

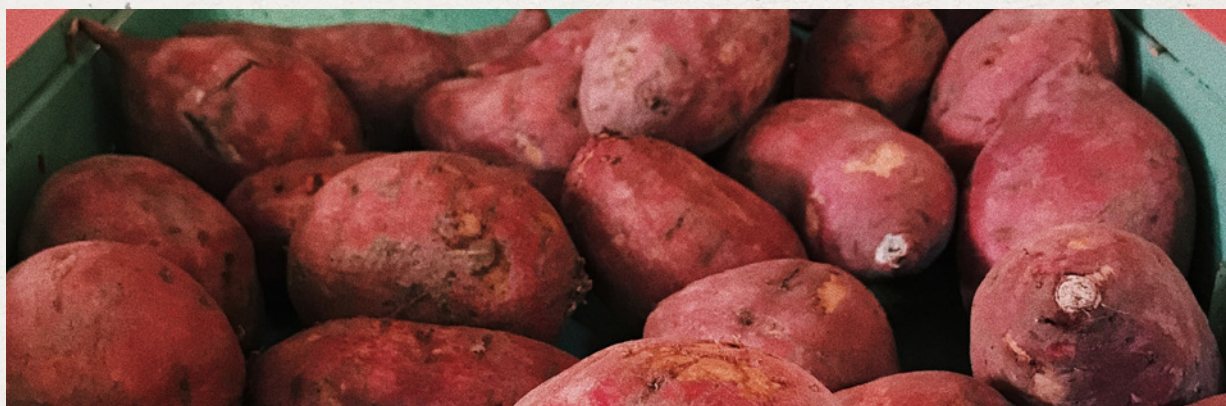
MARKET PROFILE

Market profile

Sweet Potato flour and starch,
puree, and gari



Subject of the study:	Market profile on sweet potato flour and starch, puree and gari from Ghana, for local, regional and European markets
Date :	October 2022



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This study aims to provide insight into the market opportunities available for processed sweet potato products in Africa, specifically for trade with the European Union and other markets. This study involved a combination of desktop research, including a review of innovations and virtual store visits, and interviews with importers, processors, retailers and experts, as well as a consumer focus group. Trade visits in the United Kingdom, Ireland, Germany, the Netherlands, Ireland and Belgium enriched the findings.

The USA is a major supplier of sweet potato globally. However, as revealed by this study, the demand for sweet potato is growing, driven by global food trends such as gluten free foods, ketogenic diets and wholefood or plant-based eating. This presents new potential market opportunities for sweet potato producers and investors in Africa.

Interest in processed sweet potato products – starches and flours, puree and gari (a form of granulated flour) – is also increasing. However, these products compete in distinctly different markets. Understanding this requires detailed investigation of the at diverse product markets.

Sweet potato flour and starch

Starches are a core part of food manufacturing and there is a large market for these products, which can be used in packaged foods, drinks, dairy products, medicine paper production, and more. The growth of the market for gluten-free products has created opportunities for more expensive starches (potato and rice) to be used in new product recipes. However, compared with some of its competitors, sweet potato starch is relatively expensive and there are questions around whether processors in Africa can profitably produce these products to compete with the large starch processors in Asia.

Sweet potato puree

Chilled and frozen foods have seen strong growth both in terms of product innovation and revenue. Food manufacturers are also showing great interest in using whole foods and healthier ingredients in their recipes for diverse product categories, such as baby food, baked goods, soups and even brewing. Sweet potato puree offers opportunities to access these dynamic markets.

While aseptic and frozen puree production is technically challenging and requires a significant investment, it potentially offers access to larger, growing markets.

Sweet potato gari

Sweet potato gari is an innovation that provides a healthier twist on traditional cassava gari. While novel and exciting, this concept is yet to be proven and faces many challenges. The product's success depends on overcoming challenges including stimulating interest from consumers who are unfamiliar with the product and how it compares to cassava gari, and then developing the market. From the consumer's perspective, innovating with a traditional product they know and love may not be beneficial. For example, some consumers may perceive sweet potato as simply a 'western' product that should be used in its unprocessed form.

Finally, the study revealed that while opportunities in the processed sweet potato market are not simple to capture, those companies willing to invest in technology and operational excellence, and in finding an importer with an appetite to undertake market development, are potentially able to compete and win market share. This is especially true for sweet potato puree, which has the greatest chance of success.

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1. INTRODUCTION

Sweet potato has long been popular with consumers in the USA, which is also the single largest exporter globally. Evolving global food trends have led to the increasing popularity of sweet potato around the world. Sweet potato is known to be a nutritious, low glycaemic index food, leading to it being included as an important component of whole-food, plant-based, low carbohydrate, gluten-free and vegan diets, as well as diets designed to combat insulin resistance and diabetes.

