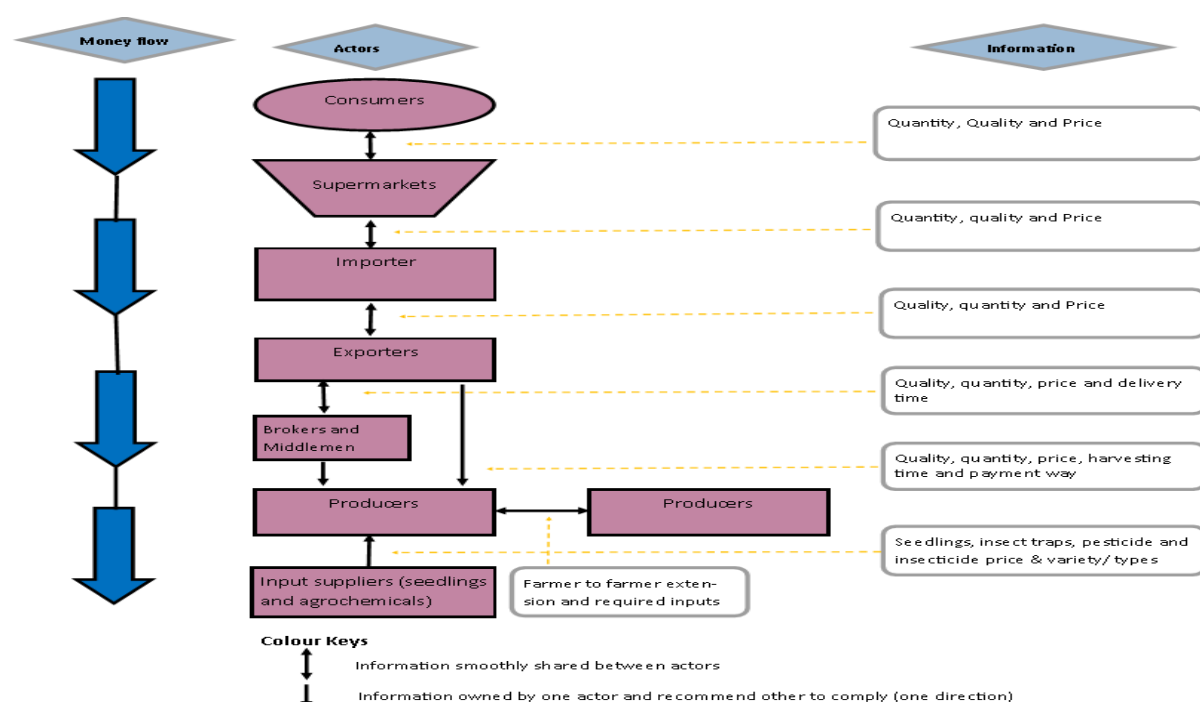


Figure 13: Information flow between actors

The information flows in the chain are regarding pesticides and fungicides, new production techniques, avocado market and price, product quality standards and food safety requirements for customers, financial, post-harvest handling and policies. The volume information is only determined by the low and high season periods, and it is saved by export companies and farmers do not know their production cost information. There is no clear and organised avocado stakeholders' platform and the county director of agriculture and the senior horticulture office from the HCD Meru region office said that there is a clear extension service delivery plan but there is little budget and shortage of staff to implement it, but they mentioned that the information is good hence insufficient extension services provision.

Information flow between actors and supporters and enablers is not smooth and there is no clear stakeholders' platform which makes the value chain to be uncoordinated.

4.1.4 Finding on availability and accessibility of avocados transport and storage services

Table 7: Avocado transport services

Services	Service providers	Service owners
Avocado transport from farm to local roads	Pickers (brokers) by head	Middlemen or exporters
Transport from local roads to Nairobi packhouse	Hired small car (locally called pro-box) or pick ups	Middlemen
Transport from local roads to tarmacked roads	Hired or owned pick ups	Exporters
Transport from tarmacked roads to Nairobi packhouse	Hired or owned normal truck or rarely humidity and temperature controlled	Exporters

A big part of avocado production is packed and transported in sacks by middlemen and in crates for the formal market by exporters. Middlemen or export companies manage avocado production transport from farmgate to warehouses. Temperature and humidity are not controlled during production collection and transport. Suitable avocado transport services are not accessible and available in Meru County.

The avocado storage services required for keeping the freshness of products are not available in Meru County. The services are available only in Nairobi where export companies have their packhouses. When a broker found where avocados reached export maturity (slightly dark green) are they communicate with middlemen, when middlemen have a market, they order the pickers to harvest and sometimes middlemen buy production harvested two days before transport and they found it covered in fresh banana leaves. In the same context, trained pickers inform exporters about the status of production from contracted farmers and send field agronomists to coordinate harvesting and transport activities; most of the time product reaches the packhouse on the same day and gets processed and stored. Temperature and humidity are controlled during avocado transportation and storage services are not availability and accessibility in Meru County. Both controlled temperature and humidity in transport and packhouse services are available to the avocados reached in Nairobi packhouses to shipping places.

4.2 Reliability of institutional governance in the avocado value chain

4.2.1 Policies and regulations and quality standards applied to the avocado chain

The research found that there are well-designed policies regarding the export chains including avocado. There are KEPHIS Act cap No. 54 of 2012, state corporations Act cap 324 and seed and plant varieties Act (CAP 326) laws and regarded policies and regulations developed governing regulation of phytosanitary measures in production of seedlings and subsidies, quality and standards of avocados. The use of required inputs and chemical is controlled by PCPB. The cooperative and export companies' registration and implementation plan of quality standards and requirements of international buyers, packhouse and product transport and storage requirements are checked and licensed by HCD based on the AFA Act of 2016, Crop Act (No. 16 of 2013) and by developed checklist forms in annex 3. There are clear policy documents in the Horticultural crops directorate (HCD), Kenya plant health inspectorate services (KEPHIS) and Meru County government. However, there is a little awareness campaigns due to shortage of staff and funds which affect the implementation and harmonisation. The policy harmonization is stimulated by the Kenya avocado society for its members, but few farmers are members, but Abogeta cooperative is a member. Supporters and enablers wait for the farmers to apply for the services due to the shortage of field staff.

4.2.2 Market institutions and economic incentives

4.2.2.1 Market institutions

The avocado value chain in Kenya is not new but it is still developing. There are two types of chains, local and export, local chain covers around 58% of avocado production while export chain is around 42%. Production of the local chain is sold by using informal scaring measures where farmers sell it to middlemen or brokers in sacks and middlemen to retailers and even to consumers per piece and payment is in cash at farmgate where farmers get little to compare to the retailer's price due to the risks in the business. Brokers negotiate price and link farmers to middlemen, for the farmers to make choose for best price contacts different brokers otherwise brokers just communicate the price to farmers.

a. Local variety value chain

Farmers in local value chain do not have options as local variety production is sold when it is 100% mature, ripens in two days after harvest and in four days gets perished as there are no improved transport and storage conditions. So, farmers sell to brokers or middlemen who come first. There are no formal quality standards in local chain and customers require high oil content avocados checked by testing (eating small part for tasting), colour inside, size and price for them to buy; the more avocado fruit is big the higher the price. A sack of around 300 pieces is around 1000 Ksh at farmgate which means around 3.5 Ksh per piece while retailer price is more than 40 Ksh per piece in Mukutano and Mukoromune open markets in Meru town and 75 Ksh in NAIVAS supermarket in Nairobi. The more local variety of avocado is big the more the price.



Figure 14: Local avocados near road, losses near middlemen stores and inside local stores/ packhouse

b. Export value chain

The export chain production has a formal market for farmers who are in the Abogeta cooperative and the price, quality standards and delivery conditions are described in the farming contract between cooperative and exporters. The contract is for harvesting season, it is signed before harvesting period and renewable every harvesting season. For individual export chain farmers, the production is sold to middlemen and the linkage is done by brokers. Avocados are sold in pieces when it is well harvested by locally trained pickers. Quality standards required at farmgate are sizes between 12 and 32, green colour, free of mechanical injuries and defects from insects and diseases. For a farming contract, the payment is done to the individual farmer's bank account after product delivery at the agreed time and the farmer is given a delivery note. For farmers who are not cooperative, their payment is done at farmgate in cash, but they get low and very changing prices. 40% of export chain production is marketed through Abogeta cooperative at 13 Ksh per piece at farmgate based on a signed contract and 60% of production is sold to middlemen at between 5 to 10 Ksh per piece based on the price decided by buyers. Farmers sell avocados to middlemen at low prices because they get paid at farmgate and they like quick money regardless of the low price.



Figure 15: Individual export chain farmers with broker and middleman

C. Economic incentives

Farmers interviewed do not pay income taxes and it is difficult to know their investment and they have no records. The only incentive in the avocado sector is on seedlings produced by buying public institutions called Kenya Agriculture and livestock research organisation (KALRO), farmers pay 120 Ksh per licensed seedling while other companies sell at 250 Ksh. Middlemen and exporters interviewed said that they pay tax in every crossed county during avocado transportation, which affects the price of avocado at farmgate. Abogata cooperative received funds from NARIGP for recruiting 95 new members in 2019 and a grant of 16 million Ksh for building a packhouse of 200 tones capacity by 2023. The World Bank and Kenyan government partnership project (National Agricultura and Rural inclusive growth project) is involved in the upgrading of four chains including the avocado value chain.

d. Avocado quality standards

Quality standards and other international buyer requirements are checked and enforced by the Horticulture crop directorate (HCD) and Kenyan Plant Health inspection services (KEPHIS). HCD checks the maturity of avocados and registers export companies. KEPHIS makes sure that all avocados for the export chain comply with the required dry matter content, are free of disease and pest defects and have a minimum residue level (MRL) of pesticides.

According to KIVI Augustus the coordinator of the TIMAU office near the big flour production area, their work starts with licensing planting materials and registering nursery growers and before harvesting, field staff take samples for laboratory check-ups. When results are positive, post-harvest activities are allowed to start and the service is paid 1000 Ksh for the first ha and an additional incremental of 250 Ksh per ha in five days. Abogeta cooperative organizes its members and pays the required fees for KEPHIS services to get a yearly certificate of production. Samples are taken from different farmers as many of them own land smaller than one must pay KEPHIS services. Avocados grown in Meru County for the export chain are organically managed and they do not have an organic certificate, they are sold as conventional production.

