

SECTOR STUDY: PROCESSED AVOCADO



This publication has been developed by the Fit For Market + programme, implemented by COLEAD within the framework of the Development Cooperation between the Organisation of African, Caribbean and Pacific States (OACPS) and the European Union (EU). It should be noted that the information presented does not necessarily reflect the views of the donors.

This publication has been developed by the New Export Trade Kenya programme, implemented by COLEAD, funded by the European Union (EU) and established in collaboration with the EU Delegation in Nairobi and Kenyan stakeholders. It should be noted that the information presented does not necessarily reflect the views of the donors.

This publication is part of a collection of COLEAD resources, which consists of online and offline educational and technical tools and materials. All of these tools and methods are the result of more than 20 years of experience and have been developed progressively through COLEAD's technical assistance programmes, notably in the framework of development cooperation between the OACPS and the EU.

The use of particular designations of countries or territories does not imply any judgement on the part of COLEAD concerning the legal status of these countries or territories, their authorities and institutions or the delimitation of their frontiers.

The content of this publication is provided in a "currently available" form. COLEAD makes no warranty, direct or implied, as to the accuracy, completeness, reliability or suitability of the information at a later date. COLEAD reserves the right to change the content of this publication at any time without notice. The content may contain errors, omissions or inaccuracies, and COLEAD cannot guarantee the accuracy or completeness of the content.

COLEAD cannot guarantee that the content of this publication will always be current or suitable for any particular purpose. Any use of the content is at the user's own risk and the user is solely responsible for the interpretation and use of the information provided.

COLEAD accepts no liability for any loss or damage of any kind arising from the use of, or inability to use, the content of this publication, including but not limited to direct, indirect, special, incidental or consequential damages, loss of profits, loss of data, loss of opportunity, loss of reputation, or any other economic or commercial loss.

This publication may contain hyperlinks. Links to non-COLEAD sites/platforms are provided solely for the information of COLEAD staff, its partner-beneficiaries, its funders and the general public. COLEAD cannot and does not guarantee the authenticity of information on the Internet. Links to non-COLEAD sites/platforms do not imply any official endorsement of, or responsibility for, the opinions, ideas, data or products presented on those sites, or any guarantee as to the validity of the information provided.

Unless otherwise stated, all material contained in this publication is the intellectual property of COLEAD and is protected by copyright or similar rights. As this content is compiled solely for educational and/or technical purposes, the publication may contain copyrighted material, the further use of which is not always specifically authorised by the copyright owner.

Mention of specific company or product names (whether or not indicated as registered) does not imply any intention to infringe proprietary rights and should not be construed as an endorsement or recommendation by COLEAD.

This publication is publicly available and may be freely used provided that the source is credited and/or the publication remains hosted on one of COLEAD's platforms. However, it is strictly forbidden for any third party to state or imply publicly that COLEAD is participating in, or has sponsored, approved or endorsed the manner or purpose of the use or reproduction of the information presented in this publication, without prior written consent from COLEAD. The use of the contents of this publication by any third party does not imply any affiliation and/or partnership with COLEAD.

Similarly, the use of any COLEAD trademark, official mark, official emblem or logo, or any other means of promotion or advertising, is strictly prohibited without the prior written consent of COLEAD. For more information, please contact COLEAD at network@colead.link.



Funded by
the European Union

This document is part of the avocado sector study. This study explores the technical and economic feasibility of different processing and waste valorisation activities. The other chapters are available here: resources.colead.co.uk/

Table of Contents

1	AVOCADO PULP	2
1.1	What is avocado pulp?	2
1.2	Avocado pulp's competitors	3
2	DEMAND FORECAST	4
2.1	Market trends	5
2.2	Importing countries	6
2.3	Market structure	8
3	REGULATORY AND QUALITY REQUIREMENTS	9
3.1	Product specifications	9
3.2	Food safety and quality management	9
3.3	Sustainability and certifications	9
4	SUPPLY	10
4.1	Supplying markets	11
4.2	Pricing	11
4.3	Seasonality	11
4.4	Variety	11
5	PRODUCTION	12
5.1	Production process	12
5.2	Production technology	13
5.3	Production economics	15
6	PROPOSED MARKETING STRATEGY OPTIONS	16
6.1	Key opportunities and challenges	16
6.2	Ingredients for success	17
6.3	Conclusion	17

1. Avocado pulp

1.1 What is avocado pulp?

Avocado pulp, which is sometimes called avocado puree, is the mashed flesh of avocados. This is typically made by destoning (removing the pit) the avocados, scooping out the flesh and then pressing the avocados into a creamy paste.