Consumers with gluten sensitivity – an increasingly common dietary issue – are looking for alternatives to traditional grains such as wheat and spelt. Sweet potato is naturally gluten free and can be used as replacement for gluten-containing cereals in cakes, crusts, batter, pasta, bread and other products. Gluten-free brands and products are now more widely available in supermarkets, specialist health food retailers and online stores in western countries. In some countries, supermarkets have dedicated aisles for gluten-free products, although it is also common for gluten-free items to be placed alongside the products they have been designed to substitute.

The increased interest in sweet potato – as a whole vegetable and as a food ingredient – has incentivised production in traditional areas such the USA and has led to the development of new growing areas in China, parts of Africa, Viet Nam and Australia. European Union (EU) production, specifically in Spain and Portugal, has grown substantially. Spain produced 62,000 tonnes of sweet potato in 2017, double the volume of 2015. Portugal is also a known producer, with a stable supply of 23,000 tonnes (2017) and superior quality.

At the same time, imports into the EU have increased. Imports of whole sweet potatoes increased by 56% between 2017 and 2021, while imports of processed sweet potato products doubled in volume over the same period (see Figure 1).

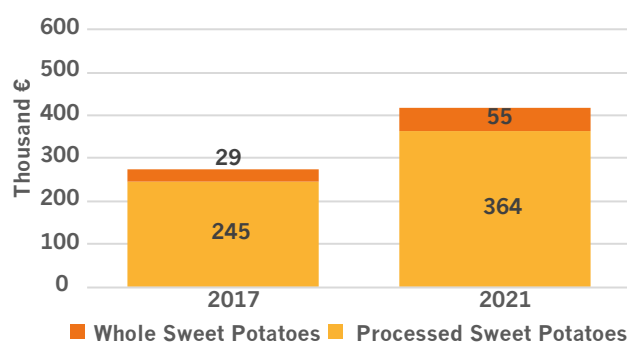


Figure 1. Imports of whole versus processed sweet potatoes into Europe, 2017 vs 2021; in thousands of Euros
Source: ITC Trade Map, HS code 071420

The USA, Viet Nam, Spain, Egypt and Canada are the top five largest producer-exporters of sweet potatoes and their related processed products globally. The Netherlands, the largest importer in Europe, imports and then redistributes these products across the EU. Exports from the Netherlands grew by 31% between 2016 and 2020.

Other countries have also steadily increased their production of sweet potato and their market share. Egypt, Japan and South Africa increased their production and export of sweet potato between 27% and 35% since 2016, moving Egypt into the top five suppliers of sweet potato and related products globally.

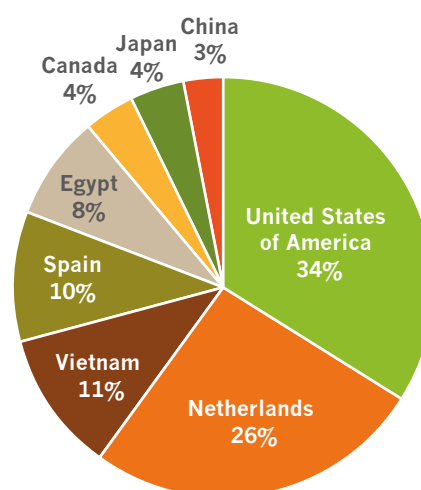


Figure 2. Market share of the top seven exporters of sweet potatoes (whole and processed) in value (€) in 2020
Source: ITC Trade Map

Increasing production in Africa has brought sweet potato to local markets and has allowed Africa to boost its share of the international sweet potato trade. Egypt is by far the largest exporter of sweet potato in Africa, despite charging a relatively high price of US\$1,191 per tonne, 62% higher than South Africa, the second largest African exporter (see Table 1).

Table 1. Export of sweet potato and processed products, 2020

Country	Volume (tons)	Price per ton	Share of African volumes
Egypt	37,535	€1,094	69%
South Africa	7,512	€737	14%
Mali	6,562	€66	12%
Ghana	772	€844	1%
Uganda	683	€258	1%
Guinea-Bissau	476	€244	1%
Morocco	401	€682	1%