4.3 Resiliency of avocado value chain innovation support system

4.3.1 The availability of financial, research, ICT and business plan services

The avocado value chain in Meru County has enough actors, supporters and enablers. There is no gap in the chain functions, but 84% of interviewees have a need of innovating the collaboration. The collaboration between the actors in terms of product flow is in place but sharing information between actors, supporters and enablers has a gap to upgrade. Farmers and key informants interviewed said that stakeholder platforms need to be harmonised and upgraded. There are eight main supporters and enablers, and their main activities are to develop the chain, empower farmers in extension services, reduce post-harvest losses and ensure licensed availability of planting materials.

Abogeta cooperative and individual farmers have NARIGP and KALRO as supporters which can financially support the chain and healthy HASS variety seedlings consecutively. The access to financial and nursery (seedlings production) services are not enough. Farmers said that avocado farming does not require much investment and the only problem raised is a shortage supply of Hass seedlings which are favourable for export and licensed nursery beds are far from them which hinders them to plant none licensed seedlings grown locally. NARIGP is helping the cooperative to build an avocado packhouse and to recruit members to contribute to the reduction of avocado losses in Meru County. The project gave sixteen million Kenyan shillings as a grant and the cooperative will borrow from a bank the remained money to build the park house.

Collaboration between farmers and extension services supporters is low. 100% of respondents said that they only meet with extension agents based on the application where they write a letter to either public or private supporters and wait to get a response which depends on their availability and sometimes when they are available, they do not visit farms, they only instruct farmers in meeting in the centres. The available extension services provision is called the “farmer demand extension model”. Vertical Collaboration is only active during the harvesting period and there is no trust between farmers, brokers and middlemen. Producers prefer to be paid little money at their production at farmgate when they do not have any agreement with exporters.

All activities at the farm level are manual and farmers know that ICT is for big business, the only used ICT tool is cell phones and most of the time are not smartphones. The owners of the phones use them for communicating with buyers (contracted or none contracted) when avocados are mature or when they are passing information between cooperative members for export chain. Digital registration of avocado products and their traceability are more used in exporters’ warehouses. Exporters keep records regarding sources of avocado production (region) without knowing exactly the producers, time of unloading, the quantity of production and owners, laboratory check-up information, parking day and dry matter content.



Figure 16: ITC use in exporter (Keitt exporters company)

During the discussion in FGD with cooperative management team, it has been found that Abogeta cooperative does not have a clear and written business plan and they did not receive any training to

improve their capacity in business plan preparation and implementation. Farmers still grow avocado naturally, substance hobby and do not do it as a business.

4.3.2 Extension services provision

100% of farmers interviewed said that they grow and manage their avocado orchards based on experience from their neighbours and heritage skills from their parents. There are enough supporters to provide extension services and key informants from HCD, CAO, NARIGP, Avocado society and KARLO interviewed each said that they have a shortage of staff and any extension agent who starts retirement time there is no new recruitment in government. The public extension services model is based on demand and farmers' formal service applications which take long procedures (farmers' driven extension).

Abogeta cooperative sometimes organises training for their members but there is no field visit, extension services are provided in the meeting. An exporter who has a contract with Abogeta cooperative sends a field agronomist to coordinate the picking activities and train pickers. There is insufficient extension services delivery and capacity building – skill development is low in avocado VC.

4.4 chain actors' views of access to financial services and prices

Chain actors interviewed stated that banks and other financial institutions do not easily support avocado value chain activities, and no one applied for a loan because of long procedures and requirements. For avocado orchards to have a loan, farmers said that they are required financial grants from supporters or insured collateral. Farmers feel the financial institutions (banks and microfinances) do not trust the farming sector and they cannot give them loans without collateral and avocado farms are not insured.

4.5 Avocado value chain activities toward the proper use of chemicals, technology, disposal of waste and planet-friendly production system

4.5.1 Chemical and technology tools use impact

98% of interviewed farmers said that they grow avocados organically, use organic manure in Meru County and both high and low land regions, and control pests and diseases using traps. With technology, around 100% of professional farmers in retirement and large farmers interviewed farmers in the highland and low land regions, have drip irrigation systems in their farmers. Avocado farming has enough water for irrigation, especially in the highland region. Only skilled farmers and professional farmers in retirement know the benefits of irrigating their farmers; it also requires much investment that small farmers cannot afford. Technological tools are only used in the packhouse and at that level avocado production is well kept and processed based on international quality standards and requirements but at the farm level, there is a gap in seedlings and production traceability technology. Dry matter content and accuracy size of avocados are measured in exporters' packhouses by using improved material while at the farm level, activities are manually done.



Figure 17: Irrigation system by gravitation as part of technology in avocado VC

4.5.2 Disposal of avocado losses and waste

In the avocado export chain, losses of avocados mean fruits that do not meet export requirements while in the local chain, losses mean fruit that cannot be sold to the local markets. There are different destinations for avocado losses: the waste from avocado production is either sold to oil extractor companies at a very low price (20-25Ksh/kg) or remains in orchards as organic matter and covers the soil and in the export chain or the market pits of open markets (Mukomone or Mukutano) and is mixed with other market waste for local chains. Some farmers visited used avocado waste to feed their animals like pigs and chickens. Farmers need to put waste in pits for quick decomposition which help in organic manure preparation and avoids spreading diseases and pests among avocado farmers.

Table 8: Losses in the avocado value chain and their destination

Function level	Estimated percentage of losses	Losses destination
Export chain		
Producer (farmgate)	23-25%	Oil extraction or animal feeding or home consumption
Packhouse	7-8%	Oil extraction or local retailers
Local chain		
Producer	9-14%	Home consumption or animal feeding
Middlemen	34-36%	Compost pits



Figure 18: Avocado waste disposal (in local packhouse, in farm and in oil extraction factory)

4.5.3 Chemical use and Planet-friendly production methods

According to farmers interviewed 84% organically grow avocado trees and 16% are mainly large-scale and medium farmers, they apply pesticides allowed for the export market. All farmers fertilize their farms by using organic manure and the local avocado chain is naturally grown. Most of the small farmers who grow Hass or Fuerte varieties, mix them with other crops. Some large and medium farmers used their avocado plantations with animals or with macadamia trees. Avocado plantation helps in erosion control in highland and lowland regions and does not require continuous tillage which can allow the destruction of biodiversity (micro-organisms). Avocado is an agroforestry tree in Meru County where many farmers mix it with other crops or animals.

4.6 Extent to which women and youth are involved in the chain and the contribution to the food security among smallholder producers

4.6.1 role of men, the role of women and youth in the avocado in terms of tasks, responsibility and control over the resources, as well as access to the different inputs and services

Men, women and youth are all involved in the avocado value chain but at different levels and percentages. In the Abogeta cooperative, 4% are women and 96% are women, a respondent said that tree crops including avocados are for men and sometimes they send their women to NGO meetings to show that the sector is inclusive. Young people are only involved in picking and broking activities. Land ownership is a big barrier for young men and women to join avocado farming; women are not culturally allowed to have land as a heritage from their parents but regardless to gender government can get land tittle, only their brothers are allowed which is also a problem for them to access financial services and the land is for a man. The women found who are cooperative members took over the land after the death of their husbands and one individual farmer owned land as a gift from her father. Young men from Abogeta cooperative members have been trained in detecting mature avocado sweets export markets and how to pick them properly. The avocado export chain is a business for men in Meru County, but most farm maintenance and trading (middlemen) activities are done by women. Men are heads of family and manage financial resources from the export avocado chain.

For the local avocado chain, women are involved in all trading activities from collection to retailing locally called mama mboga. In Meru County, women are involved in more perishable and little value chains including the local avocado value chain.



Figure 19: FGD in avocado orchard, transport and local open market in Meru County

4.6.2 Contribution of avocado to the food security

The avocado value chain, especially the export chain is the source of income in Meru County. Meru is considered a horticulture hub in Kenya and every household owns a tree crop. All farmers interviewed used to grow tea and miraa (stimulant plant) trees, but all said that avocado is a more profitable one that helps them to fulfil their basic needs. Women interviewed who are individual farmer has 13 avocado trees (6 trees in production and 7 new small), she said that she earns around 30, 000 Ksh per year and she buys food to complement what she produces, she pays school fees for her children, and she buys new seedlings to extend avocado plantation.

Other visited farmers said that even if they wish avocado prices to increase but they find avocado farming as the first to secure their households' income and no other crop they can shift for. During the focus group discussion, said that besides income from avocado, avocado is a source of OMEGA 3 as they have limited access to fish then they eat avocado in their families.

A 75-year-old man said that she bought a new farm locally called shamba for growing food crops and for him it is a kind of securing food for his family. Some farmers including the chairman of the cooperative, Mr Kinywa are uprooting tea plantations to grow avocado due to its contribution to fulfilling their households' food security

4.7 Avocado value chain sustainability profile in Meru County

The table 9 highlights sustainability profile of avocado value chain resulted from two different focus group discussions: with farmers and Abogeta west growers' cooperative management team.

Table 9: Sustainability profile

Profile	Findings
Planet	Avocado plantations contribute to soil conservation as require little tillage activities and reduce erosion effects on the soil
	Avocado plantations conserve biodiversity because farmers use organic manure on their farms
	In Meru County, there is enough water, especially in the highland region. farmers who irrigate their farms use drip irrigation which contributes to the efficient use of water.
	Avocado trees contribute to purification and 84% of farmers do farming naturally (they do not apply chemicals)
	Most farmers mix avocado with other crops and animals like chickens and bees which is good for the environment.
	There is a good environment for avocado farming
People	The avocado tree growing is a man's man business which excludes youth and women
	In Abogeta cooperative, the average age for members is around 75 years old according to cooperative chairman
	Women have low access to production factors and financial services
	There is no child labour in the avocado value chain
	Youth is involved in fruit picking and broking while women are more involved in trading activities (middlemen and retailing)
Profit/ Prosperity	The avocado value chain is the main source of income and employment
	Farmers said that avocado is the only most profitable chain, and many are joining
	Farmers do not have a role in avocado price setting and the price is much fluctuating
	Financial institutions and banks do not support avocado value chain and the plantation is not insured

4.8 SWOT analysis of avocado value chain in Meru County

The figure 20 shows strengths, weaknesses, opportunities and threats of avocado value chain in Meru County. The strengths and weaknesses are internal factors, strengths must be internally kept as they are advantages while weaknesses should be upgraded as they are disadvantage of avocado value chain. The opportunities and threats are external factors. Opportunities are factors of the external environment that avocado chain actors can seize upon to improve the chain performance and threats are factors of the external environment that may endanger the chain competitive advantages.