Avocado pulp is used largely as a replacement for fresh avocado in packaged guacamole. There are a number of brands that offer guacamole that needs to be refrigerated, as well as non-chilled product. Some brands in the European Union include Old El Paso, Sabra and Holy Moly Guacamole. However, a growing number of local, international and retailer brands are available in stores in developed economies. The category is also becoming more innovative, with many variants of guacamole and other dips that contain avocado pulp becoming more widely available each year (Figure 1). These might include avocado with chickpeas, for example, or other herbs and spices.

Avocado pulp is also used in preparing packaged foods. It has a smooth texture that makes it better suited to applications that themselves have less texture. Baby foods, guacamole chips, vegetable juices and smoothies are examples of products that contain avocado pulp.

Avocado pulp is increasingly used in the food services sector (i.e. hotels, restaurants, caterers, delis, etc.) These businesses use avocado pulp in foods such as open sandwiches, toast or hamburgers; to prepare their own guacamole and dips; and to add flavour, colour and visual appeal to popular new dishes such as sushi bowls.

Figure 1. Illustration of uses of avocado pulp



Source: Brand images sourced from brand websites (from left to right) Holy Moly, Once Upon a Farm, AH. Food services images sourced from www.canva.com

1.2 Avocado pulp's competitors

When avocado pulp is used in a guacamole recipe, it usually replaces fresh avocados or even individually quick-frozen (IQF) avocado. IQF avocado dices and pulp can be blended together to create a chunky guacamole that has a more authentic, home-made feel. Chunky avocado pulp is becoming more readily available. This enables the food services sector to avoid buying and storing two different processed avocado products. It also allows them to reduce the risk of waste, which is a concern when using any avocado products.

When avocado pulp is used in packaged food ingredients it tends to replace fruits and vegetables, or even some oils. However, many of the alternatives are more affordable and easier to handle and store than avocado pulp, so manufacturers tend to use as little avocado pulp as possible in recipes. Some recipes that are clearly labelled as containing avocado actually use relatively small amounts in the recipe.

The health perceptions of avocado mean that it is used as a signal of freshness, taste and health in many dishes in fast food outlets (Figure 2), restaurants, cafes and delis. It has also become a popular ingredient in sandwiches, on toast and in dishes such as nachos.

Avocado pulp is a very practical alternative to fresh avocados as it is always available, ready for eating, lasts longer when "open", can be frozen for longer and offers easier storage. However, the biggest competitor to fresh avocados is IQF slices. These give a more visible avocado appearance than pulp and so are in greater demand in the food services sector.

Figure 2. McDonalds France advertising for burgers with avocado pulp



Pour votre santé, pratiquez une activité physique régulière. www.mangerbouger.fr

Source: McDonalds France Facebook Page

2. Demand forecast

Several market trends suggest that demand for avocado pulp will increase in the coming years. Currently, the market is relatively small. Some estimates suggest that €480 million of avocado pulp was sold globally in 2021.¹ This is marginally more than the €395 million of fresh avocado imported into Germany in that year.²

Nevertheless, current predictions suggest that demand for avocado pulp will grow. Some market analysts predict that the category will be one and half times larger by 2031 (4% compound annual growth rate).³

2.1 Market trends

Vegan foods and healthy fats

The vegan way of eating is a significant food trend that has created greater interest in new product innovations that can replace popular food ingredients containing animal products, such as mayonnaise and other sauces containing eggs (Figure 3). The interest in plant-based eating has also increased interest in healthy fats. These promise to improve heart health, reduce inflammation, which is associated with seed oils, and generally improve vitality.

