

Introduce Kenyan Frozen Avocado to the Netherlands

FINAL REPORT



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Summary

The great value of avocado promotes the competition in avocado trade over the world, the oversupply when peak season will cause food waste due to the perishability. With the increasing demand for healthier and convenient food products, the frozen fruit market is expanding. The report highlights the potential of introducing Kenya IQF (Individually Quick Frozen) avocados to the Netherlands. The comprehensive literature study, interview and market survey were conducted to exam if the Kenya IQF avocados fits the requirements of Dutch market and the EU regulations. The findings showed that the possibility to introduce Kenya IQF avocados depends on the size of the company. It will be easy for bigger exporters, but smaller exporters face lots of challenges, including the lack of cold storage facilities, high investment costs, absence of certificates, and inadequate traceability. Also, Kenya IQF avocado will face the intensive competition from other countries, local processing companies and fresh avocado. The report also proposed the suggestion for further study to have more details, including processing status of small IQF avocado producer and exporters in Kenya and B2B market requirements.

At the end, regarding to the main question “What are the opportunities for introducing Kenyan IQF frozen avocados to Dutch market?”, Kenya IQF avocado is able to catch to succeed in the Dutch market, but it may be not suitable for all companies. Small exporters need to address the challenges they face and meet the market's requirements. For big companies, the trend of smoothies and seeking convenience food, are the opportunities for them to enter the Dutch market.

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1. Introduction

Avocado is a popular subtropical fruit of high economic importance (Bill et al., 2014). Many countries consider it as the “new gold” and start the fierce competition. Therefore, the demand and supply balance will be broken in European market in the future (Match Maker Associates, 2022).

Kenya is one of the biggest avocado-producing countries in Africa, which takes up 3% of global avocado production (CBI, 2022; Sibulali, 2020). Avocado production is the main economic source for Kenyan people. However, the production is dominated by small-scale farmers. It contributes to the challenge of quality and certificates for export (Snel et al., 2021). Also, the production of avocados is seasonal. The two aspects result in the low value chain of avocados and lead to 10-20% food waste of avocados (CBI, 2022; Kiilu & Wambugu, 2001; Snel et al., 2021).

The general export season for Kenya is from April to September. It will compete with Peru, South Africa, Israel, Mexico, and Spain. These competitors all have good reputation on quality (CBI, 2022).

In recent years, people are more and more interested in healthier and convenient food products. The increasing demand drives the enlargement of frozen fruits market. As a freezing technology, Individual Quick Freezing (IQF) can be used for fruits, vegetables, and fish. It takes short time, avoids doing damage to the quality of the product to a great extent, and expands the shelf life (Sebastian, 2020). IQF avocado is considered as an essential way to deal with the blemish and ripeness problems. The technology is used widely in Australia frozen avocado industry (Fanning et al., 2012). In 2021, Kenya has exported IQF avocados to China, which were processed by the company Sunripe.

The Netherlands is the center of import and re-sell frozen fruit products in Europe (CBI, 2020a). As estimated, 70% frozen products will go to food processing industry and there is a great increasing in food service industry in Europe (CBI, 2020b). However, it's unknown that Kenya IQF avocados meet the requirements of Dutch market or not. Therefore, the problem is to investigate the opportunities of introducing Kenyan IQF frozen avocados to the Netherlands. If it is feasible, the Kenya fresh avocados could be processed by IQF to extend its shelf life and prevent the competition when peak season, which will help Kenya avoid the food waste due to perishability of avocados.

Therefore, the objective of the project is to investigate the opportunities to sell IQF frozen from Kenya to the Dutch market to reduce oversupply food waste by doing literature study, interviews, and market survey.

Main question:

-What are the opportunities for introducing Kenyan IQF frozen avocados to Dutch market?

Sub-questions:

-SQ1: What is the quality of IQF avocados in Kenya now?

-SQ2: What is the quality of IQF and none IQF avocados in Dutch market?

-SQ3: What are the regulations on food import in the Netherlands

-SQ4: What are the market preferences on frozen avocado in the Netherlands?

Conceptual Model:

The conceptual model can help to figure out the factors that may influence the approaches to make Kenya IQF frozen avocado more competitive in Dutch market, which is basis to conduct the research.

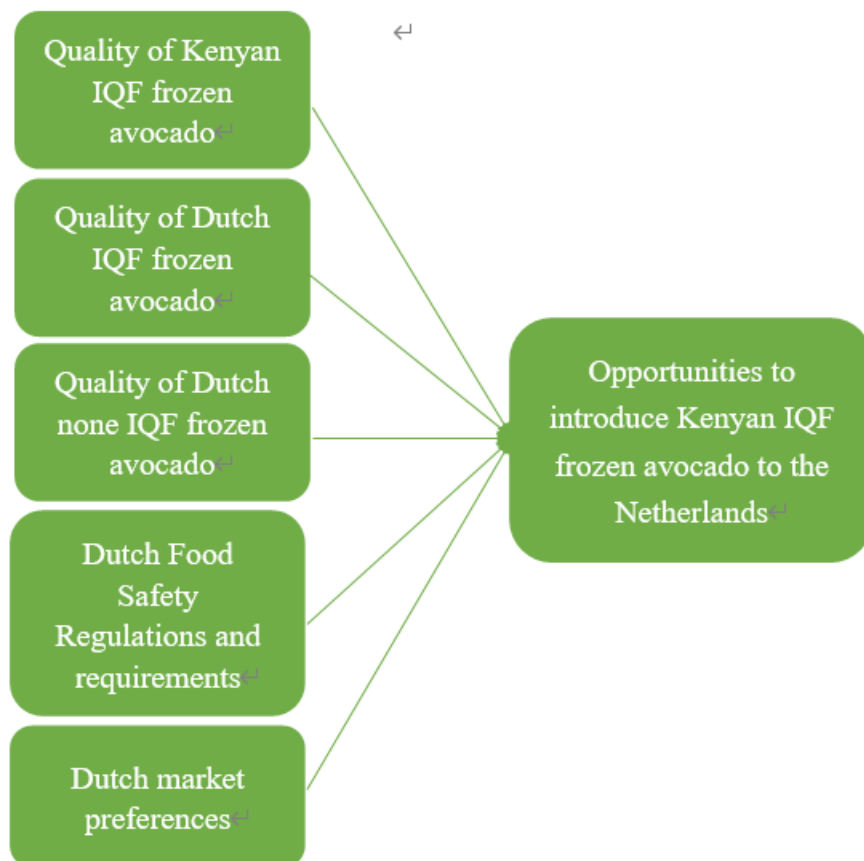


Fig.1 Conceptual Model, showing the factors determine the opportunities to introduce Kenyan IQF frozen avocado to the Netherlands. ↵

Research Model:

The research model provides the framework of the whole project, which is the guideline to conduct the research and collect data.