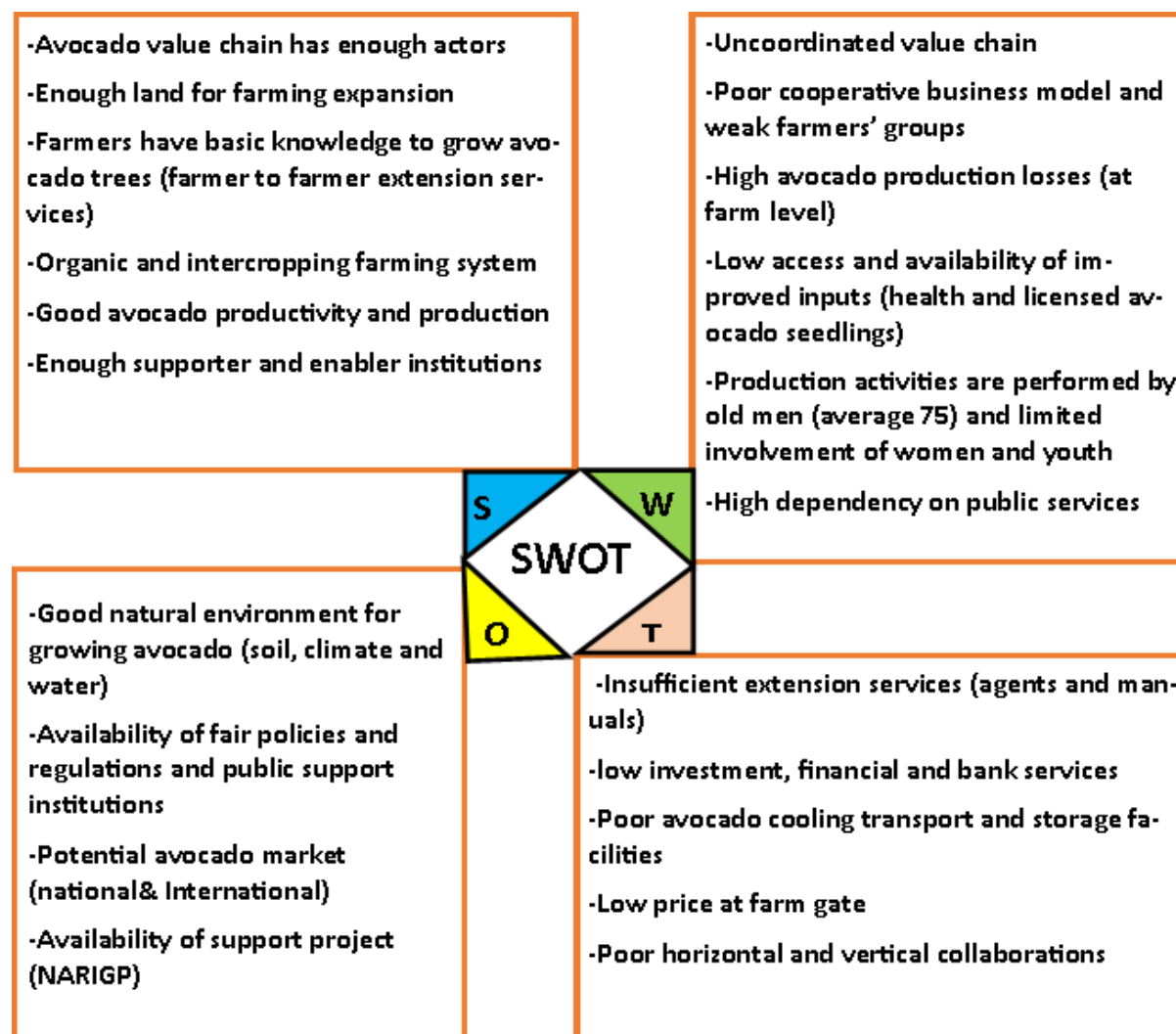


Figure 20: SWOT analysis of avocado VC

4.9 PESTEC of avocado value chain

The figure 21 highlights political, economic, social, technological, environmental and cultural factors that affect either negatively or positively the avocado value chain.

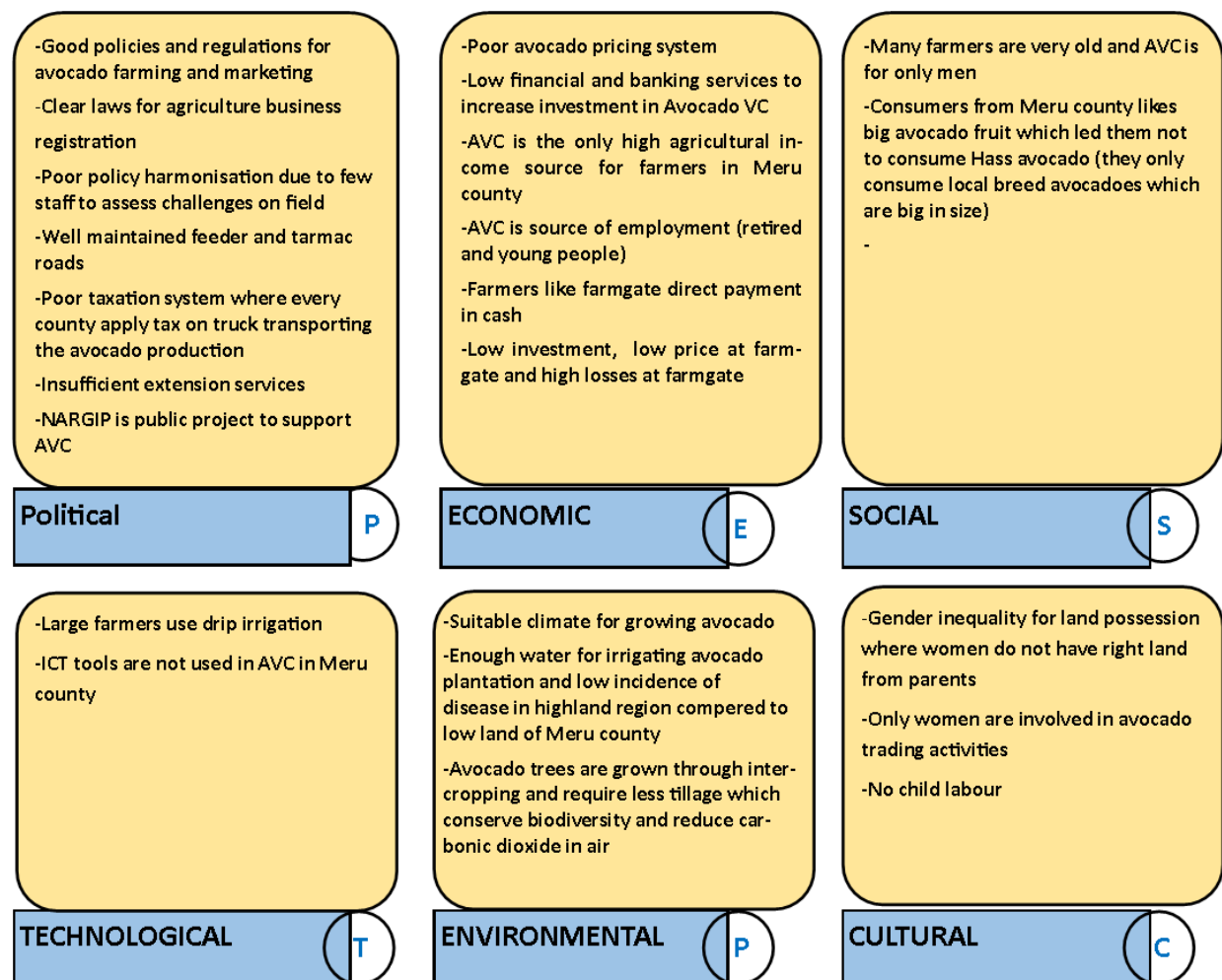


Figure 21: PESTEC profile of avocado VC

4.10 Avocado value chain's stakeholder matrix

The figure 22 illustrate avocado value chain in Meru County and how their power and interest are ranked according to focus group discussions with Abogeta West growers' cooperative members. The public institutions own more power and actors like exporters and middlemen own more interest in avocado value chain.

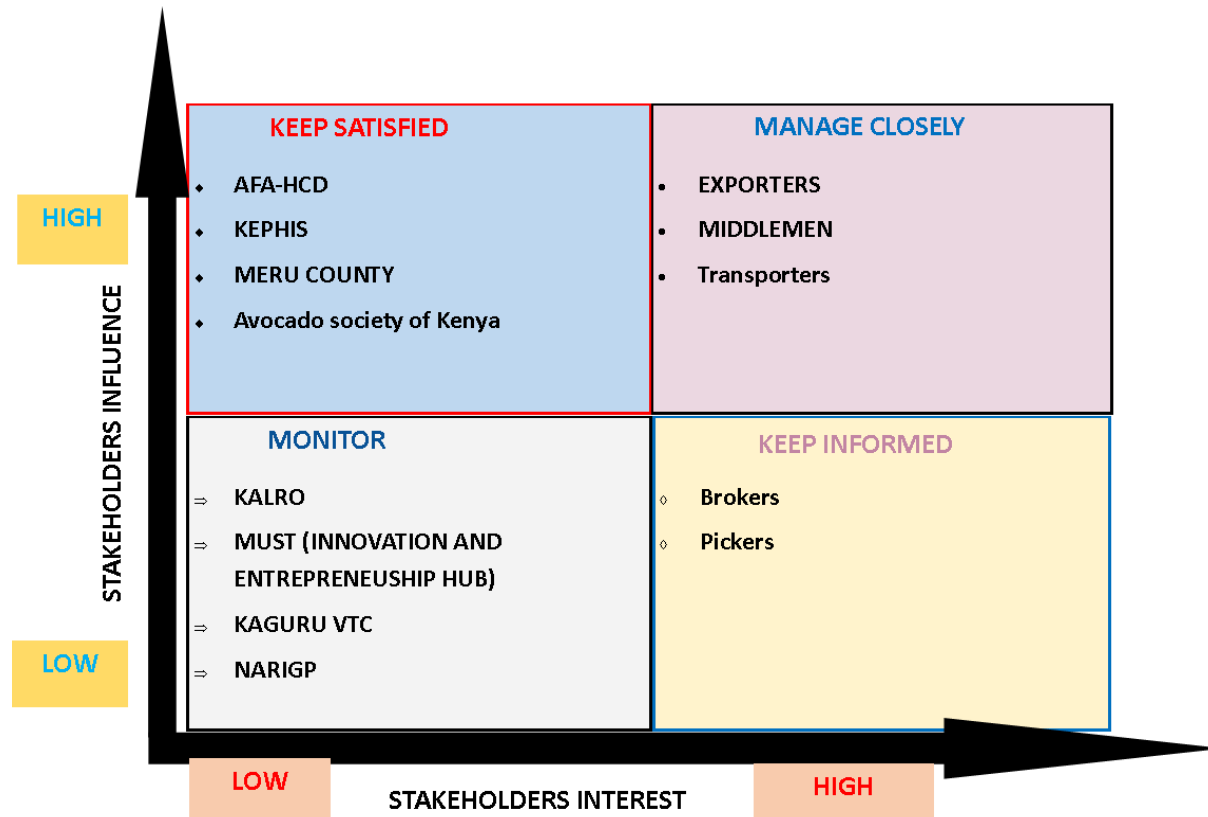


Figure 22: Avocado value chain's stakeholders' matrix

CHAPTER 5: DISCUSSION OF RESEARCH FINDINGS

The discussion presents arguments on various factors analysed during the research based on the result, literature and the researcher's knowledge and skills on the matters investigated.