Figure 3. Innovative vegan, healthy fat sauces and dressings



Source: Brand websites. From left to right: Mayoneur, Hellmans, Chop

1 Raju, K & Roshan D. (2022) Avocado Puree Market Research, 2031, Allied market research forecast 2021–2031, Allied Market Research, <https://www.alliedmarketresearch.com/avocado-puree-market-A16925>

2 Source: ITC Trade Map

3 Raju, K & Roshan D. (2022) Avocado Puree Market Research, 2031.

Exotic flavours

Guacamole is available in many retailers, especially in urban centres. To keep guacamole relevant manufacturers have been introducing new flavours such as chilli, garlic and other herbs and spices (Figure 4).

Figure 4. Example of flavoured guacamole



Source: Retailer website, Tesco

Vegan spreads and dips

Sandwich toppings include a wide range of products. Recent food trends such as an interest in middle eastern cuisine and plant-based eating have led hummus to become more mainstream. More recently, avocado has been added to these dips and spreads to create new flavours, or even specialised bread spreads. This is allowing avocado to become more mainstream and convenient.

Figure 5. Examples of hummus with avocado



Source: Brand websites (from left to right): Deli Genuss, Carrefour, Allos

2.2 Importing countries

Data on avocado pulp trade and consumption is not readily available. However, the consumption of fresh avocado is a good indication of how much interest there could be in purchasing avocado pulp.

The Netherlands and Spain are the largest importers of avocado in the EU. However, both countries are also large exporters of fresh avocado. When exports are taken into account, Dutch consumption (0.6 kg per capita) is relatively low compared to other EU countries.

Scandinavia and France enjoy the largest consumption per capita in the EU, while+ consumption in large markets such as Germany, France and the UK lags behind. The gap between consumption in Scandinavia and these countries suggests that there is potential for increasing consumption in these larger markets. There is a considerable marketing effort from the avocado industry to increase consumption of avocados and to make this a more regular eating habit. There are some signs that this is paying off as countries such as Italy have seen rapid growth in consumption,⁴ while innovation in the UK and Germany has become more visible.

Table 1. Consumption figures for leading fresh avocado importers in the EU

Country	Imports (tonnes)	Consumption (tonnes)	Consumption per capita (kg per person)
The Netherlands	378,761	10,503	0.60
Spain	214,202	189,777	4.00
France	181,609	149,282	2.21
Germany	120,986	104,873	1.26
United Kingdom	114,273	107,662	1.60
Scandinavia (Sweden, Denmark, Norway, Finland)	65,041	64,775	2.39
Italy	41,655	39,711	0.67

Notes: Imports and export volumes are from ITC Trade Map, consumption calculated from imports, exports and production. Spanish consumption figures include production number sourced from World Bank statistics.

Source: Population figures used for consumption calculations for the EU are sourced from EuroStat, UK population data is sourced from World Bank.



4 Fruitrop, Edition 283; 28 Sept 2022

In 2021, Spain produced 115,000 tonnes of fresh avocados and imported almost twice as much as it produced (Table 2). This allowed the country to export more than it produced, while also retaining a large amount of avocado in the country. In 2021, more than 189,000 tonnes of avocado were available to consume, which make Spain the largest consumer of avocados in the EU. If this is correct, the average person in Spain would have consumed 4 kg of avocados over that year.

Table 2. Spanish trade figures and consumption data

	Production	Imports	Exports	Consumption (tonnes)	Population Size (millions)	Consumption per capita (kg)
Spain (estimate)	115,500	214,202	139,925	189,777	47.4	4.00

However, from the perspective of what people eat rather than what they grow, avocados are still relatively new and considered an “exotic” food ingredient in Spain. Most studies agree that it is not likely that the Spanish consumer enjoys anywhere near 4 kg per year of avocados. If this is the case, what is happening to the rest of the fruit?

Spain has a large processing sector (Table 3) and is well known for supplying processed avocado, especially guacamole and avocado pulp. It is far more likely that Spanish consumption of avocados is similar to that of Italy (0.6 kg per capita). At that rate, 161,337 tonnes of avocado would be available for processing, or nearly 85% of the avocados remaining after export. Once converted into a final product, they could produce as much as 80,669 tonnes of avocado pulp, guacamole and IQF each year. As Spain is well known for pulp and guacamole most of this volume is likely used for these purposes rather than for IQF avocado.