Source: ITC Trade Map, Exchange rate (\$:€) average annual exchange rate 2020

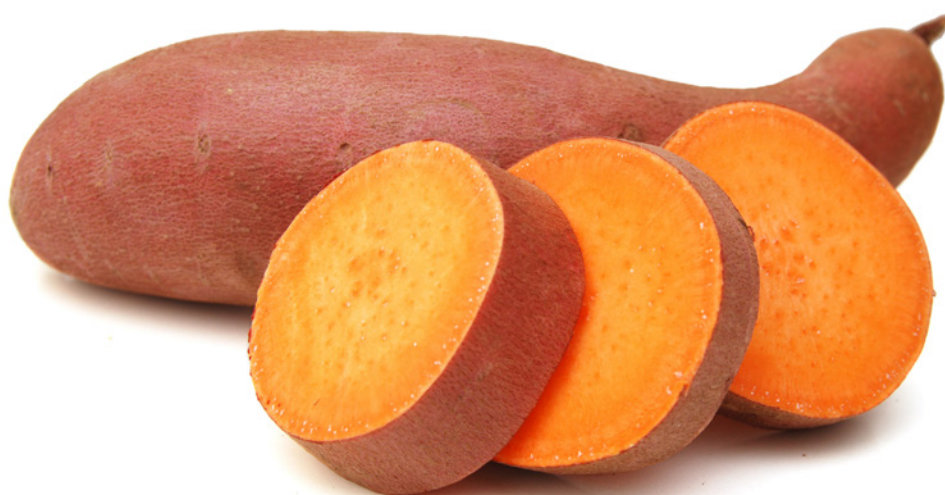
In response to the growing popularity of sweet potato, food manufacturers have brought many new sweet potato products to market. In particular, various frozen sweet potato products, including those that mimic the typical uses for more traditional potatoes, have become more available. Sweet potato fries, wedges, mash, baby foods and crisps are now available in many supermarkets in countries including the EU, USA, Canada, Australia, the UAE and South Africa.

The main question now facing the African sweet potato industry is whether sweet potato can be used to produce other novel products, and whether those products offer opportunities for African processors. Some innovative ideas include transforming sweet potato into flour or starch, or into puree for food manufacturing, and replacing traditional

cassava gari with a healthier sweet potato gari. These three categories of products are the focus of this study.

In this market study we describe the market in which these sweet potato products could compete. We review global and local trends and consider whether they provide opportunities or threats for potential processors of these products. Finally, we assess the factors required to succeed in the global sweet potato market. This includes a review of the ingredients for success and the specific marketing mix that might be helpful in bringing these products to market.

The overarching goal of this report is to help African producers, exporters and potential processors, as well as policymakers, to decide which markets and products offer the most potential for growth.



2. SWEET POTATO FLOUR AND STARCH

2.1 What are sweet potato flour and starch?

Sweet potato flour or starch is made from ground, dehydrated sweet potato. There are many different cultivars of sweet potato, which broadly fall into two categories:

- White flesh: the staple type of sweet potato, with purple skin and a high starch and dry matter content
- Orange flesh: the dessert type of sweet potato, with orange flesh and skin, has a high sugar and beta-carotene content.

The end use of the sweet potato determines which cultivar is used. For sweet potato starch and flour, the white flesh sweet potato is usually preferred due to its higher starch content.

There are several key differences between the production processes of flour and starch (see Figure 3):

- **Sweet potato flour** is usually made from dried sweet potato chips, which are ground into a fine, beige or pale orange powder, depending on the variety of sweet potato used.
- **Sweet potato starch** is made by cleaning and grating the uncooked potatoes and then separating the liquid from the starchy residue. Rinsing (multiple times) creates a clean, white product. The residue is finally dried leaving a high starch, low fibre product.