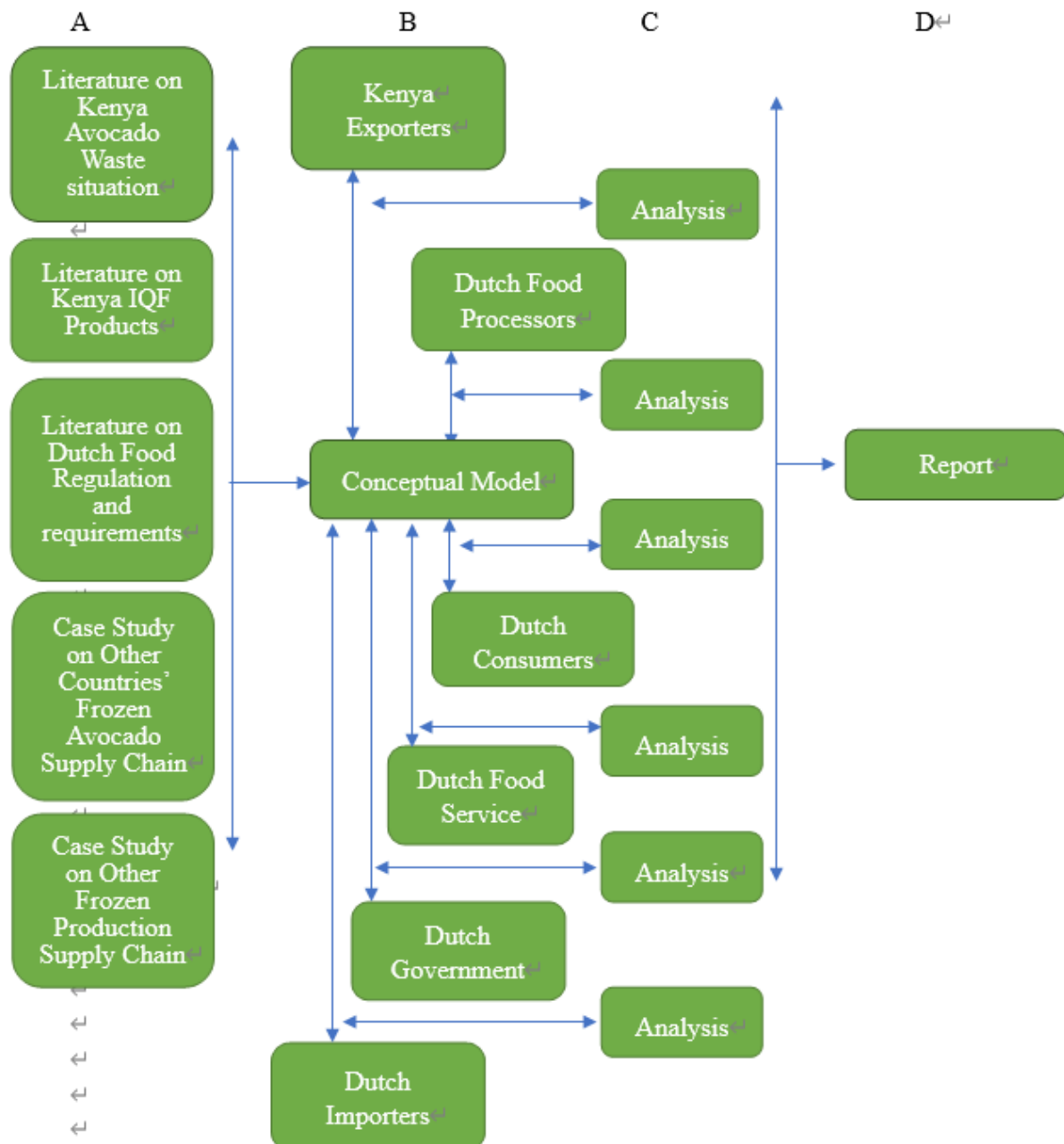


Fig.2 Research Model, requiring the information of avocado food waste on the worldwide and Kenya levels, food safety regulations in the Netherlands, and IQF frozen products supply chain in Kenya and other countries (A). Based on that, the market survey with Dutch importer, Dutch food processor, Dutch food service, and Dutch consumers will be carried out to know their preference on frozen avocado; the current processing situation in Kenya will be known from Kenyan exporters (B). The results will be analyzed (C) and used to advisory report of find approaches to Kenyan IQF frozen avocado more competitive in Dutch market to reduce oversupply waste (D).

The scope of this research is limited to the post-harvest phase of the supply chain, especially addressing the challenges faced by Kenyan IQF frozen avocado producers in processing and exporting frozen avocados as well as identifying the opportunities for improving the competitiveness of their products in the Dutch market. The Dutch market includes three parts: food services, food processing sector, and end market.

The project is commissioned by Woody Maijers, who is an active member of the platform (FOod waste Reduction and food Quality living LAB) FORQLAB. The platform is aimed to reduce post-harvest loss and improve the efficiency of food system in Kenya. The project is financed through SIA (the Taskforce for Applied Research SIA, or Regieorgaan SIA), the organization is aimed to improve the quality and widen the impact of the applied research that done by Dutch applied sciences university. The commissioned student is Xiaoyi Zhang, the student from Inholland University of Applied Sciences.

The report is structured as follows: **Chapter 2** presents the methodologies of the literature, interview, and market survey, including the selected group for research and the details of research method. The approach to analyze the data is also indicated.

Chapter 3 describes the results from literature and the survey, identifying the current status of Kenya IQF processing, preferences in the Dutch market, and the competition in IQF avocado industry. The Porter 5 Forces and SWOT analysis will be applied to show the potential of introducing the Kenya IQF avocados to the Dutch market. In **Chapter 4**, the differences between the literature study and the research will be discussed. **Chapter 5** is the brief conclusion for the whole report and each question will be answered. In **Chapter 6**, the recommendation for possible strategies for Kenya IQF avocado industries and further study will be shown. All the used literature will be listed in **Reference**.

2. Method & Materials

2.1 Literature Study

The collected information will be presented in this part. It will also point out the direction for further study.

Table 1. An Overview of Research Methods for Literature Study

Question	Specific information	Search Engines	Key words
1. What is the quality of IQF avocados in Kenya now?	The quality includes the taste, certificates, and the way they process products.	Google scholar, Inholland library.	IQF fruits; Kenyan IQF avocado; Kenyan processed fruits; Kenyan frozen fruits; Kenyan frozen fruits' quality;
2. What is the quality of IQF and none IQF avocados in Dutch market?	The competitors in the Dutch market	Google scholar, Inholland library	IQF fruits in Europe; European frozen fruits
3. What are the regulations on food import in the Netherlands	EU regulations on importing frozen fruits	Google scholar, Inholland library.	Food safety regulation; Brand regulation; Custom
4. What are the market requirements on frozen avocado in the Netherlands?	B2B market requirements and consumer preferences.	Google scholar, Inholland library.	Frozen food processor; Frozen food service; Processed avocado market

In **Table 1**, different questions correspond to different key words of detailed information.

2.2 Interviews

2.2.1 Materials of Interviews

There are four groups of interviews for research (**Table 2**).

Table 2. Selected group for research

Target Group	Description
Kenyan exporters	Sunripe, the active company in Kenya, which is responsible for IQF avocado producing and exporting. It has already had the trade with China and France.
Importers	The importers and food processors will not be limited in the Dutch market, since the Netherlands is the re-export center and the processed products will be sourced in the European market. Thus, the scope will be Europe. Food services will be different with food processors, the selected companies will be more local (in the Dutch market). For the three groups, the company may have no experience in IQF frozen avocado trade, but it should have other IQF products (e.g., IQF raspberry).
Food processors	
Food services	

2.2.2 Methods of Interviews

Kenya IQF Frozen Avocado Processing

(1) Interview Objective

The interview is aimed to have an overview of Kenya IQF frozen avocado processing situation, which will be used to compare with the market requirements.

(2) Steps

The interview will be carried out to collect information from Kenya IQF avocado exporters. It includes these aspects: quality control, certificates, materials of packaging, cold chain & storage, current market, capacity, and challenges.

It will be held online and arrange with the company by email. The selected company will be Sunripe, which is the active IQF avocados' processor and exporter in Kenya.

(3) Information Analysis

The information will be analyzed together with the market requirements by SWOT and Porter's 5 Forces

B2B Market Requirements on IQF Frozen Avocado

(1) Interview Objective

The survey is aimed to know the B2B market requirements on IQF frozen avocado and know the competitors in the Dutch market, which is important for Kenya exporters to enter the market successfully.