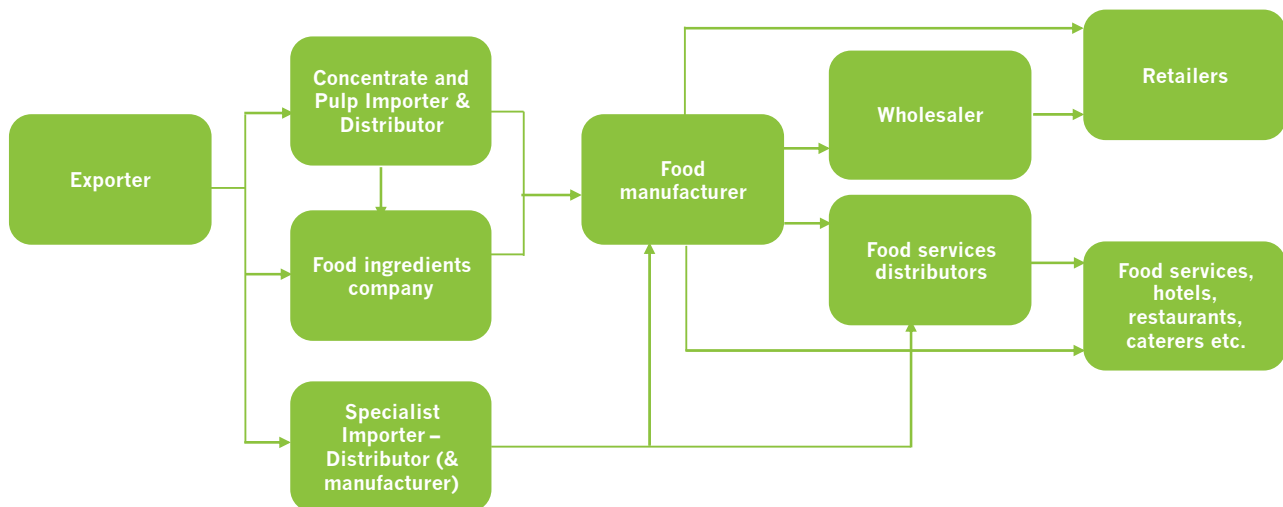
Table 3. Estimates of Spanish processing volumes.

	Available Avocados (tonnes)	Population Size (millions)	Consumption per capita (kg)	Consumption (tonnes)	Available Processing Volume (tonnes)	Final Product tonnes @ 50% conversion rate)
Spain (estimate)	189,777	47.4	4	189,600	177	89
Spain (mid-tier consumption estimate)	189,777	47.4	1.2	56,880	132,897	66,449
Spain (low consumption estimate)	189,777	47.4	0.6	28,440	161,337	80,669

Source: COLEAD based on World Bank

2.3 Market structure

Figure 6. Avocado pulp market structure



Avocado pulp is typically used in the food services sector and increasingly as an ingredient in manufactured food products such as sauces, and in some innovative new snacks such as guacamole chips and dips. Successfully marketing avocado pulp therefore relies on being able to access food manufacturers and the food services sector.

As the preferred suppliers of avocado pulp for the food services sector, specialist importer-distributors play an important role in this chain. In some cases, these importers are also branching out into food manufacturing, with some offering products such as avocado sauces or spreads.

Many food manufacturers prefer to source products from food ingredients companies, although some companies that manufacture juices or smoothies have stronger, more established relationships with concentrate and pulp importers. This strategy allows manufacturers to have a steady, year-round supply of a similar or near-identical ingredient.

Some food ingredients suppliers also import avocado pulp or source the product from importer-distributors in the EU. Currently, food ingredient companies and juice and concentrate importers play a smaller role than specialist importers. However, if food manufacturers continue to innovate and introduce new avocado-based products, their role in the supply chain is likely to grow.