5.1 Robustness of avocado value chain

5.1.1 Chain actors' relations (agreements)

The avocado value chain has enough actors, making the chain complete (see figure 12, table 6 and 4.1.2 last paragraph). This is a fundamental factor to develop and sustain the relationship between actors and the vertical coordination and effective control of the value chain for reducing transaction costs and safeguarding actors' interests. According to Mishra and Dey (2018), in their study to access Governance of agricultural value chains, Coordination, control and safeguarding, they equally mentioned the same and elaborated the following chart.

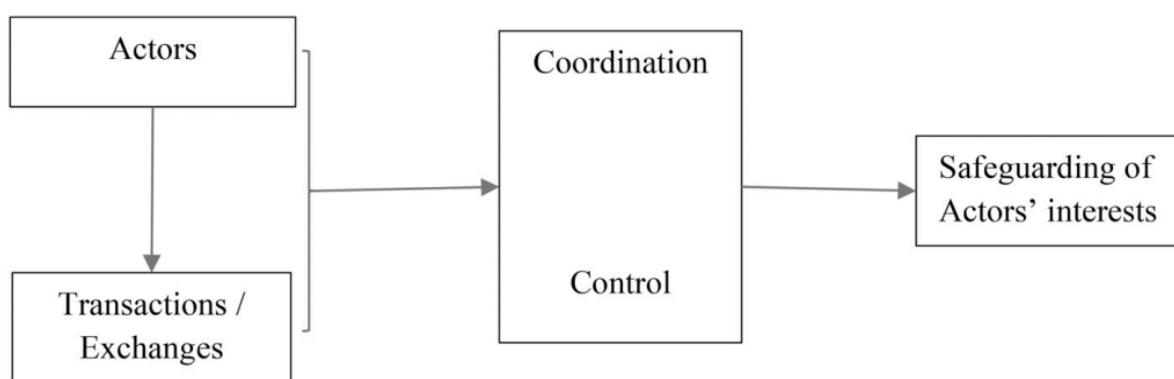


Figure 23: Actors' relationship
Source: Mishra and Dey (2018)

In Meru, there is a shortage of local and licensed Hass avocado seedlings production and supply for farmers who want to expand their Hass plantations which have high demand in the international markets. Seedling inputs are supplied by KALRO and are produced in Embu County at 95 Km from Meru County. This could be a reason for farmers to grow local none licensed avocado seedlings and produce avocados which do not meet export market requirements and incidence of pests and diseases. In addition, planting poor-quality seedlings spread diseases and pests on avocado farms. Similarly, Amare, et al (2019), suggested that the Hass variety yields a better price than the Fuerte, and this is attributed to the Hass variety's higher resistance to pests and diseases, higher oil content, and ability to conceal bruises. It is also the dominant variety in the large EU export market.

Abogeta west growers' cooperative association Ltd has only a marketing role in linking farmers to exporters. This is not enough role or function for producers' cooperatives. Zhang, et al, (2020) argue that farmer cooperatives may encourage agricultural technology adoption, increasing crop productivity and farmer income. Even though the evidence is always presented in the context of the developing world, cooperative membership is positively related to price, yield, quality, input adoption, and overall income.

The relationship between actors, especially between smallholder farmers who are not cooperative members, inputs suppliers and middlemen, is informal, weak and has no trust without any farming contract. Abogeta west cooperative has a formal and good relationship with exporters where the cooperative signs a contract with an exporter every year, but with weak and informal relations with input suppliers. The signed contract is sometimes not respected, during the study there was a delay in payment leading to avocado losses and the cooperative was searching for new exporters. Farmers are vulnerable while middlemen for individual farming and exporters in cooperative production systems are chain coordinators. Contrarily to the above study findings, KIT and IIRR (2008) say that chain relations are about the organisation, trust, open communication, and collaboration for mutual development between two or more actors in the chain for lowering transaction costs and other

hazards that stymie chain development. When suppliers and merchants agree to enhance their relationship, all stakeholders in the value chain will gain more. The contracts could be attributed to the current situation shows that middlemen and exporters have more power and earn much instead of working for mutual development of entire chain actors and in that context the transaction cost is not lowered.

5.1.2 Value chain information flow

The information does not flow smoothly between actors and actors and supporters, and the main information needed is regarding avocado inputs especially seedlings, price, price setting processes and production cost, quality, quantity and standards and financial services and that information is most of the time shared in one direction around farmers (see 4.1.3 and figure 13). This could be attributed to the reason of farmers who sell 60% of Hass avocados to middlemen via brokers at a low quick price at the farm gate which is around 30 Ksh/kg and leads to the delay in harvesting and payment time and weak stakeholders' platform and partnerships.

Similarly, Agyekumhene et al (2020) in their study on Making Smallholder Value Chain Partnerships Inclusive in Ghana, found that farmers in developing countries generally lack the access to advanced agricultural inputs, timely market information, and a full range of financial services. In addition, they said that actors and stakeholders' partnerships are the solutions to both mutual benefits for smallholder groups and value chain actors, which is increasingly seen to improve smallholder access to these crucial services. The information that could be smoothly flowing in the avocado value chain actors and supporters is regarding inputs such as avocado seedlings supplies, financial, extension, price, production cost, quantity, quality and standards, adequate inputs supply and market services. It has been found that the chains led by middlemen is because they hold and sell information as they do not change physical attributes of an item (Suhaimee et al, 2015).

5.1.3 Avocado product flow, reliable and quality market

The avocado product flow is defined but it is still informal. Only 40% of Hass production that fits export market requirements is sold through a farming contract between Abogeta West and exporter (Bio farm export company). The production which is not fit in the export flow meets the oil extraction industries market at a very low price. All necessary information to produce avocados that meet the reliable and quality international market requirements are defined and documented. This confirms what PABRA (2015) states that farmers can only sell their products if they do know what buyers or and if someone knows about or is interested in what they have.

5.1.4 Access and availability of storage and transport services

Avocado's storage, packhouse, cold room and transport services are planned and implemented by buyers and regulated by HCD. There is no adequate avocado packhouse and cold room storage and transport services in Meru County. Avocados are harvested when buyers (exporters or middlemen) are ready to transport them to Nairobi where processing takes place and adequate storage services are. The buyers convey avocado production using sacks and crates packed in no temperature and moisture-controlled trucks or small cars. Inadequate avocado production transport and storage facilities could be one of the causes of avocado losses at both the farm and Nairobi pack houses levels. Avocados reach over maturity stage due to long waiting wait for buyers and at the pack house, rejects are due to mechanical damage and short shelf life due to inadequate transport and colling services. According to Snel et al (2021), installing cold storage facilities is the most effective mechanism to extend the shelf life of avocados and reduce transport and storage losses by 30-60%.

5.2 Reliability of institutional governance

5.2.1 Policies and quality standards

The interviews showed that policies and quality standards are well developed by different public institutions like AFA-HCD and KEPHIS in partnership with the Kenya avocado society, exporters and international importers. Policies and quality standards are put in place in Kenya regarding healthy and licensed avocado seedlings and plantation, registration of an export company, avocado MRL, maturity, transport and storage conditions, DMC, maturity and safety. At the start of harvesting and exporting activities, quality and standards must be checked by HCD and KEPHIS complied and certified, which is the current result for Kenya to be the first African country to export a big volume of avocado that meets international market requirements. (FAOSTAT, 2022) and (Mokria et al, 2022) show that Kenya is the first African avocado exporter seconded by South Africa with 79,081tonnes and 47, 265 tonnes respectively.

However, the research showed that there is a gap and a challenge in policies and quality standards implementation at the farm level. Public and private institutions said that they have a staff shortage, and the government does not recruit new staff or even replace those who reached their retirement time and low access to field devices and tools which could affect policies harmonisation and the expected best result to be achieved and a cause of avocado losses at farm level.

5.2.2 Market institutions and economic incentives

a. Market institutions

Market institutions are developed/ improved in the export chain based on size, colour, dry matter contents (DMC), free from diseases and pests and mechanical damage, piece, variety, picking way and weigh scale systems. At the farm level, avocados are sold based on size, and colour, free of mechanical damage, picking way and variety for both local and export chains. However, there are not written and formal standards as they are manually checked by brokers, middlemen and field export officers. Exporters pay suppliers based on both formal and informal and formal and informal which is similar to what (Carbone et al.,2020) state that any market institution, competitiveness should indicate that the market values the product, that the market price covers overall production costs, and that the market price does not act as a barrier to customers and (KIT and IIRR, 2008) argue that market institutions might be written or unwritten, formal or informal, produced or growing contracts.

b. Economic incentives

The researcher found that financial incentives are only applied to avocado seedlings produced by KALRO (public with incentives), where one seedling price is 120 Ksh while without incentives is between 150 and 300 Ksh in private companies and individual nurseries. Subsidised avocado seedlings more used by farmers and they are insufficient. According to the farmers' views, extension and insect traps need to include in financial incentives. This could contribute to the environmental avocado production-friendly system. Abogata cooperative received funds from NARIGP for recruiting 95 new members in 2019 and a grant of 16 million Ksh for building a packhouse of 200 tones capacity by 2023 (see 4.2.2). Both incentives on licenced seedlings and grants for building local packhouse are crucial for increasing the investment in avocado VC and stimulate the product diversification. Incentives help farmers to have access on input subsidies, extension services for modern inputs and training. Similarly, Masangano et al (2021) in their study on Role of Policies, Stakeholder Programs and Interventions found out that governments and agricultural organizations implement policies and programs reflected in interventions such as input subsidies, extension services for modern inputs and training, which either enable or hinder agricultural diversification and modern investment.