(2) Steps

Supply countries (only apply for importers) and requirements on quality control (including additives), certificates, materials of packaging, cold chain, capacity (availability), traceability, and CSR are included in the questionnaires. There will be three questionnaires for importers, food processors, and food service.

(3) Information Analysis

The information will be analyzed together with the market requirements by SWOT and Porter's 5 Forces

2.3 Market Survey

2.3.1 Materials of Market Survey

The materials of the market survey will be the consumers of frozen fruits in the Dutch market.

2.3.2 Methods of Market Survey

(1) Survey Objective

The survey is aimed to know the consumers' preference on IQF frozen avocado and know their attitude towards fresh avocado and frozen avocado, which can provide an overview of the potential of retail market.

(2) Steps

The questionnaire will include five aspects: quality, price, convenience, packaging, availability, and reputation. It will be presented by Google Form and handed out by Yammer.

(3) Data Analysis

For the "satisfaction of the frozen avocado in the Dutch market" and "willingness to buy frozen avocado instead of the fresh for different factors", the two questions are the scale questions. The quantitative data will be defined with number. For example, "Very Satisfied" will be 5, and "Very Dissatisfied" will be 1. It will be presented as the average score first. For each score, it will be compared to the score that is lower than itself by One-sample t test to show if it is significantly different with the lower score ($p < 0.05$). For example, the satisfaction score of quality is "3.698", it will be tested by "3" (Neutral). If they are significantly different, it means the satisfaction of quality tends to "4" (Satisfied). The result will be listed in a table:

Table 4. One-sample t test

	<i>t</i>	<i>p</i>
Quality		
Convenience		
Availability		

Also, since the data is categorical data, it will be analyzed with Chi-square by SPSS ($\alpha = 0.05$) to check whether the factor will affect their choice.

Table 5. Analysis of different factors

		Willingness to try frozen avocado in the future			X²	<i>p</i>
		Yes	Maybe	No		
Buy frozen fruits to make special food (e.g., smoothies)	Yes					
	No					

If they have difference, the next phase will test the correlation between them by percentage. For example, due to 65.4% of people who have the preferences on “buy frozen fruits to make special food” tend to “willing to try”, they are more likely to try it in the future than those who buy frozen fruits not for special food.

For the rest questions, the results will be analyzed by frequency and make it visible by bar chart or pie chart.

Table 6. Preference on Quality

	Frequency	Percentage	Total
Certificates of the Product			
Sustainability of the Product			
The texture/taste is similar with the fresh			
The additives/preservatives should be minimized or eliminated			
Total			

3. Results

3.1 Current Situation of Frozen Avocado in Kenya

From the literature study, IQF (Individual Quick Freezing) is a freezing technology that is used for frozen products. Compared with the traditional freezing technology (bulk freezing), IQF frozen products can be separated, which is convenient to take out (Sebastian, 2020). It's popular in the frozen products industry: as the main part of Serbia's economy, 90% of their raspberries are processed by IQF and go to the European market (Paraušić & Simeunović, 2016).

In Kenya, one of the main characters is seasonal production. Therefore, there are periods of oversupply and shortage during the year, which also leads to the waste of 10%-20% of fruits. In addition, the seasonal production contributes to the low-added-value chain (Kiilu et al., 2001).

Also, freezing is considered as the way to help alleviate the limitations of seasonal production by transforming excess production into high-value and stable shelf life (long shelf life) products. Also, fruits with visible damage can be partially used for processing. Thus, the frozen product is considered as an approach to solving the problems of avocado maturity and blemishes (Kiilu et al., 2001; Fanning et al., 2012).

In the survey, Sunripe does not face the challenge of seasonal production, their trees can fruit for 9 months a year. But there is the other problem: Kenya government set up frequent bans on the fresh avocado exports to ensure their quality. Sunripe claimed that the IQF can help solve the problem of perishability and break the bans of the fresh avocado, which extends the Kenya avocado supply period, creates more profits and reduce the food waste.

Regarding the problem of imperfect avocados, Sunripe only use the fruits that meet their high-quality standards.

Through the literature study, there are four challenges of IQF processing that developing countries are facing:

Lack of international and regional standards and product specifications: The main reason for which is the high cost of certification (Kiilu et al., 2001). Secondly, product quality and food safety standards of the target market will also be a part of the challenge, which is also happening in the frozen raspberry industry in Serbia (Kiilu et al., 2001; Paraušić & Simeunović, 2016).

According to the survey, Sunripe doesn't have the worries of reaching the international or regional standards, they have the certificates of "Global G.A.P" and "BRCS", which are the two common certificates in global food industry.

Availability of raw materials (fresh avocados): If the processor doesn't have enough avocados to maintain the processing volume, it will be difficult to meet the quantity requirement of orders (Kiilu et al., 2001).

But in the survey, it's not the challenge for Sunripe, they have their own farms that are closed to their processing area. Also, they cooperate with top growers and try to ensure the supply of their fruits all year round. Also, Sunripe agreed that more avocado varieties are suitable for being frozen instead of being export as fresh, which can help them to supply more, not only "Hass" or "Fuerte".

Storage: These products should be put under a cold atmosphere to ensure they will not be defrosted. However, in the Kenyan fresh avocado industry, the lack of cold storage is still a challenge (Snel et al., 2021). According to the research from Arifeen (2011) and Kiilu et al. (2001), although IQF can meet the requirements to freeze the fruit within 5 minutes, there should be a cold chain to maintain product consistency, which requires additional investment.

In the survey, as the processor and exporter, Sunripe is responsible for ensuring the procedure from the farm to the target country. After being frozen, these products will in the containers with Controlled Atmosphere (CA) to ensure they are under the right conditions. They will be delivered by sea in 20-35 days to the Europe.

Utilization of processing facilities: One research on Kenya mango processing mentioned that lack of processing facilities and the seasonal production can put pressure on peak season processing. However, if invest more machines, the high cost will be a problem for the processing factories. These machines are underutilized during the rest of the time as well. (Kiilu et al., 2001; Match Maker Associates, 2022).

For Sunripe, IQF avocado is not the only product that they have, they also process frozen broccoli and other frozen products. Thus, it's not a challenge to them.

Regarding the quality of Sunripe IQF avocados, they will select the qualified avocados to hydrocooled to maintain their quality of the raw materials. Also, they will add antioxidants and stabilizers to ensure the products have the same texture, color, aroma, and the flavor as the fresh.

Also, the IQF avocados of Sunripe have less food waste and packaging than fresh avocados. Also, they have lower carbon footprint than the airfreighted products.

3.2 Competitors of Kenya IQF Avocados in Dutch Market

In order to know the intensity of the competition in the Dutch market, Porter's Five Forces is selected as the model. If the competition is heavy, it will be difficult for Kenya IQF avocados to enter the market.

Porter's Five Forces:

1) Threats of New Entrants

In the literature study, Vietnam shows an increase in export to Europe to be a potential competitor (CBI, 2020b). It may be a sign for the easier entry of new entrants. Also, the Netherlands is one of the biggest European frozen fruit markets, also the largest importer and re-exporter in Europe, which provides great opportunities for new entrants (CBI, 2020b). The threats will be high, which will effect the influence of companies in the market currently.