3. Regulatory and quality requirements

3.1 Product specifications

Table 4. Avocado pulp export product specifications

Item	Specification
Ingredients	Avocado (99.9%), Stabiliser – ascorbic acid, citric acid, salt
Variety	Hass
Appearance	Characteristic shades of green, typical of fresh avocados.
Shelf life	18–24 months
Preservatives	Zero, a clean label product is required, natural antioxidants (ascorbic and citric acid) permissible and recommended
Storage conditions	-18°C
Packaging	1 kg, 2 kg, 5 kg and client specified pack sizes, vacuum packed bag, often preformed, typically 6 x 1 kg bag per box

3.2 Food safety and quality management

Avocado pulp is often an end product that does not undergo any further sterilisation or pasteurisation. As it is also a product that is often purchased for its health benefits, food safety is essential to importers, retailers and the food services sector. Food safety concerns mean that related certifications are greatly valued. Companies without certification might find it challenging to market their product as an export-grade product without investing in systems and certification. Some respected and desirable certifications are:

- International Featured Standards (IFS)
- British Retail Consortium (BRC)
- FSSC 22000
- An equivalent standard

3.3 Sustainability and certifications

As avocado pulp is so often an ingredient in a finished manufactured food product, or a dish in a restaurant or deli, sustainability certifications are not necessarily marketed to the manufacturers, or even to buyers in the food services sector. Usually, this would mean that importers do not value these certifications. However, in the case of avocado pulp, sustainability certifications can still assist in marketing efforts, especially when competing as a new supplier.

Rather than the certification being valuable for what it is intended to signify (i.e. a free trade or sustainably produced product), it provides reassurance to importers that the supplier is organised and professional. This in turn signals that quality and food safety is likely well managed. Suppliers therefore have a wide choice in the specific certification to invest in.

Organic certification is less important than in the fresh market and is not strictly essential. Nevertheless, there is growing interest in organic product in the EU. This could provide a useful entry point to start a relationship with new buyers, or in new markets.

4. Supply

4.1 Supplying markets

Due to the high demand for fresh avocado and because avocado processing requires complex methods and technology to prevent browning, relatively few countries have specialised in pulp production. Mexico is arguably the largest supplier of avocado pulp, alongside South Africa and Spain.

Mexico

Mexico is the largest supplier of avocados to the USA, which imports about 30% of all traded avocados worldwide. The local market for guacamole is also very strong. From a production perspective, quality export-grade avocados are available year-round and in large volumes. This steady and sizeable demand and continuous supply of the raw material has enabled processors to make the business case for investing in advanced technology to prevent browning of the avocado pulp, which has allowed Mexico to become the largest supplier of avocado pulp globally.

Spain

Avocado is still an unfamiliar, exotic fruit in Spain, so demand is low. However, local production and imports of about 214,000 tonnes each year⁵ have created an opportunity to develop a processing industry for avocados. Processing has the added benefit that fruit damaged during shipping and ripening can be used to create a valuable product, rather than becoming waste. The processing sector imports some local and exotic varieties from Peru and Colombia, which are suitable for processing and can be blended with Hass avocados to create a more affordable avocado pulp.

The combination of local production, damaged fruit and imports of lower cost exotic varieties enables processors to enjoy a longer processing season. And thereby to afford the high-pressure pasteurisation equipment that is needed to produce and market quality avocado pulp.

South Africa

Avocados are a well-known and widely enjoyed product in South Africa, where shoppers have access to quality avocado products. There are several growing regions for avocados in South Africa, which allows processors to access a relatively reliable supply of avocados year-round. This means they can export pulp for most of the year and establish a business that supplies avocado pulp and guacamole to the local market. There are several companies that have been able to invest in the necessary technology for pulp production and packaging and are able to export avocado pulp from South Africa.

Peru

Peru is the second largest exporter of fresh avocados globally. Most avocado production happens at altitude, which creates an avocado that is relatively low in fat compared to the

⁵ Sourced from ITC Trade Map.

avocadoes supplied by Mexican or African exporters. Typically, avocadoes that are lower in fat (i.e. less than 10% fat) are better suited to making IQF products. This is the case in Peru, so pulp production in the country is relatively low, particularly relative to the scale at which avocados are produced and exported.

Kenya

Kenya is well established as a supplier of fresh vegetables to the EU and is a relatively new exporter of avocado pulp. Even though avocado pulp is typically sold as a frozen product with a long shelf life, buyers still appreciate that the product will be “fresher” due to shorter travel distances. As carbon footprints become more visible and important in the supply chain, the shorter travel distance may also be advantageous for being able to market pulp from this origin.

4.2 Pricing

Avocado pulp is approximately €6.66 per kg at free-on-board (FOB) price.⁶ Organic avocadoes are able to achieve a higher price – typically between €7.99 and €9.32 per kg – than conventional avocado pulp (Table 5). As with fresh avocadoes, this price premium is about 20–40%.