5.3 Resilience of innovation support system

5.3.1 Extension services

The provision of extension services is insufficient (see 4.3.2) which has a direct negative effect on poor avocado farm management, postharvest handling, the persistence of pests and diseases (adoption of GAP) and leads to high avocado losses at the farm level (table 8). Similarly, Kassem, et al. (2021) confirm that extension services give timely and appropriate information that can help farmers solve problems and make better decisions on their farms.

5.3.2 Financial, research, ICT and business plan services

a. financial services

Financial services in the avocado value chain are limited (see 4.3.1, paragraph 4). Banks, Microfinance and financial companies don't financially support the chain as avocado farms do not have insurance and are not formally registered for them to be collateral and farmers' cooperatives are still in the formation stage to be social collateral. This could be associated with low investment in the avocado value chain and result in inadequate avocado transportation and poor storage services to enhance the development and sustainability of the chain (KIT & IIRR, 2008). Abogeta cooperative started to approach informal financial institutions (NARIGP) for it to support the construction of an adequate avocado packhouse and to recruit new members which will help them to reduce losses at the farm level.

b. Research services

KALRO conducts research and produces licenced and healthy Hass avocado seedlings which give good production in Meru County. The research found that Hass variety is preferable on Fuerte due to their high oil content and long shelf life during storage (Ghafoor, 2021). Avocado seedlings produced by KALRO are not enough to meet farmer requests in the region and they are produced around 95 kilometres far from Meru County in Embu County (table 6).

c. ICT services

ICT services are limited in AVC, especially at the production level. 77% of interviewees had mobile telephones and 7% of telephones were smartphones but they mostly use them for communicating with buyers not to increase productivity and even if they rarely use them to ask for information about GAP from Kaguru agriculture training centre and other supporters (e-extension). This is attributed to the low access to improved extension services and poor traceability of avocado production which do not bring desired avocado transformation and resilience. Similarly, Oyelami et, al (2022) state that there is necessitates and a need for employment and application of all available technologies including ICT technology to bring about the desired transformation in the agricultural sector in the sub-Saharan region. Some ICT tools and technological devices are only used at export packhouses in Nairobi for checking quality, DMC, oil content, moisture, diseases and labelling avocado packages (cartoons) with bar codes.

d. Business plan services

The research found that there is a gap in business plan training for avocado growers who are in the Abogeta cooperative and for all farmers in general (see 4.3.1, paragraph 5). This is associated with the insufficient training support from NGOs, private support companies and avocado growers' cooperatives and might be also because avocado cooperative is still new compared to dairy cooperatives in Meru County. The poor business plan services are attributed to low profitability and poor business plan in Abogeta west and Abodoguci cooperatives and the real cause of unfunctionally of Abodoguci cooperative.

5.4 The chain actors' views of access to financial services and prices

From the farmers' interviews and observations of investments and innovations, researcher found that they feel that financial institutions do not give loans and other financial services to farmers (see 4.4) they do not apply them, and they do not have informal collective financial and saving groups. Institutions do not trust producers which are attributed to the irregular cash flows only during harvesting season and the lack of registered and insured collateral. Avocado plantations are not insured, and cooperatives are weak for the banks and other formal financial institutions to make sure that they can get back their money. Low access to formal and informal loans is associated with low investment in the avocado chain.

100% of interviewed farmers said that prices of Hass licenced seedlings are high to afford and produced far from Meru County. This could be the major cause of the use of locally and nonlicenced seedlings and lead to avocado chronic diseases and pests and high losses at the farm level.

The interviewees said that avocado fruit price is low and fluctuate during the harvesting period. In addition, farmers do not participate in price setting which makes them vulnerable to chain actors and low household income.

5.5 The status of the chain activities towards the proper use of chemicals, technology, disposal of waste and planet-friendly production methods

Avocado value chain activities are rudimental and organically performed by farmers based on researcher observations, quick scan in interviews and study area. Diseases and pests are controlled by the IPM system, large-scale farmers use insect pheromone traps and small individual farmers do not apply any chemicals to their avocado plantation. The practice could be considered as good factor for conserving biodiversity and reducing planet pollution.

The research results show in general that the use of technology is very low at the farm level which affects the management of avocado orchards and information flows through the chain stakeholders and the speed of avocado VC transformation.

Avocado production waste is poured into the farm plantation. This could lead to the spread and persistency of diseases and pests which inclement avocado losses. Avocado plantations contribute to afforestation and agroforestry production systems which participate in erosion control and the reduction of rivers' water in the high land of Meru County.

5.6 the extent to which women and youth are involved in the chain and the contribution to food security among smallholder producers

By research observations and findings on list of cooperative members, 4% of Abogeta cooperative members are women and youth are only involved in production picking and broking activities. This could show low participation of women and youth in production decision-making and access to production factors like land and extension services. The interviewees stated that avocado tree is men's business. During FGD with farmers, researcher found that women do not have the right to land heritage from their parents, except when they are widows or bought it with their own money, generally they depend on their husbands. Young men have only the right to their family land when they are about to get married or when they can buy it with their own money. Low inclusion and ownership in avocado production for young people could be the cause of night avocados and other smuggling stilling behaviours attributed to the youth in general.

82% of smallholder farmers interviewed said that incomes from avocado farming are used either to buy other food crops that they do not grow or buy what is missing in their food crop production for improving household food nutrition and security. From avocado income, farmers try to fulfil their households' basic needs.

5.7 Reflection as a researcher

The beginning of research was full of dilemma and with a lot of mixed feelings. At first, I had an idea of my research topic but after pitching, the feedback was not supportive because I have good ideas, but I could not arrange them systematically for making my topic to have significance and sense. The topic did not change but it required much consultation with my supervisor for helping me to organise broaden thinking about the topic. Another serious challenge that I experienced during the phase was formulating the problem statement, research problem and research questions that would meet my commissioner's expectations. This was the most challenging stage as formulating the problem statement until it made sense was an uphill task. What helped me were the discussion with different lecturers, my peers and supervisor. From there, I got more options from different sources, and this helped me in the process.

I met challenge and I learn that research will be full of new experience when it came to formulate the conceptual framework. I faced some difficulties in formulating the conceptual framework as it was hard to find past conceptual framework related to my research topic. I continued with literature review, and I adjusted conceptual framework after finding required literatures. Literature review was much annoying as it involves much going back and forth. Finding information which was relevant required thorough review of quiet several past literatures. From this experience, I learnt that research is an iterative process, and it requires that one understands the topic well as possible and to have previous experiences.

Identification the research methods was not difficult. Qualitative data analysis method was chosen to gain in-depth information about my research topic. I mixed sampling methods for collecting accurate data. Classification of my population based on sex and number of own avocado trees have been followed by purposive and snowball techniques of sampling were selected because I was not familiar with the people in the field study area, and I needed complete data. The proposal was presented to my assessor and supervisor, thereafter I had to make some adjustment to the report before heading for data collection.

Data collection process was quite engaging but challenging as I was working in a new country and with different culture and language. It was first hard for me to get information regarding the preparation of my move to field of study area and where to live. It required my contact, and I found many sources for comparing and I finally got a Noon congregation from Rwanda working in Kenya but living in different county. From them I got incredible help because they gave me a sister from Kenya who helped me to find a hotel in Meru and picked me from airport. After training a local translator, I started gathering information from different stakeholder along the entire chain which was hectic. Moving from one place to another to gather enough information required patience. There was high number of referrals by the stakeholder which was unexpected. With the help of the collaborators in the project my colleagues and I were able to easily reach the key informants we were referred to. Participants of two focus group discussion were selected based on purposive sampling. The process also required one to be attentive listener and probe further. This is because some of the respondents were not giving full information. Therefore, as my fellow researchers were dealing with the same topic but different aspects, we were able to probe.

Another challenge was getting to interview some key informants such as brokers and middlemen. This is because they are not located in one place, and they are always moving in different counties, and they ask money not for expenses compensation but to be paid. I failed to organize their FGDs, but I paid them, and I met them separately in their places. Therefore, proper scheduling of interview with the help of our translator helped in reaching them. The use of translator also helped me realize that close monitoring is important to ensure that data collected is correct even if I trained him translation from one language to another can change the original information, it requires me too vigilant and careful. This was noticed when the translator was not able to translate correctly what the respondent had said. This made realize that flexibility is an important trait of a researcher. I also realized the importance of teamwork as it makes work easier. Data collection in new country is expensive and

respondents after presentation they knew that I am doing my studies in Europe expected money from me and it was obvious to buy Fanta for them.

The process of data analysis was time consuming. I had to transcribe and categorize data from different sources. To be able to get answers for my research questions. Compiling all data to make sense of it was really time demand and required me to think critically. I was also struggling with finding supporting information from past literatures to my findings and I use to have headache and leave it for continuing following day. Putting down applicable recommendations was also a challenge. I used suggestions and ideas from the interviewees to come up with recommendations.

The entire research process has also strengthened my analytical, multicultural and interpersonal skills like listening skills and empathy.

CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The conclusions are based on discussed results and research findings.

6.1.1 leverage points in the avocado value chain governance to reduce avocado losses

This research was conducted to identify leverage points in the avocado value chain governance and to advise Abogeta cooperative and FORQLAB project about mitigation interventions to reduce losses and improve the quality and standards of avocados for making a sustainable avocado value chain with a planet-friendly production system. For assessing the avocado value chain governance, the author applied 3R which are robustness, reliability of institutional governance and resilience of innovation support system in the value chain.

6.1.1.1 Robustness of avocado value chain

The research revealed that avocado value chain governance in Meru County is still in the developing stage and the avocado value chain has full actors and enough supporters which is good factor for the chain to achieve robustness. However, the chain stakeholders are not in an active platform for further development of the chain. Regarding avocado flow, the research found that there are two avocado chains: 42% export and 58% local chains and Meru County is Kenyan horticulture Hub. Only 40% of export chain production flow based on farming contract between cooperative and exporter and the study put much focus on the export chain in which Abogeta cooperative involves. This shows that there an upgrade strategy needs to be developed for making avocado flow in formal ways based on farming contract because 60% sold out of contract at low price at farm gate (average 30 Ksh/kg) while for formal way average price is 52Ksh/kg.