2) Bargaining Power of Suppliers

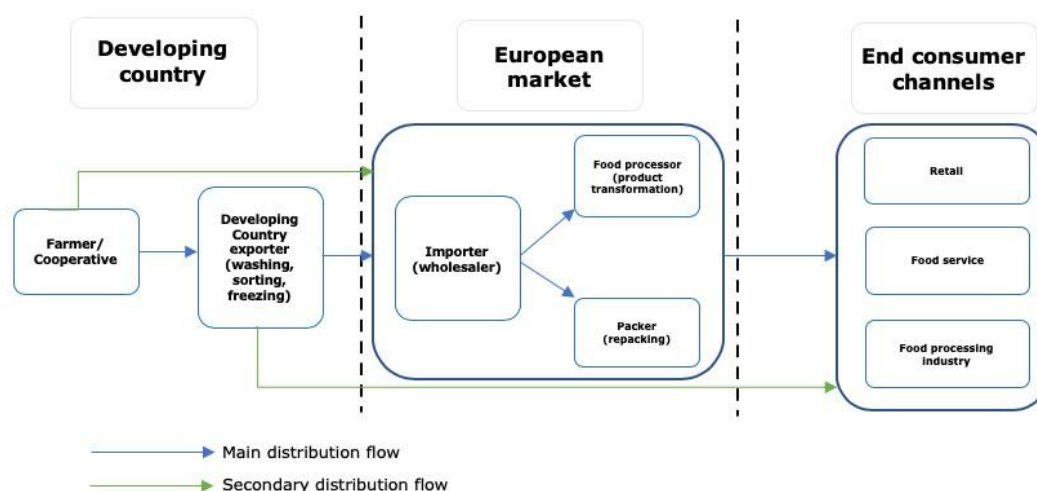


Fig 3. The distribution flow of frozen fruits (CBI, 2020a)

The figure presents the supply chain model for frozen fruits from the developing country to the European market. Generally, professional frozen fruits importers or wholesalers are responsible for import, other stakeholders are not involved in. But some importers will play the role of packing house, these products can be sold to end-consumers directly, which is the reason for “Secondary distribution flow” (CBI, 2020a).

In the survey, Sunripe is the follower of the “Main distribution flow”. They cooperate with the local farmers and process products by themselves. When the frozen avocados reach the target country, they have their partners to distribute these products. In the Dutch market, there are many companies in this category, such as “Westfalia Fruit” (sourcing globally) and “Champion Foods” (processing in Mexico), they have set their agency in Europe and their products have their own labels.

In the literature study, the main frozen avocado supply countries for European market are Vietnam, Mexico, and Peru (CBI, 2020b). However, in the survey, there are many European frozen avocado producers. For example, Salud Foodgroup is the biggest IQF avocado producer and supplier in the Europe. It is the company of “Secondary distribution flow” in **Fig.3**.

Their products will go to the food services, retails, and food processing industries, which are also the target market for Sunripe. Therefore, the bargaining power of suppliers is low, which will affect the price of the product.

3) Bargaining power of Buyers:

According to the market survey, only 32.52% of Dutch consumers have purchased frozen avocado (**Appendix 1**). For those people who prefer not to buy fresh avocados, they gave the answers:

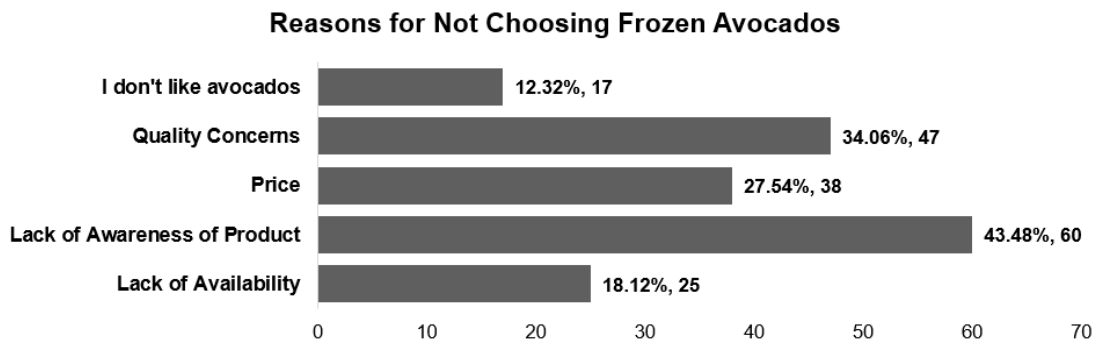


Fig. 4 Reasons for Not Choosing Frozen Avocados (from the market survey)

The top two reasons are “Lack of Awareness of Product” and “Quality Concerns”. During the interview, the restaurant “Spice Temptation” mentioned that they prefer to treat their customers with fresh avocados since it shows the quality of their meals, even if the frozen avocados show a better quality than the fresh.

Therefore, the bargaining power of buyers is high, since the number of the buyers is limited. When there are only few buyers but too many suppliers, the buyers are much easier to compare and choose different suppliers.

4) Threats of New Substitutes:

There are two types of the substitutes: other frozen avocados in the market and fresh avocados (CBI, 2020b; CBI, 2021).

Frozen Avocado:

Customer Satisfaction with Frozen Avocados in the Dutch Market

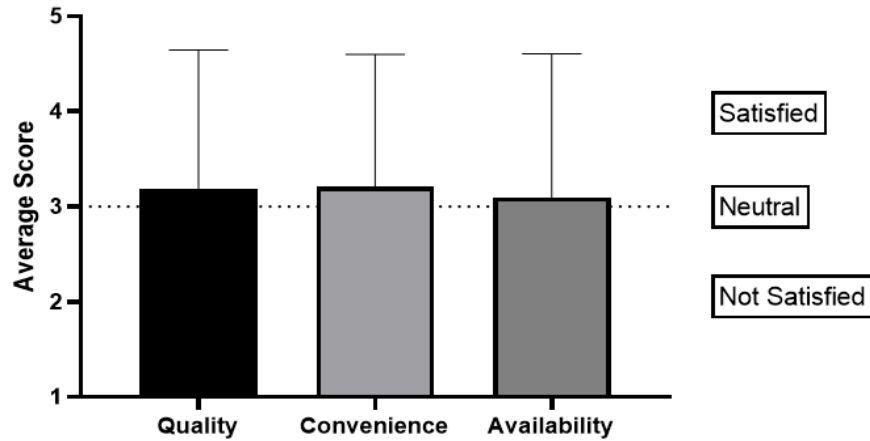


Fig. 5 Customer Satisfaction with Frozen Avocados in the Dutch Market (from the market survey)

In **Fig. 5** (1-Very Dissatisfied, 5-Very Satisfied), the satisfaction of three elements is 3.189, 3.206, and 3.094.

Table 7. One-sample t test of **Fig. 5** ($p < 0.05$)

	<i>t</i>	<i>p</i>
Quality	0.944	0.350
Convenience	1.086	0.283
Availability	0.455	0.651

According to the **Table 7**, the scores of three elements have no differences with 3, which means that the customers' satisfaction of frozen avocados in the Dutch market is on the Neutral level but not tend to be Satisfied level.

Fresh Avocado:

Willingness to Buy Frozen Avocados Instead of Fresh Avocados for Different Factors

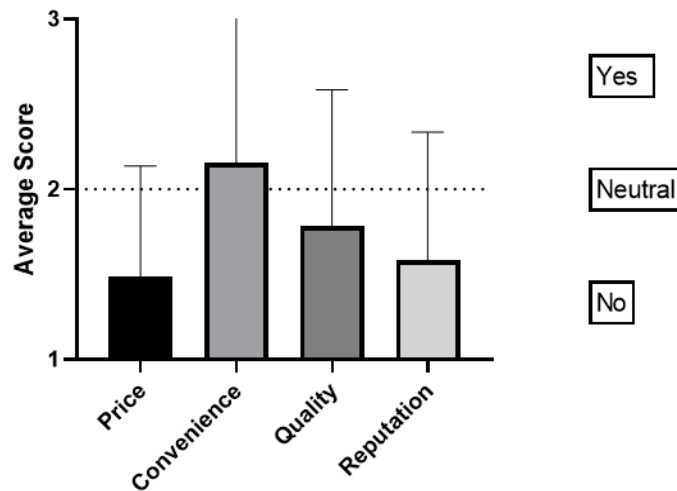


Fig. 6 Willingness to Buy Frozen Avocados Instead of Fresh Avocados for Different Factors (from the market survey)

In this figure (1-No, 2-Maybe, 3-Yes), people’s willingness to buy frozen avocado rather than fresh avocado for four elements is 1.485, 2.153, 1.785, and 1.583.