Table 5. Avocado pulp export pricing (FOB)

	Conventional avocado pulp	Organic avocado pulp
EU	€6.66 per kg	€7.99–€9.32 per kg
USA	€8 per kg	€9.60–€11.20 per kg

Source: Pricing sourced from interviews with exporters and importers.

4.3 Seasonality

Pulp production relies on the supply of fresh fruit, particularly if it is being used as a way to create value out of waste. Typically, peak production follows the export season for fresh fruit. Buying during or at the end of the export season is preferred, as the market values freshness and this allows buyers in the EU the longest shelf life.

4.4 Variety

It is possible to produce avocado pulp from many varieties of avocado. However, the market has become accustomed to the Hass variety –the intense flavour, creaminess and fresh green colour of the Hass variety is what most buyers of avocado expect.

This does not mean that Hass is the only variety used. Some manufacturers of guacamole, especially in Spain, use other exotic varieties such as Fuerte pulp in their guacamole recipes. However, in this case it is important that the exotic variety resembles Hass in colour, flavour, texture and fat content. To ensure that the final guacamole has these Hass characteristics, most manufacturers add these exotic varieties to Hass avocado pulp. The exact ratio is determined by the manufacturer and the buyer.

⁶ Pricing sourced from exporter and importer interviews.

5. Production

5.1 Production process

Avocado is a delicate product that requires care to preserve its vibrant green colour and to avoid the pulp becoming bitter. Many possible solutions have been tried. These range from immediately freezing the product, adding preservatives and antioxidants to the pulp and increasingly using high pressure pasteurisation (HPP) to kill microbes and deliver a food-safe product.

Avocado pulp produced using HPP is increasingly preferred by importers and consumers. The high pressure combined with the packaging creates a food-safe product that is free of common food pathogens such as listeria, salmonella and *E. coli*. As the product does not require a preservative it has a clean label. Once opened, it is more stable and provides a longer shelf life.

HPP is a cold pasteurisation method that effectively protects the colour and flavour of the avocado. This enables importers in the EU to market a pulp that very closely resembles fresh avocado. This is especially important to restaurants, hotels and the foods services businesses that are using avocado pulp to replace fresh avocado.

The production process for avocado pulp follows four steps: reception, preparation, pulping, and preserving and packing. As processors are able to market a product that does not use HPP it is important to understand the different options available when making avocado pulp. The biggest difference lies in step 4, preserving and packing.

Figure 7. Production process for avocado pulp



Stage 1: Reception, washing, sorting and ripening

At reception a visual inspection of the fruit is carried out. The fruit is then washed in a water-bath that can be dosed with chlorine or other products, before being sorted, with any infected, overripe or rotten fruit removed.

Stage 2: Preparation

The fruit is typically cut mechanically, the pit is removed and the fruit is scooped out of the skin. This leaves about 60% of the original avocado. In some cases, the pit might be pulped mechanically along with the flesh. However, this is not recommended when trying to enter the export market.

Stage 3: Pulping

The avocado flesh is mechanically squashed to create a paste and then mixed to achieve the correct consistency. This is typically done mechanically.

Stage 4: Preserving and packing

As avocado pulp browns easily when exposed to oxygen, it is important that the final product is stabilised:

Freezing only

The pulp is packed into pouches, which are then sealed and frozen. This method carries the risk of exposing the product to oxygen. As a result, relatively few buyers are willing to buy this type of product.

Added stabilisers and antioxidants

An antioxidant such as citric or ascorbic acid can be added to the pulp along with a stabiliser or additional preservatives. The final product is packed into pouches and can be shipped as a chilled or frozen product. Product with added citric or ascorbic acid is technically clean label. Nevertheless, EU buyers increasingly prefer product without added antioxidants and stabilisers. This will likely change in the future. New investors with an interest in producing pulp should thus consider this a product that will in time be better suited to local or regional markets.

High pressure pasteurisation

High pressure pasteurisation, better known as HPP, is a method of pasteurisation that can be carried out at relatively low temperatures (5–20°C). Placing foods such as avocado pulp under intense pressure destroys pathogens and microbes that might be present. The product then becomes more stable and has an improved shelf life. This treatment allows the flavour and texture of the food to be maintained, which is advantageous in high quality foods that are marketed for their naturalness.