The high losses of avocado production are at the farm level where around 24% do meet export requirements. According to the findings, the main cause is the delay in harvesting when there is no exporter or middlemen who are ready to buy and properly transport avocados, which leads to over-export maturity. Furthermore, harvested avocados must be transported or stored in a cooling truck or room before four hours after picking for keeping their freshness and to increase their shelf life, therefore, this needs to be improved because there are not available in Meru County. installing cold storage facilities is the most effective mechanism to extend the shelf life of avocados and reduce transport and storage losses by 30-60%.

The study found a weak relationship between producers and exporters, middlemen and brokers. Information regarding production factors, market, price, and quality and standards is managed and retained by other actors rather than farmers, hence, it not equally shared among all actors. Farmers are vulnerable and buyers have more power, in addition, farmers do not have access to price and market information. The gap needs to be addressed for making a win-win avocado business model. 70% of export chain producers are not direct members of any farmer group, and 30% are only Abogeta cooperative members either as direct members or via cluster membership (indirect membership). To improve the power of farmers, they could be grouped into farming cooperatives or farmers' groups for being able to increase their bargaining power and to reach avocado value chain coordination.

The research found that Abogeta west growers cooperative association Ltd has only a marketing role in linking farmers to exporters. This is not enough role or function for producers' cooperatives. The farmer cooperatives may encourage agricultural technology adoption, increasing crop productivity and farmer income. Even though the evidence is always presented in the context of the developing world, cooperative membership is positively related to price, yield, quality, input adoption, and overall income.

6.1.1.2 Reliability of institutional governance

Based on research findings, avocado value chain environment is enabled by well-designed adequate policies and laws to regulate the sector. The only challenges are in implementation side where all concerned and interviewed institutions showed the shortage of implementing staff and this affects their awareness among stakeholders especially actors like farmers and harmonisation for enforcement and updating processes. The situation needs to be ameliorated through making strong and active stakeholders' platform.

The research experienced that there are gaps in the production and accessibility of good quality and licensed Hass avocado seedlings in Meru County. Improved quality seedlings are produced by public institutions (KALRO) in 95Km far from the farmers and supply only 30% of the farmers' demand and farmers can produce their own seedlings. Good seedlings are a key factor for producing good quality and standardised avocados that meet export market requirements and reducing avocado losses caused by pests, diseases and low environment adaptation. The challenge affects the avocado farm expanding and this pushes farmers to grow nonlicensed Hass seedlings. Therefore, farmers grow poor-quality seedlings locally produced with low techniques but near them. The situation needs to be ameliorated for building the capacity of producers' cooperatives and empowering the sector.

6.1.1.3 Resilience of innovation support system

The findings showed that there is insufficient extension services delivery for improving farmers knowledge and skills in avocado production techniques. The extension services providers claim to have staff shortage, and, in our days, government does not hire new personnel. The current extension services delivery model is farmer oriented, where government does not have regular field staff and farmers are required to request the services writing letters and the process is not guarantying to expect the availability of an extension agent depending on to season of other crops and office urgent calendar. In addition, when a public extension agent is available meets farmers in a meeting and cannot find time to visit farms for deep assessment of the situation. The situation allows farmers to adopt farmer to farmer extension services where they share their knowledge and skills, but it is obvious that they miss new production techniques, information about access to finance, ICT tools needed in agriculture and skills in avocado business plan preparation for achieving desired avocado production transformation and innovation systems. This situation needs to be addressed via building skilled and strong farmers' cooperatives and stakeholders' platforms.

6.1.2 The current status of avocado value chain sustainability aspects in terms of people, planet and profit for implementing SDGs goals in Meru County

Farmers feel that financial institutions do not trust the sector because their plantation is not insured and does not have collateral for applying for a loan. Thus, they do not plan to collaborate with financial institutions for increasing investment in the value chain. Findings showed that farmers do not participate in avocado price setting which results in low prices at farmgate without considering their production cost. That challenge could be addressed for improving farmers' income.

There is the exclusion of women and youth in access to avocado production factors. The study revealed that, in Abogeta cooperative activities, women are involved at the rate of 4% and young men do not own production factors which is a gap for the avocado value chain to be sustainable and upgraded. In addition, avocado tree growing is a men's business in Meru County and the average age of members is 70 years old. The situation could be improved for the business to be inclusive, sustainable and developed.

From research findings, Producers do not participate in price setting, thus, the price is not fair and do not consider production cost. Small scale farmers produce avocados organically and mix with other crops which is good for biodiversity, but their production is not certified as planet friendly. Avocado

trees are used for production, but they are also used to control erosion and they are good the domain as they require minimum tillage, therefore, they participate in controlling water runoff.

6.2 Recommendations and interventions

6.2.1 Recommendations

Based on the conclusive findings of this study, it is obvious that the assessment of the avocado value chain shows leverage points in chain robustness, reliability of institutions and resilience of innovation system to make an upgraded and sustainable avocado value chain governance which is competent to reduce considerably avocado losses. The researcher identified four themes that could make a proposed model for accelerating the reduction of avocado losses in Meru County. Figure 24 displays the proposed avocado value chain governance framework in Meru County on which recommendations to Abogeta West growers' cooperative association Ltd and FORQLAB project are based on.

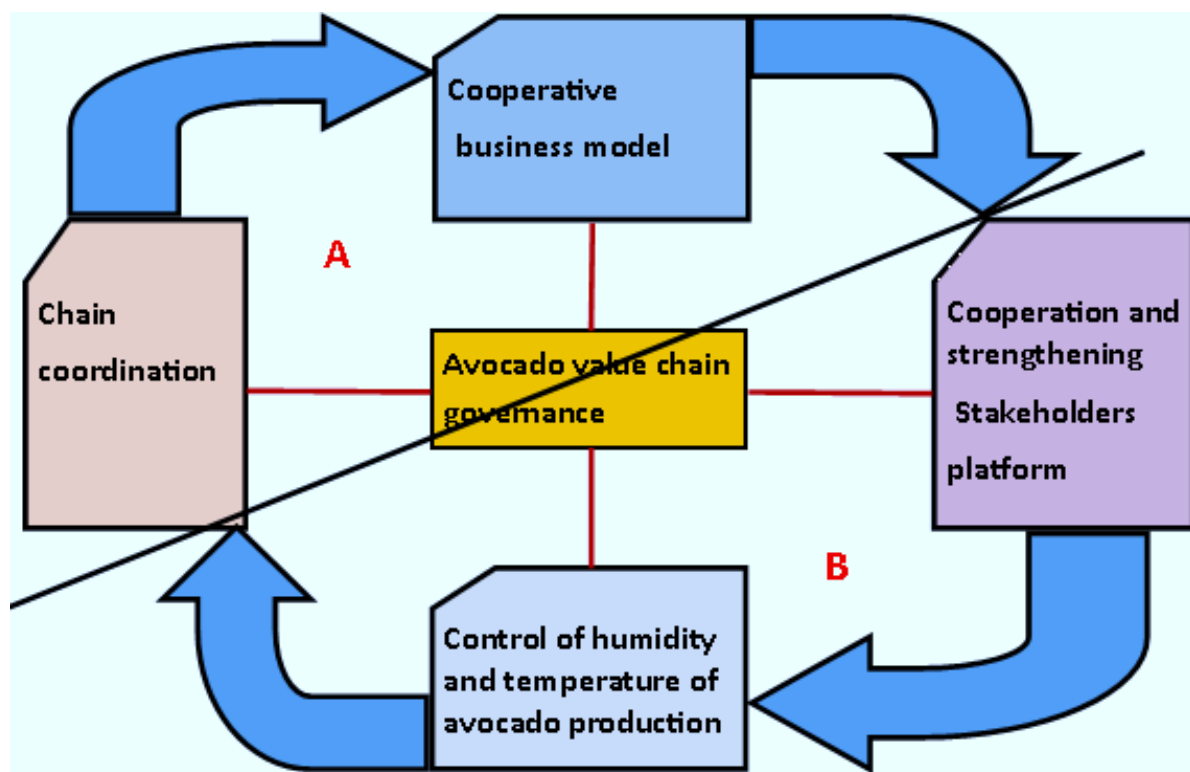


Figure 24: Proposed 4Cs to improve value chain governance and reduce avocado losses

6.2.1.1 Recommendation to Abogeta cooperative (A)

Theme 1: Chain coordination

Avocado producers in Meru County could be active and direct members of Abogeta cooperative to secure their bargaining power and improve production factors themselves. The clusters which are members of Abogeta cooperative could be registered cooperatives and every sub-county can have one avocado grower's cooperative. All seven cooperatives could make a cooperative union which is powerful. All individual actors could work in groups and both farmers' cooperatives and other actors can work closely for coordinating the chain. There is necessitates and a need for employment and application of all available technologies including ICT technology to bring about the desired transformation in the agricultural sector in the sub-Saharan region. The only bridge to the desired avocado value chain transformation can be achieved when all actors are in group and the chain is coordinated.

Theme 2: Cooperative business model

The Abogeta cooperative is now playing the role of linking farmers to exporters. Farmers still face other issues regarding avocado losses, insufficient extension and financial services and low access to improved Hass avocado seedlings. All these challenges could only find appropriate solutions from farmers themselves through their cooperatives which can work as business entities rather than social entities only. The cooperatives should develop business models that create a win-win situation for other actors and farmers to earn together. There should have to develop a business model regarding avocado marketing, processing and good quality and licensed Hass avocado seedlings.

For processing avocado, Cooperatives need to build a local packhouse, organise avocado collection centres in every Sub- County and organise adequate transport of avocado production to the packhouse. The packhouse can firstly solve delays in harvesting while waiting for exporters then lowering avocado losses and secondly can help increase bargaining power which can result in the good price of avocados in Meru County. This makes more than one option because the Parkhouse can be rented to an exporter with the agreement of collecting avocados on time. Furthermore, from the cooperative union's profit, they can hire their own extension agents to improve productivity and contribute to the reduction of losses caused by pests and diseases together with the production of licensed Hass avocado seedlings.

6.2.1.2 Recommendation for the FORQLAB project (B)

Theme 3: Cooperation and strengthening stakeholders' platform

The study found out that, the avocado value chain has stakeholders who know their responsibilities to develop the chain, but they are in an active and strengthened platform where they can share challenges and find solutions together. I could recommend FORQLAB focus on that part for making a deep assessment of the case and helping in the establishment of an active avocado stakeholders' platform.

Theme 4: Control of temperature and humidity of avocado production

The cooperative management team need improved skills in post-harvest handling of avocado production. The skills gaps among leaders who are the ones to train farmers through farmer-to-farmer extension model are in controlling temperature and humidity in harvested avocados. They still harvest avocados and keep them under fresh banana leaves for sometimes more than two days before transportation and this could be a major problem even when the cooperative will have an adequate Parkhouse. I would like to recommend FORQLAB train at least a cooperative management team and empower them with enough skills to control the humidity and temperature of avocados for increasing their shelf life.