Table 8. One-sample t test of **Fig. 6.** ($p < 0.05$)

	<i>t</i>	<i>p</i>
Price	9.894	0.000
Convenience	2.246	0.026
Quality	12.544	0.000
Reputation	9.894	0.000

According to the **Table 8**, the scores of “Price” “Quality”, and “Reputation” have differences with 1, which means that the customer willingness tend to “Maybe”. The score of “Convenience” has difference with 2, customers’ willingness to buy frozen avocados for convenience tends to “Yes”.

Based on the above analysis, although consumers showed that they are not enough satisfied with frozen avocados in the market, the threat from substitutes will be high: consumers prefer to buy fresh avocados for “Price” “Quality”, and “Reputation”, instead of frozen avocados. The high threats of substitutes will make the competitiveness of the company be lower.

5) Competition in the Industry

Based on the information above, Kenya IQF avocados have to face the competition from Mexico, Peru, Vietnam, and even the European competitors. Regardless of them,

Kenya IQF avocados also need to join the race with fresh avocados. Therefore, the competition in the industry is intensive, which means that Kenya IQF avocado exporters/processors may face the challenges of lower profits and long-term competition. The ability to win the competition will be weaker.

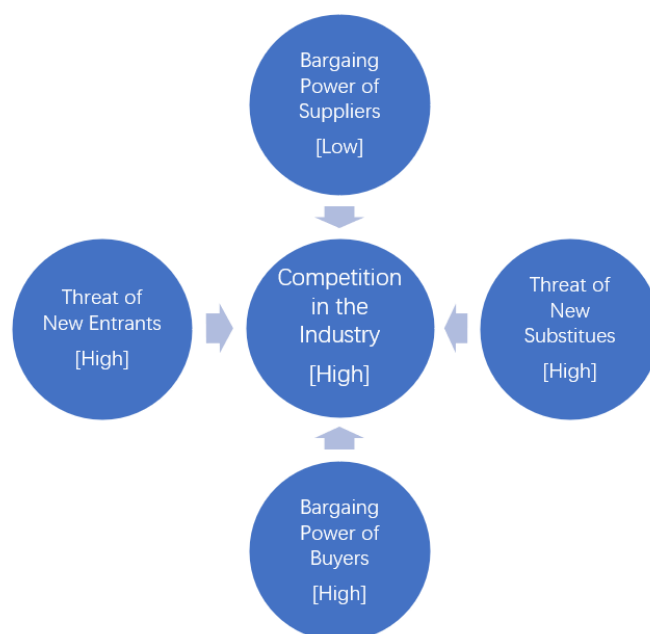


Fig. 7 Porter's 5 Forces (from the research)

3.3 EU Regulation on Frozen Fruits

The Netherlands and even the whole European market have high requirements towards the food industry. Regarding the processed products, there is no request for phytosanitary certificates, except for nuts and whole vegetables (CBI, 2021).

In the literature study, there are two aspects of EU regulations on frozen fruits.

Control of contaminants: Pesticide residues and microbiological organisms are the common presence in frozen fruits. For pesticide, the European importers are responsible for checking and testing for these products. If they are not qualified, they have to quit the European market. European Union also has official border controls for pesticides. The requirements will be stricter if the products are repeatedly non-compliant. Kenya's beans were monitored by EU for pesticide residues (CBI, 2020b; Regulation (EU) 2022/913).

As for microbiological organisms, the common ones in tropical fruits are norovirus and salmonella. And this is related to the production environment and post-harvest, which means that hygiene will be the key (CBI, 2020b; Regulation (EU) 2022/913).

In addition, heavy metals, especially lead and cadmium may be present in frozen fruits. According to the European Commission Regulation (EC) No 1881/2006, the

source of these elements might be the cultivation environment, packaging materials, etc.

For Sunripe, they have set up the high-quality standards for their products. Also, their farms are certified Organic or in-Conversion. They have the certificates as “Global G.A.P”, “ECOCERT”, “Integrated Farm Management”, and “HACCP” for the farms. For their packing house, they have the certificates as “BRCGS”, “Global G.A.P”.

Temperature Control: For IQF products, EU has special requirements for them. Due to the special product characteristics, the temperature should be equal and even lower than -18 °C on every step of the chain to guarantee the quality (CBI, 2020b).

As it was mentioned in 3.1, Sunripe can ensure the continuity of the cold chain from the packing house to the target market. Therefore, there is no worries of temperature.

CSR (Corporate Sustainability Reporting Directive): According to Directive (EU) 2022/2464, the Dutch company should report both their own and partners sustainability from 2024. Therefore, they have to ensure the transparency of the supply chain, which requires their suppliers communicate/share the sustainability information.

3.4 Buyers Requirements on Frozen Fruits

In a study of Australian processed avocado products, it mentioned that the increasing demand for healthier options of end-consumers strengthen the trend of frozen avocado, which is also reflected in the European market. More and more people are looking for convenient and healthy alternatives. Then, smoothies joined the trend and became popular, which also represents one major target market for frozen fruit is food service industry. In addition, many European frozen fruit companies are trying to introduce mixed frozen fruits so that the time for preparation will be shorter. These frozen fruits can be used as raw materials in many industries, such as ice cream, jams, and sauces. Therefore, another direction of frozen fruits market is food processing. It is estimated that the food processing industry takes 70% of the frozen fruit market (CBI, 2020a; CBI, 2020b; CBI, 2021; Fanning et al., 2012).

Therefore, there are two target groups of the research: B2B and B2C. The B2B group includes food processing and food service industries.

B2B (business to business):

Generally, the requirements are about these aspects: quality, certificates, and traceability, (CBI, 2020b).

Quality: According to the research from CBI (2020b), as an element of the quality, taste will be influenced by additives. For example, some processors will add citric acid to frozen avocados because they easily oxidized after being cut. Additionally, a

good quality IQF products should be individual with each other (CBI, 2020b; Shahnawaz & Shiekh, 2011).

Certificates: For certificates, different companies have their own preferences. Based on the research of CBI, the popular certificates are International Featured Standards (IFS), British Retail Consortium Global Standards (BRCGS), and Food Safety System Certification (FSSC 22000). Another research shows that Global G.A.P and HACCP are also important. Although the certificate is not forced, it will still affect the establishment of partnership (Arana Coronado et al., 2015; CBI, 2020b; Match Maker Associates, 2022).

Traceability: Considering the food safety for consumers, many stakeholders require the traceability of the products, so that they can recall the faulty products. Also, consumers prefer to know the footprint of the whole journey of the product from the farm to the shelf (CBI, 2020b).

B2C:

In the survey, the number of collected questionnaires was 163, of which 72 were male, 84 were female, and 7 were non-binary gender. The main age group is in 36-39 years old, which took 39.9%. For gender, the distribution is almost equal, which proves the universality of the market survey.

Table 9. Demographic Distribution of the collected responses

Category		Frequency	Percentage
Gender	Male	72	45.4%
	Female	84	54.6%
	Not defined		
Age	Under 18	12	7.4%
	18-25	37	22.7%
	26-35	65	39.9%
	Above 36	49	30.1%

In the research, 18.4% of them have never tried frozen fruits, 49.0% have tried frozen fruits but not frozen avocado, and 32.5% have tried frozen avocado.