The pulp is pasteurised in its end packaging. Typically, companies use pre-formed bags. These are then vacuum sealed to remove as much air as possible from the packaging. The filled and sealed bags are placed into baskets and inserted into the high pressure chamber of the pasteurisation unit. Water is injected into the chamber, allowing the pressure to rise to 6,000 bar/600 MPa/87,000 psi.

This method is the best way to preserve the colour, texture and flavour of avocado pulp and allows manufacturers to market a product that has no preservatives added. This is a clean label product and is highly prized in the avocado pulp trade. When combined with freezing, which is required by importers in the EU, the product has an even longer shelf life.

5.2 Production technology

Avocado pulp is produced using a blend of manual and mechanical steps. The manual steps assist in protecting the quality of the fruit. Many companies prefer to use manual labour, especially where labour costs are low. Nevertheless, some mechanical equipment is used to reduce processing times. These are described below.

5. Production

Destoner or crusher: A destoner cuts the avocado in half and removes the pit. The fruit is then ready for scooping out, or removal of the flesh from the skin, which tends to be done manually to preserve the quality of the fruit. Companies producing a low-cost, low-quality product sometimes use a crusher, with the pit included in the pulp. This produces a poorer quality pulp that is not in demand for export. It could be tested for the local market.

Mixing group: This equipment allows for mechanical mixing of the avocado into a smooth paste.

Packing equipment: A form-fill and seal machine can be used to form and fill pouches. Some companies prefer to use pre-formed bags. The equipment used at this step would include a vacuum sealing unit to remove as much air from the product as possible. This prevents packaging bursting in the high-pressure pasteurisation unit and preserves the shelf life during distribution.

Pasteurisation: High pressure pasteurisation requires specialised equipment that can withstand the intense pressure applied in the chamber (see Table 6). There are relatively few suppliers of this equipment, which is also expensive. The high price and the odd shape of the chamber means that capacity and throughput are important considerations when selecting equipment (see Figure 8 for examples). Capacity is the volume of product that can be contained in the pasteurising chamber and is affected by the shape of the packs being placed in the tube. Throughput refers to the mass of product that can be pasteurised and takes the time taken to pasteurise product into account. This is also affected by the pumps and the pressure that can be created.

Table 6. HPP equipment specifications and costs

Category Descriptor	Details
Capacity/throughput	270 kg, 3 tonnes/h
Dimensions	L: 8 m [26.2 feet] W: 2.8 m [6.8 feet] H: 2.2 m [7.2 feet]
Pressure	600 MPa/87,000 psi
Cost	€700,000 – €3,000,000

Figure 8. HPP packing lines from two international suppliers



Source: www.hiberbaric.com



Source: www.jbt.com

5.3 Production economics

The investment in high pressure pasteurisation technology means that companies need to process a significant volume of fresh avocados each month. Should a company invest in the smallest HPP unit (250 kg per hour) and use it for two shifts per day, 6 days per week, that factory would produce approximately 96 tonnes of finished HPP product each month. As a 20-foot container can typically carry 20 tonnes of product, this would mean that the business would be marketing about five containers of finished and packaged product per month (see Table 7). This product can of course be marketed to developed countries as well as locally.

Table 7. Monthly production capacity of 250 kg per hour HPP machine

Capacity (kg per hour)	Production per day (tonnes)	Production per month (tonnes)	Number of 20-foot containers
	(2 x 8 hour shifts)	(6 days per week, 4 weeks per month)	(~20 tonnes maximum load)
250	4	96	5

The company would also have a considerable sourcing challenge. Most factories aim to convert 50% of the fresh avocado fruit into finished pulp. Therefore, a company with an HPP unit with a capacity of 250 kg per hour would need to source and process at least 192 tonnes of fresh fruit per month to operate efficiently (Table 8).