6.2.2 Proposed interventions

To reduce avocado losses in Meru County, the construction of a local avocado packhouse and collection centres and organised adequate production transport are the main solutions. In addition to coordinated VC and active stakeholders' platform as part of chain governance, could be the sustainable solution to the reduction of avocado losses in Meru County. Figure 25 shows proposed applied interventions.

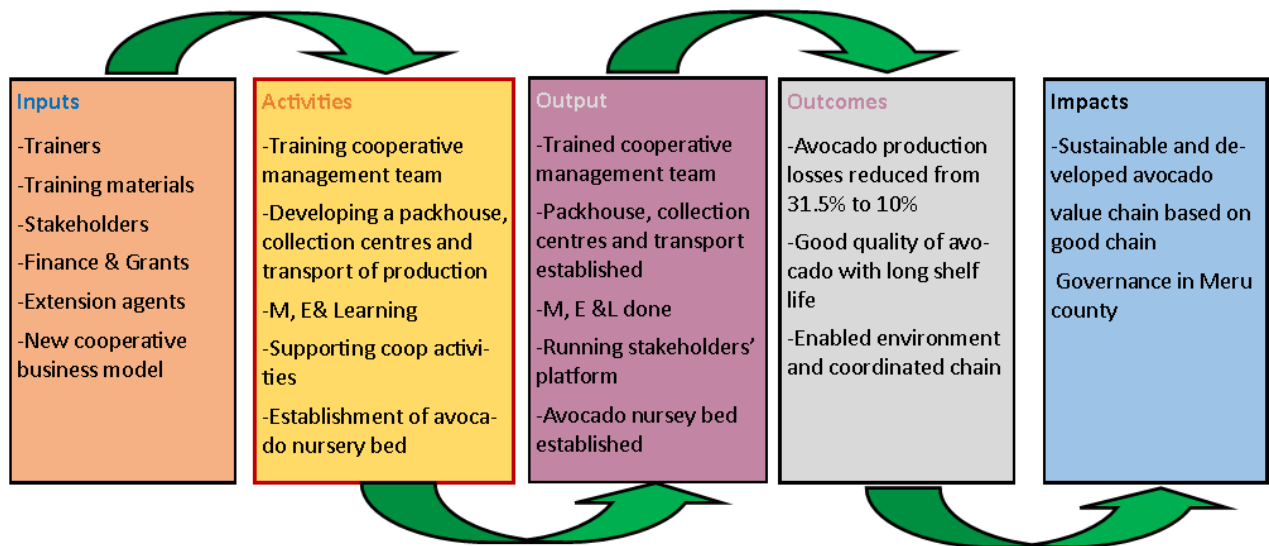


Figure 25: Proposed interventions in the theory of change

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ANNEXES

Annex 1. FORQLAB project

Project summary

The consortium would like to contribute to the structural reduction of post-harvest and food losses and food quality improvement in Kenyan avocado and dairy value chains via the application of technical solutions and tools as well as improved chain governance competencies in those food chains. The consortium has four types of partners: 1. Universities (2 Kenyan, 4 Dutch), 2. Private sector actors in those chains, 3. Organisations supporting those chains, and 4. Associate partners which support category 1 to 3 partners through co-financing, advice and reflection.

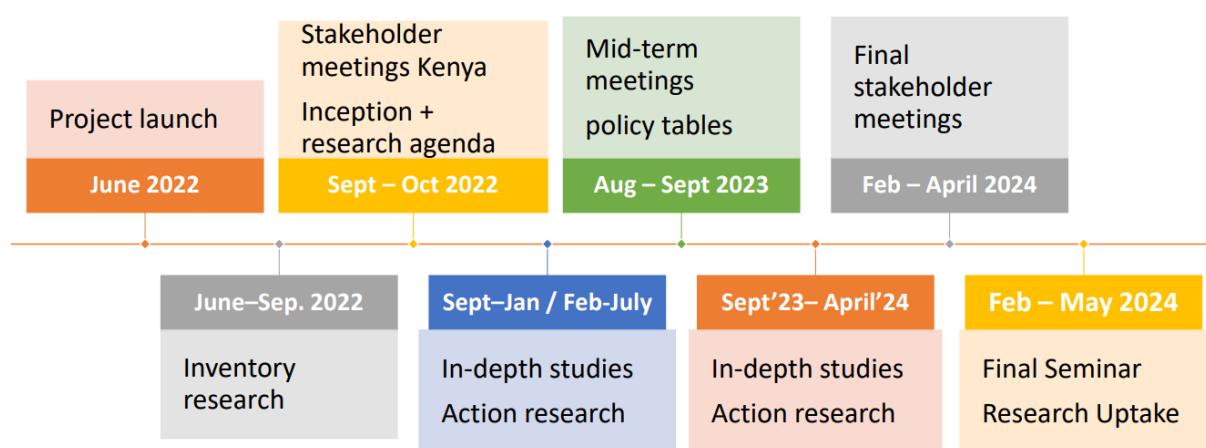
The FORQLAB project targets two areas in Kenya for both commodities, a relatively well-developed chain in the central highlands and a less-developed chain in Western Kenya. The approach is business to business and the selected regions have great potential for uptake of successful chain innovations as an outcome of research results. The results are scalable for other fresh and processed product chains via a living lab network approach.

The project consists of 5 work packages (WPs): 1. Inventory, status quo and inception, 2. Applied research, 3. Dissemination of research outputs through living lab networks, 4. Translation of project output in curricula and training, and 5. Communication among partners and WPs. The applied research will be implemented in cooperation with all partners, whereby students of the consortium universities will conduct most of the field studies and all other partners support and interact depending on the WPs. The expected outcomes are: two knowledge exchange platforms (Living Labs) supported with hands-on sustainable food waste reduction implementation plans (agenda strategy); overview and proposals for ready ICT and other tech solutions; communication and teaching materials for universities and TVETs; action perspectives; and knowledge transfer and uptake.

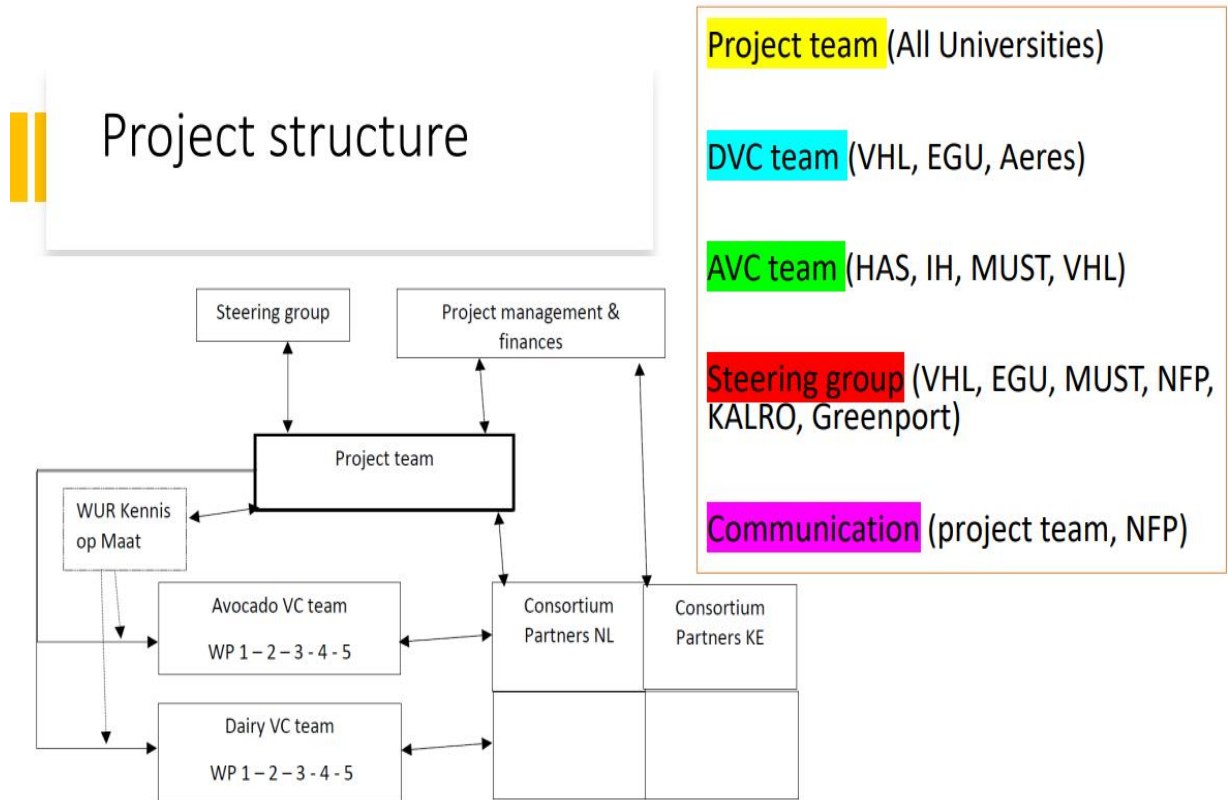
Goals

- To contribute to the structural reduction of post-harvest losses in Kenyan avocado and dairy chains via the application of technical solutions and tools as well as improved chain governance competencies.
- To develop interventions in the Kenyan avocado and dairy food systems.

Project timeline



Project organizational structure



FORQLAB Project partners in Avocado chain



FORQLAB – avocado partners



Abogeta-West Avocado
Growers Cooperative Society
Nandi Avocado Farmers
Cooperative Society



GREENPORT
West-Holland

Annex 2: Interview checklist

A. Individual interviews

1. Identification

- a. Sex:.....
- b. Age:.....
- c. Sub-county:.....
- d. Ward:.....
- e. Cooperative or producers' organisation membership: From.....
- f. Membership conditions:.....
.....
- g. Types of membership: i. direct.....ii: indirect/ group cluster.....
- h. How many general assemblies per year:.....When was the previous one.....
When will you have the next one?.....
- i. Do you have a code of conduct(rules and regulations)?.....
- *. If yes: How did it design.....
- * Who validated it?.....
- *Services gained from cooperative/organisation:.....
.....
.....