According to the research of Australian market, convenience is the greatest value of the frozen avocado for consumers and quality is the second important factor; price and the origin of suppliers will also affect consumers' choices (Fanning et al., 2012).

Convenience:

As for their preferences on convenience, people prefer the longer shelf life of the frozen avocados most, but there are still 24.11% of people hope the frozen avocados should be individually (Fig.8).

Preferences on Convenience of Frozen Avocados

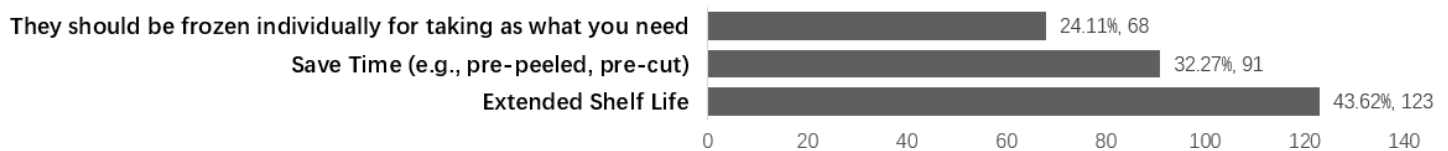


Fig. 8 Preferences on Convenience of Frozen Avocados (from the market survey)

Quality:

As for quality, in the literature study, people more concerns texture will be ruined after being defrosted. Also, the taste and nutrition are important. Many people prefer to buy fresh avocados because they have better taste and vitamins are not lost (Fanning et al., 2012).

It also presented in the survey, the texture and taste are also what they care most about the quality. The certificate is the least important. Also, there are 26.67% of them would like to have less additives/preservatives and 25.6% take sustainability into their consideration (Fig. 9).

Preferences on Quality of Frozen Avocados

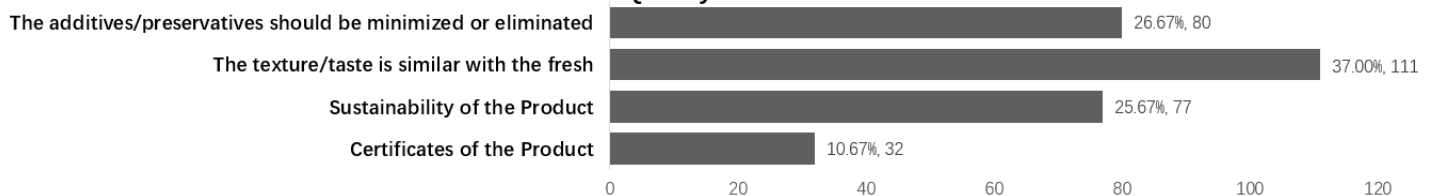


Fig. 9 Preferences on Quality of Frozen Avocados (from the market survey)

Regarding additives/preservatives, 60.12% of Dutch consumers mind the additives and preservatives in the survey (Appendix 2). During the survey, some people mention they care about them since they would like to have healthier food. If these products are no longer healthy, they will never try it.

Price:

According to the literature, price is also a factor that affects the consumers' choice. In the research of Australian market, most people would like to try cheaper Mexico frozen avocado instead of the fresh. (Fanning et al., 2012).

In the survey, although 42.33% of them selected "No" (not willing to buy the frozen when it is cheaper than the fresh, Appendix 3), many people indicated that "price is not the only factor that will affect my choices, sometimes a lower price means a worse quality".

Reputation:

In the literature study, reputation will be an element as well. Australia sources frozen avocado globally, the main suppliers are New Zealand, Mexico, Peru, and South Africa. The Mexico frozen avocado is well-known for its quality and price; therefore, Australian people would like to import from Mexico (Fanning et al., 2012).

However, in the survey, only 16.36% of people thought the origin of the supplier is “Very Important” during the survey (**Appendix 4**).

For the elements above, people also ranked their priorities when buy frozen avocados (**Appendix 5**). It shows that “Quality” is what they care most among the elements, and the second is convenience.

Potential consumers:

For the potential market, those who have tried frozen fruits gave their reasons for not buying fresh fruits (**Fig. 10**).

Regarding the reasons, the longer shelf life and the specific food are the two strengths of frozen fruits. During the survey, many people pointed out that they always buy frozen fruits (e.g., berries) just for smoothies, because these products are already frozen and easier for processing. Also, 18.47% of them thought the frozen products are cheaper than the fresh.

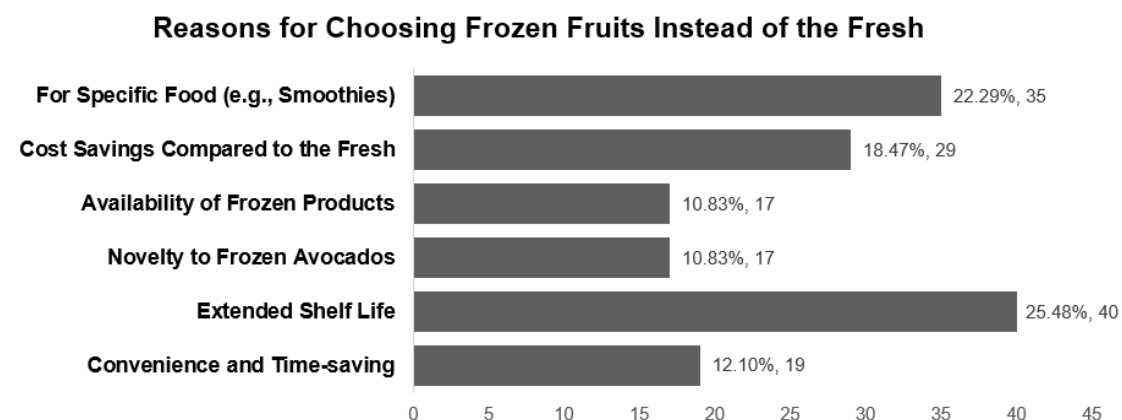


Fig. 10 Reasons for Choosing Frozen Fruits Instead of the Fresh

Regarding their willingness to try frozen avocados in the future, 37.27% of them chose “No”. However, there are still 35.45% selected “Maybe”, who provide the potential market for frozen avocado (**Appendix 6**). Also, their willingness to try frozen avocados in the future will be affected by “Special food”. People who prefer to buy frozen fruits for special food (e.g., smoothies) are more willing to try frozen avocados in the future (**Appendix 7**).

To have a better overview of Kenya IQF avocados, SWOT is selected to know all aspects of the internal and external conditions of it will be integrated and summarized based on Sunripe IQF avocados.

SWOT Analysis:

The model is selected to know all aspects of the internal and external conditions of the Sunripe IQF avocados will be integrated and summarized (**Table 10**).

Table 10. SWOT Analysis of Kenya IQF Avocados

Strength	Weakness
<ol style="list-style-type: none"> 1. IQF can produce almost the same texture/flavor products as the fresh. 2. Compared with the fresh avocados, the IQF avocados can have longer shelf life and supply all year round. 3. IQF avocados can help breaks the frequent bans on fresh avocado export in Kenya. 4. Big companies (such as Sunripe) are able to ensure the quality of the products and meet the requirements of the customers (availability, certificates, sustainability, and traceability). 	<ol style="list-style-type: none"> 1. Seasonal production of fresh avocados will affect the availability of frozen avocados. 2. It's difficult to have certificates and be a part of the supply chain for small-scale farmers. 3. Due to small scale production, the traceability will be a challenge. 4. The products may be added with antioxidants to maintain the quality.
Opportunity	Threat
<ol style="list-style-type: none"> 1. The trends of seeking convenience and healthier alternatives (smoothies) help expand the market. 2. People are looking for avocado products with a longer shelf life. 3. People's satisfaction of the frozen avocado products in the Dutch market is Neutral. 4. People in the Dutch market less care about the origin of the suppliers. 5. The awareness of the frozen avocado is limited. 	<ol style="list-style-type: none"> 1. People are not that interested in "freezing individually". 2. The competition in the Dutch market is intensive. 3. Customers prefer to have less additives/ preservatives. 4. Due to the concerning of quality, people prefer to have fresh avocado 5. B2B market prefer their suppliers are able to have traceability of their products. 6. Consumers prefer to buy sustainable products.