Table 8. Projected fresh avocado requirements for different throughput rates of HPP equipment

Capacity (kg per hour)	Production per day (tonnes)	Production per month (tonnes)	% flesh recovered from fresh avocado	Fresh fruit requirement (tonnes per month)
	(2 x 8 hour shifts)	(6 days per week, 4 weeks per month)		
250	4	96	50%	192
670	11	257	50%	515
1,410	23	541	50%	1,083
2,600	42	998	50%	1,997
3,000	48	1,152	50%	2,304

HPP technology is available at various scales, from 250 kg per hour to 3,000 kg per hour. Some suppliers offer equipment that has been built to specifically process product at a larger scale, while others offer opportunities to scale up by adding more pumps. The larger the capacity, the more expensive the equipment.

The larger scale has implications for the amount of product that needs to be marketed and for the volume of fresh fruit that needs to be sourced. At the largest scale (3,000 kg per hour), HPP equipment needs at least 2,304 tonnes of fresh fruit per month and can produce 1,152 tonnes of avocado pulp. This assumes that the factory operates for two shifts per day. These volumes would increase by a third if three shifts are used.

6. Proposed marketing strategy options

6.1 Key opportunities and challenges

Table 9. Opportunities and challenges

Opportunities	Challenges
<ul style="list-style-type: none">▪ Interest from the food services sector▪ Growing market▪ Provides tangible benefits: better handling, longer shelf life, improved availability▪ Many favourable food trends: veganism, plant-based eating, healthy oil, fresh foods▪ Large markets with potential to increase consumption▪ Established importers and distributors▪ Potential to expand business with food ingredients companies and juice and concentrate importers▪ Certification could be an asset in marketing▪ Scaling up is possible and can be modular or a replacement of the line.	<ul style="list-style-type: none">▪ Quality management is crucial for high value export markets▪ Food safety must be well managed▪ Strong established competitors who have access to the required technology and raw materials▪ Relatively high equipment costs requiring access to finance to enter the market▪ High costs require business models that allow for rapid recoup of investment▪ Scaling up requires capability to market larger volumes of avocado pulp and to secure more raw ingredient.



6.2 Ingredients for success

Lengthen the equipment in-use time

The high investment costs for HPP technology requires that companies find models to be able to afford the equipment. In Mexico and South Africa, year-round production is possible thanks to a year-round supply of avocados. In countries where this is not currently possible, companies should investigate sourcing avocados from further afield. Regional sourcing could be a sensible option.

Where this is not possible, solutions to keep the equipment operational for longer should be considered. HPP technology is very versatile and can be used to pasteurise many types of fruits and vegetables. This would keep the entire plant operational – the ripening, washing lines, cutting equipment and other machinery can all be repurposed for similar fruits such as mango, passion fruit and pineapple. Vegetable purees can also be pasteurised using HPP technology.

HPP technology can also be used to pasteurise packaged food products such as bottled juices, soups and baby weaning foods. Finally, the company could consider offering toll pasteurisation outside the avocado season.

Quality management systems

Quality is an important aspect of producing avocado pulp, particularly for product for export. This requires careful training of staff and consideration of how to source, process and handle the fruit to protect both the quality of the fruit and the end quality of the pulp. In particular, companies should be clear about where to introduce equipment or manual labour. Where manual labour is used, quality management systems must be well managed and staff need to be particularly well trained.

6.3 Conclusion

The anticipated growth in this market suggests that HPP pasteurised avocado pulp has good potential in the market. Companies that are able to access finance to fund the equipment and who can ensure that a steady stream of product is pasteurised in the HPP unit will have the best chance of succeeding. There are several novel models that can be considered to get the most value from the equipment and to be able to support the investment in the HPP technology. The added complexity requires investors to carefully consider whether they have the capability and appetite to process many types of fruits and vegetables, or to manage a toll pasteurisation business. In addition, the quality requirements to be able to export avocado pulp requires an organised, professional management team.

SECTOR STUDY: PROCESSED AVOCADO

1. Avocado Oil
2. Frozen Avocado (IQF)
3. Avocado Pulp



COLEAD

GROWING PEOPLE

COLEAD

Belgium - Avenue Arnaud Fraiteur 15/23 - B-1050 Brussels
France - Avenue du Viaduc, 3 - Bât B3A - CP 90761 - 94550 Chevilly Larue
Kenya - Laiboni Center, 4th floor, P.O. BOX 100798-00101, Nairobi
network@colead.link | www.colead.link