2. Robustness of the avocado chain

- a. i. What is the flow of products from farmers to consumers look like?
.....
.....
.....
- ii. who do consider to be the chain coordinator?.....
- iii. Who is vulnerable in the chain?.....
- b. How is the relationship between the actors in the chain
- i. Do you have a farming contract.....with who:.....
- ii. What are product delivery conditions:.....
- iii. how is the payment system:.....
- iv. how much do you sell: Ksh...../piece or kg and Challenges:.....
.....
- v. Who do authorise harvesting time?:.....
- vi. How product transport and storage is done.....
.....by who.....
- vii. Where grading is done?: during pickingor later in the warehouse.....
- viii. Do you trust your clients:.....if no why?.....
- ix. Is there transparency in product follows?.....if no why?.....
- x. What is done in case of dispute?.....
.....
- xi. How are you linked with input suppliers(seedlings, fertilizers and pesticides/ fungicides supplier?
Contract....., verbal agreement.....direct buying.....other.....
- c. In which ways information is shared among chain actors?.....
- d. What types of information are flowing within the chain?.....
- e. What are the challenges in the chain's information flow?.....
- f. At which level do you have a high avocado loss?.....
- g. What are the causes of the loss.....
.....
- h. What do you do with rejection?.....
- i. What are the criteria for high good quality of avocado fruit:.....
.....

3. Reliability of institutional governance

- a. i. What organisations do support you?.....
-
- ii. In what ways (Chain map)?.....
-
- b. i. What are directives, policies and regulations and quality standards applied to the avocado chain?.....
-
- ii. Who do their dissemination and implementation in the chain?.....
- iii. Who does the evaluation in the chain? (for amendment/enforcement/harmonisation).....
-
- c. i. What are the quality standards in avocado VC?.....
-
- ii. who is controlling them?.....
- iii. Is there a certification system?.....
- iv. What are the roles of those who are involved.....
-

In which way is the buyer controlling them or the coop?.....

4. Resilience of innovation support system

- a. i. Who does provide the extension services?.....
- ii. How the extension services are provided? (way, free or paid).....
-
- iii. Which family member does receive the services?.....
- b. i. what are available financial, research, ICT and business plan services?.....
-
- ii. Which organisation does provide the services?.....
- iii. How the services are provided? (way, free or paid).....
- iv. Which family member does receive the services?.....
- c. i. What are the challenges in the avocado chain regarding extension, financial, research, ICT and business plan services provision?.....
-
- ii. What are supporting factors in the avocado chain regarding extension, financial, research, ICT and business plan services provision?.....
-
- lii. In what way?.....

2. Avocado value chain sustainability aspects in terms of people, planet and profit for implementing SDGs goals in Meru county

- a. i. What are the chain actors' views of access to financial services and prices? (Profit/economic aspect).....
-
- ii. What are the criteria (aspects) of the dimension of profit or prosperity? Price, financial services,.....
-
- b. i. What is the status of the chain activities toward properly using chemicals, technology, waste disposal, and planet-friendly production methods? (Planet/ ecological aspect).....
-
- ii. What is Product sustainability?.....
-
- lii. What is the sustainability of natural resources (soil, air, water and biodiversity)?.....

.....
.....
iv. In growing avocado requires a lot of water, how are farmers dealing with it?.....
.....


.....
c. i. What is the role of men and the role of women in the avocado in terms of tasks, responsibility and control over the resources, as well as access to the different inputs and services?
.....

.....
ii. What is their contribution to food security? Direct.....
.....
indirect role:.....
.....

B. Focus group discussion

1. What is the avocado chain map? (actors, supporters and influencers)
2. What are the strength, weaknesses, opportunities and threats in the avocado value chain?
3. What are the main causes of avocado losses
4. At which chain function level, do you find avocado losses occur mostly?
5. What are your views and suggestions for reducing avocado losses?

Annex 3: AFA-HCD quality and Standards checklists



AGRICULTURE AND FOOD AUTHORITY – HORTICULTURE CROPS DIRECTORATE

TRANSPORT INSPECTION CHECKLIST
HORTICULTURAL PRODUCE TRANSPORTATION CHECKLIST

Name of exporter	Email:		Telephone:	
Company owned/Hired (Attach contract)				
Name of transporting firm/company		Car Registration No. (s)		Date
Name of group (if applicable)				
Name of the farmer(s)		Telephone		
County, sub-county		Location		
Crops of interest				

Criteria	Evidence	Please tick		Remarks	Comments
		Yes	No		
Fresh Produce Transportation	Is the transportation of produce done in such a manner so as to avoid mechanical damage due to bruising or stacking			Major Must	
Hygiene aspects	Is the transport vessel cleaned, disinfected, and, if found to be necessary by risk assessment, fumigated on a regular basis and records maintained. (Evidence of records)			Major Must	
Documentation	Do produce handlers have clear documentation/temperature control systems			Major Must	

1


AGRICULTURE AND FOOD AUTHORITY
HORTICULTURAL CROPS DIRECTORATE
Nairobi Horticultural Centre next to JKIA, P.O. Box 42601 – 00100 Nairobi, Telephone: 020-2088469, 020-2131560 Email: md.hcd@africa.kenya / www.agricultureauthority.go.ke

Application form for Horticultural Crop Nursery Registration
(The Agriculture Act (Cap 218) HCDR Legal No 190 paragraph 29(1))

- Full Name/Group of applicant.....
- National Identification No. (ID).....
- Kenya Revenue Authority Pin No.....
- Physical business location.....
- Postal address.....
- Telephone mobile No.....
- E-mail address.....


A. Source of Propagation Material

- Copy of Receipt for Seed acquisition
- Certified Copy of HCD Mother block registration
- A Phytosanitary Certificate of seed and Mother block

B. Fruit tree Nursery Source

Crop	Variety	No. of Seedling

1



AGRICULTURE AND FOOD AUTHORITY - HORTICULTURE CROPS DIRECTORATE

EXPORT LICENCE PACKHOUSE / WAREHOUSE INSPECTION CHECKLIST

Name of EXPORTER	Date:
Exporter's contact Telephone	Exporter's email:
Name of PACKHOUSE	Telephone
Packhouse location	License number
Produce/crop handled	

Criteria	Evidence	Yes		No		Remarks	Comments
Certification to Food safety standards	Valid certification					Minor Must	
Contract between Exporter & Packhouse (where applicable)	Duly signed and witnessed contracts (Between exporter(s) and pack house user(s))					Major Must	
	Evidence of export licence by all users of the packhouse					Major Must	
Records-Source of produce	List of codes of own farms or contracted farmers (Check on the documentation)					Major Must	

1



AGRICULTURE AND FOOD AUTHORITY - HORTICULTURE CROPS DIRECTORATE

EXPORT LICENCE INSPECTION CHECKLIST: FRUITS AND VEGETABLES

Name of exporter / Dealer	Email:	Telephone:
Produce source (tick appropriate)	Exporter's own farm	Contracted sources
Name of group (if applicable)		Date:
Name of the farmer/farm		Telephone
County, sub-county		Ward
Intended Crops		

S/No - 7 Criteria	Evidence	Yes		No		Remarks	Comments
1. Certification to KSL758 or any other relevant standards	Valid certification to KSL758 and any other relevant standards					Major must	
2. Contract with Exporter	Duly signed and witnessed contracts (Check PSU terms)					Major must	
	Production Plan per crop per month (for 3 months)					Major must	
3. Knowledge of market requirements	Is the exporter aware of the market requirements in the intended market (evidence of communication from customer and training certificate on requirements)					Major must	
	Does the exporter have trained personnel to implement GAPs (evidence of certification/attendance sheets or Standard Training materials)					Major must	
	Is there a controlled and approved traceability procedure in place (from farm to collection center)					Major must	
	Does the exporter have produce NIRS test results for the intended product (s) to be exported					Major must	

1


AGRICULTURE AND FOOD AUTHORITY
HORTICULTURAL CROPS DIRECTORATE
NKUBU DEPOT,
P.O. Box 119 – 60202, Nkubu,
Contact Person: Mutungi Amos Kwigu, Mobile: 0724784595,
Email: amosmutungi@gmail.com Website: www.afa.go.ke

NURSERY INSPECTION CHECKLIST

Name of business: _____

Tel: _____ E-mail: _____ PIN No. _____

Date: _____

Location of Nursery (Sub-County & County): _____ / _____

Hectareage: _____

Type of seedlings and stage of propagation: _____


Duration of the seedlings in the nursery: _____

(Give a breakdown for each crop type where there are differences in duration)

Nursery type (Mother block/TC/seedlings) _____

KEPHIS certificate No. _____

1


AGRICULTURE AND FOOD AUTHORITY
HORTICULTURAL CROPS DIRECTORATE
NKUBU DEPOT,
P.O. Box 119 – 60202, Nkubu,
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Duration of the seedlings in the nursery: _____

(Give a breakdown for each crop type where there are differences in duration)

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1


AGRICULTURE AND FOOD AUTHORITY
HORTICULTURAL CROPS DIRECTORATE
 Nairobi Horticultural Centre next to JKIA, P.O. Box 42601 - 00100 Nairobi, Telephone: 020-2088469, 020-2331560 Email: mdc-hc@kafu.go.ke / www.kafu.go.ke
Application form for Horticultural Crop Mother blocks
(The Agriculture Act (Cap 318) HCDA Legal No 190 paragraph 29(1))

- Full Name/Group of applicant.....
- National Identification No. (ID).....
- Kenya Revenue Authority Pin No.....
- Physical business location.....
- Postal address.....
- Telephone mobile No.....
- E-mail address.....

A. Propagation Material	Variety	No. of trees/ vines

1


AGRICULTURE AND FOOD AUTHORITY - HORTICULTURE CROPS DIRECTORATE
EXPORT LICENSE PACKHOUSE / WAREHOUSE INSPECTION CHECKLIST

Name of Exporter	Date	
Exporter's contacts Telephone	Exporter's email:	
Name of Packhouse	Telephone	
Packhouse location	License number	
Produce/crop handled		

Criteria	Evidence	Yes	No	Remarks	Comments
Certification to Food safety standards	Valid certification				Minor Must
Contract between Exporter & Packhouse (where applicable)	Duly signed and witnessed contracts (Between exporter(s) and pack house user(s))				Major Must
	Evidence of export license by all users of the packhouse				Major Must
	List & codes of own farms or contracted farmers (Check on the documentation)				Major Must
Records-Source of produce	Register of in-coming produce matches the PS form?				Major Must
	Are all the produce sources declared in the PS forms				Major Must
	Food safety policy in place and displayed				Major must
	Packhouse quality management manual				Major Must
Traceability codes accompanying produce from farm to pack house	Copies of produce collection note/Goods received notes				Major Must
	Harvest date & quantity harvested				Major Must