4. Discussion

The report is based on professional journals, market reports, and official government websites (CBI and EUR-Lex). All of them were published after 2000, and the regulations are the newest and currently used. Therefore, the reliability of the literature can be guaranteed.

However, due to the limitation of time, the interviews cannot be conducted as expected. The survey of Kenya IQF avocado industry only included the company “Sunripe”. Therefore, the results cannot cover all kinds of company, especially for those young and small companies.

Also, for the B2C market, the interviews with food processors and food services were not reached in time, the restaurant “Spice Temptation” was only interviewee. Therefore, the analysis of the B2B market will be generally, and the information that related to B2B market is limited (based on literature study).

4.1 Current Situation of Kenya IQF Frozen Avocado

The literature study shows that frozen avocado can be a direction to reduce the food waste of Kenyan avocado. Due to the character of IQF frozen products, continuous cold chain is required to ensure the temperature is not higher than -18 °C. However, in the Kenya fresh avocado chain, lack of cold storage facilities has already been an issue that affect the quality of fruits. Also, due to the lack of trucks with cold storage, it will influence the continuity of the cold chain (Snel et al., 2021).

In the survey, Sunripe agreed the opinion that IQF avocado can reduce the food waste. It can help reduce the food waste of perishability and have a longer supply period than the fresh. But for the challenge of the continuity of the cold chain, Sunripe doesn’t have issues with that. The possible reason could be the size of the companies. The situation also happens in the fresh avocado industry: the bigger company has better performance and causes less food waste, the reason is they can afford more for their technologies (Snel et al., 2021).

Also, in the literature study, the certificate is a great challenge. Serbia has the same situation as Kenya. Both of two countries are dominated by small-scale farmers, 77.4% of Serbian farms are small-scale. As the main products in Serbia, raspberry is easy to be perishable as avocado. The cost of certificates is the key barrier (Paraušić & Simeunović, 2016; Snel et al., 2021).

However, it also didn’t happen to Sunripe. The main reason could be the size of the company as well. Sunripe has their own farms instead of purchasing from the farmers, which ensure the quality of the fruits and they would like to certificate their farms.

Therefore, the size of the company will be the main reason to cause the differences between the literature and the research. The challenges of continuity of the cold chain, investment of IQF, and certificates can be overcome by bigger companies. For Sunripe, they can afford more for their technologies and make their raw materials grow organically. But for some the smaller companies, it may still be a challenge for them.

4.2 IQF Frozen Avocado in Dutch Market

Regarding threat of substitutes, based on the literature that was referred in section 3.2, there is a growing trend towards healthier and more convenient food alternatives, which presents a promising opportunity for Kenya's IQF avocado exports. But it also means there will be more products as substitutes, such as frozen crashed avocado (CBI, 2020b).

For the competition with fresh avocados, Kenya IQF avocados can make use of its advantage of convenience to expand its market share. However, according to 3.2 and 3.4, people still have the worries of the quality of frozen avocados. Therefore, the threat of substitute is still high.

For buyers, the frozen avocado is still new in the Dutch market, since many people didn't realize its existence. On the one hand, there is space for Kenya IQF avocados to enter the market. On the other hand, the frozen avocado in the Netherlands is still a niche market, which will be smaller than the fresh avocado market. In that case, even though the Kenya IQF avocados enter the market, the effect is limited on reducing food waste. Meanwhile, the bargaining power of buyer is high, and the power of suppliers is low, since the customer group is small but there are many suppliers.

Therefore, the Dutch market is not that easy for Kenya IQF avocados to enter. But according to the 3.4, the trend of smoothies may be an opportunity for Kenya IQF avocado. They can supply them to the smoothie processing factories or smoothie bar.

4.3 EU Regulations on IQF Frozen Avocado

The results present that EU has strict regulations on food safety: the usage of chemicals, and environment of production and processing will affect the Kenya IQF products entry the European market. However, since the small-scale farmers dominate the production, it may be not easy to control the environment during the cultivation of the raw materials (fresh avocados) (Match Maker Associates, 2022; Snel et al., 2021).

Also, labors in the production area will carry the microbiological organisms. One example is the outbreak of Hepatitis A (HPA) in 2018, which was linked to the imported frozen strawberries. One possible origin was those who got diagnosed with HPA and around the producer. Therefore, the hygiene during the production and processing is necessary (Enkirch et al., 2018).

Regarding the CSR requirements, since the detectives will work from 2024, it's unknown that how the companies (importers, food processors, and food services) require their suppliers share the sustainable information.

However, the situation also depends on the size of the company. For Sunripe, they have the certificates of organic farms and food safety. But for the raw materials, Kenya is a country that overuse the chemicals, which will be a challenge for the companies that buy fresh avocados from market agents (Snel et al., 2021).

To have more details, in the further study, it's necessary to interview more different sizes of Kenya exporters to know how they deal with these challenges and their opinions towards information sharing.

4.4 Buyers Requirements on IQF Frozen Avocado

In the literature study, the additives will affect the taste of the product. Both in B2B and B2C market, customers prefer to have less additives. However, for Sunripe, they add antioxidants into their products, which not matches their requirements. But due to the lack of interview with B2B market, their detailed preference for additives is unknown, which could be in the further study.

B2B:

For certificates, the popular certificates include BRCGS, Global G.A.P, FSSC 22000, and IFS. Sunripe can meet their requirements. However, as it was discussed in 4.1, the certificate is still a challenge for small companies.

Regarding the traceability, it's a challenge in Kenya fresh avocado chain since the small-scale production. But it still can be achieved for some big exporters, these exporters have their own fields to control the production, which is also the situation of Sunripe (Snel et al., 2021).

B2C:

In the literature study, reputation will be a possible issue. As the regulation from (EU) No 1169/2011, the original country of the imported products should be pointed out on the brand, which will affect consumers' choice. But in the survey, Dutch consumers are not that care about the origin of the suppliers. The reason could be the difference between the two countries: the literature was conducted in Australia, which has their own avocado production and next to the other high quality avocado producer New Zealand. Therefore, these Australian consumers considered Australian avocados as their own fruits and New Zealand is their neighbor. The nationalism makes them concern about the origin of the supplier more (Fanning et al., 2012). Instead, the Netherlands has to rely on the import (CBI, 2020 b).

Also, as it was mentioned in the literature study, consumers would like to pay for the lower price frozen avocado instead of the fresh. However, it wasn't showed in the

survey, almost half of the responses selected “No”. The reason for the difference could be the comparison for time and cost (Fanning et al., 2012).

Regarding the quality of frozen avocados, according to the 3.4, consumers prefer to have the same texture/flavor as the fresh, which can be met by IQF. However, for their preferences on convenience, people didn’t show much interest in the characteristics of IQF: freezing individually. They concerned about the shelf life of the products more.

The shelf life is also the key word for people buying frozen fruits. In the literature study, the convenience and smoothies are the two trends that help expand the market of frozen fruits. However, in the survey, these elements are not the most important for people when buying frozen fruits. Instead, the expand shelf life earned most. The purpose of extending shelf life can be reached by all kinds of freezing technology, including IQF. It will be an opportunity but also result in more competitions for Kenya IQF avocados.

5. Conclusion

The quality of Kenya IQF avocados can be different for the size of the company. Bigger company can be easier to meet the requirements of Dutch market.

In term of the quality of IQF and none IQF avocados in the Dutch market, consumers are not enough satisfied with them. Also, they prefer to buy fresh avocados instead of the frozen due to a better quality.

Regarding the requirements, EU regulations have legislated the restriction on Control of contaminants and temperature control of the products. Therefore, Kenya IQF avocados should take care of the environment of the production area and ensure the continuity of the cold chain.

For B2B market, companies have their own preferences on quality, certificates, traceability, and CSR. However, due to the limitations of the survey, the detailed information is still unknown, which could be the direction of the further study.

Regarding B2C market, consumers showed that “Quality” and “Convenience” are the top elements that affect their choices. For quality, they hope the products can have almost same texture as the fresh, and with less additives/preservatives. Also, the product will be better if it’s sustainable. For convenience, they prefer the products can have longer shelf life and save time.

Overall, regarding to the main question “What are the opportunities for introducing Kenyan IQF frozen avocados to Dutch market?”, Kenya IQF avocado is able to catch to succeed in the Dutch market, but it may be not suitable for all companies. Small exporters need to address the challenges they face and meet the market's requirements. For big companies, the trend of smoothies and seeking convenience food, are the opportunities for them to enter the Dutch market.

6. Recommendation

6.1 Possible Strategies for Kenya IQF Avocado Industry

The recommendation is based on the SWOT Analysis.

Strength-Opportunity (SO) Strategies:

1) Big Kenya IQF avocado producers/exporters should cater to the growing trend of seeking convenient and healthier alternatives (e.g., avocado smoothies) with their products by producing high-quality product with almost the same texture and flavor as fresh avocados.

Strength-Threat (ST) Strategies:

- 1) Help consumers know the benefits of IQF avocados to appeal them and overcome the resistance or lack of interest for frozen products.
- 2) Differentiate from competitors by emphasizing the superior quality and assurance provided by big companies like Sunripe, reassuring customers about the product's trustworthiness.
- 3) Bigger companies should enlarge their influence to help the farmers learn more knowledge of growing high-quality avocados.

Weakness-Opportunity (WO) Strategies:

- 1) The government should provide support and guidance for small-scale farmers. Educate them with cultivation knowledge and help them reduce the usage of chemicals.
- 2) The industry should look for approaches to reduce or eliminate the use of antioxidants in the IQF avocado to meet the customer preferences.

Weakness-Threat (WT) Strategies:

- 1) Small companies can collaborate with big companies and make use of their expertise and resources to overcome the challenge of meeting the requirements of the Dutch market based on company size.

6.2 Recommendation for further study

Since the interviews weren't conducted as expected, the information of the whole Kenya IQF avocado industry and Dutch B2B market is still unknown.

The further study should focus on the small Kenya companies to know how they operates and find out their challenges, which can fill the gap of the report of lacking the information of small companies.

For Dutch B2B market, it's necessary to know their suppliers and their preferences on certificates, quality, and CSR, which will help have a better insight of the competition of the market and know the direction that Kenya IQF avocados industry can make efforts for.

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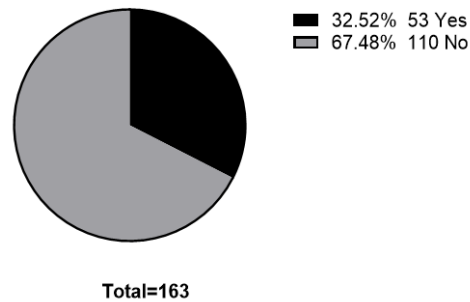
and poultry sectors: Assessing opportunities to reduce food losses.
Wageningen Centre for Development Innovation, 22-47.

Appendix

There are the analysis results from the market survey:

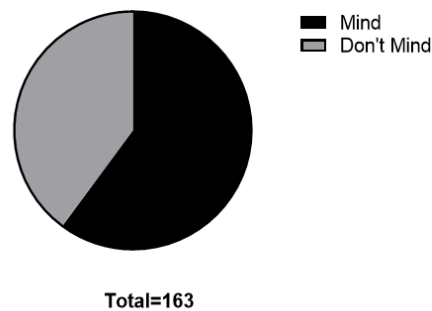
Appendix 1

Have Purchased Frozen Avocado



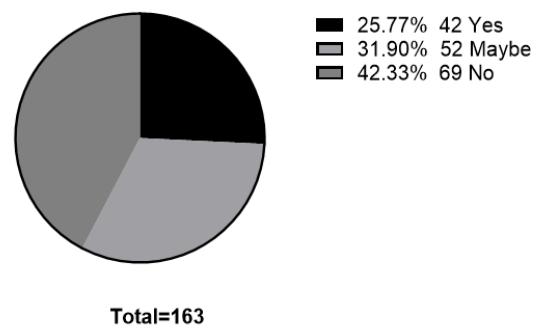
Appendix 2

Attitudes towards Additives/Preservatives in Frozen Avocados



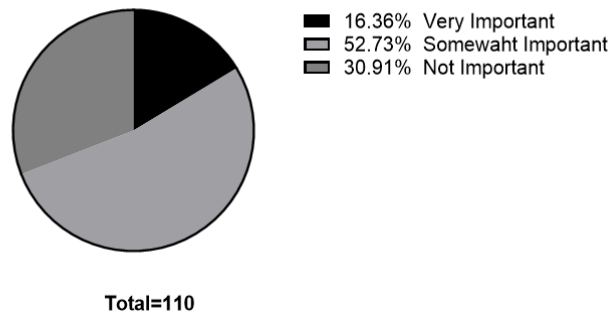
Appendix 3

Willingness to try frozen avocados when the price is lower than the fresh



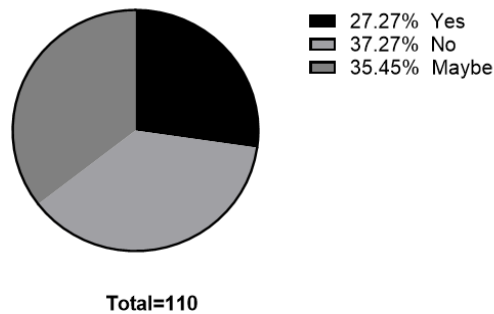
Appendix 4

Importance of Frozen Avocado Origin



Appendix 5

Willingness to Try Frozen Avocados in the Future



Appendix 6 Chi-square Analysis of “Specific Food” and “Willingness to try frozen avocado in the future” ($p < 0.05$).

		Willingness to try frozen avocado in the future			Total	X ²	p
		Yes	Maybe	No			
Buy frozen fruits to make special food (e.g., smoothies)	Yes	13	14	7	34	8.253	0.016
	No	10	12	24	46		
Total		23	26	31	80		

Since the $p=0.016$ and less than 0.05, the special food has the significant difference with the future decision. The trend of smoothies may be able to help the market development of frozen avocados.

Willingness to try frozen avocado in the future			
	Yes	Maybe	No
Yes	38.23%	41.18%	20.59%

Buy frozen fruits to make special food (e.g., smoothies)	No	21.74%	26.09%	52.17%
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It shows that 52.17% of people who buy frozen fruits not for special foods are not willing to try frozen avocado in the future, which means they are less likely to try frozen avocado than those who use them for special food.

Appendix 7 Ranking of Different Elements (1-most important, 6-least important)

Element	\bar{x}	Ranking
Quality	3.644	1
Convenience	3.613	2
Reputation of the Supplier	3.601	3
Price	3.546	4