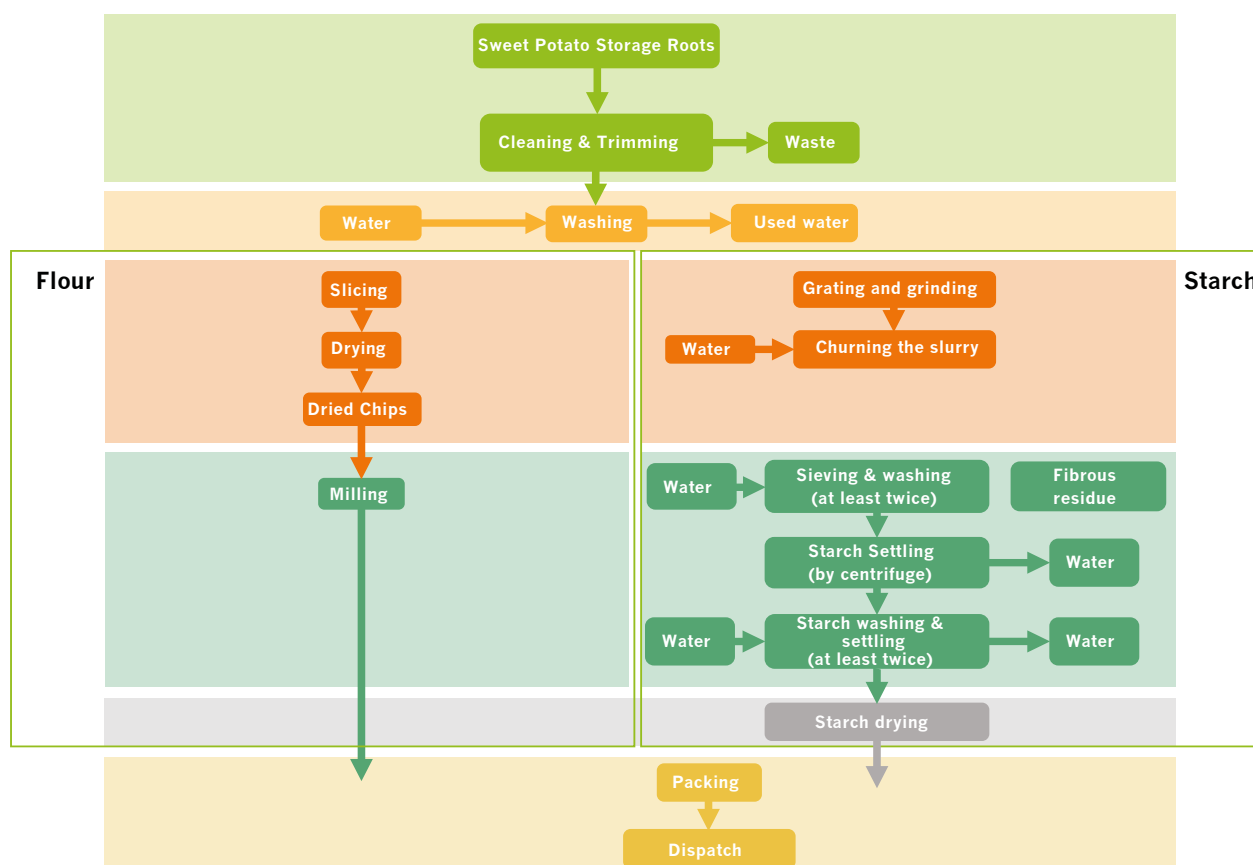


Figure 3. Production process of sweet potato flour and starch¹

¹ Insights on starch preparation from Vithu, P., Dash, S.K., Rayaguru, K., Panda, M.K. and Nedunchezhyan, M. (2020) Optimization of starch isolation process for sweet potato and characterization of the prepared starch. *Journal of Food Measurement and Characterization*, 14: 1520–1532. Doi: 10.1007/s11694-020-00401-8.

Sweet potato starch is used in foods as a thickener and stabiliser and can also be used to create sweeteners, paper and textiles. Sweet potato flour, which is less common, can be used in baked goods or as a thickener. In general, both sweet potato flour and starch are 'hidden', being used as ingredients in a final product – cookies, pastries or sauces, for example – rather than being consumed as an end product. As a result, many food manufacturers and even household cooks use starches interchangeably, selecting the starch or flour based on the availability of the product, its cost and expectations around how it will perform in the final recipe. Corn starch, for example, is cheap and performs well when used in sauces and gravies that are eaten quickly after preparation but is not suitable for reheating.

Starches are used widely in manufacturing as pure or native starches. Alternatively, companies may modify starches so that they acquire new properties that allow the starch to be used in new applications. Starches can be used in sweeteners in confectionery, drinks and baked goods; as thickeners, texturisers and stabilisers in dairy and savoury products; and in a host of other foods. They can also be used in pharmaceutical products such as fillers for pills and capsules, in chemicals, animal feed and in other non-food uses.

Though some individual consumers buy starches and flours for use at home, these products are most commonly used by the food industry. Even consumers who regularly use starch to thicken soups and sauces can take months to finish a pack of corn starch. Similarly, few consumers have the time to bake bread, cakes and other products on a weekly basis, let alone a daily basis.

Sweet potato as a flour and starch is a relative newcomer to the global starch trade. As a result, the volumes traded each year are still too small to identify from various trade databases.

China's Sichuan province produces the largest volume of sweet potato globally. Much of this production is transformed into starches for processed products such as noodles and



baked goods, which have been growing in popularity. Viet Nam, which is a major producer and exporter of tapioca flour, also produces sweet potato in large volumes for local markets. Recently, sweet potato starch has been used as a partial replacement for wheat in noodles.² Established tapioca flour producers and exporters are now able to include sweet potato flour in the shipments they make to clients in core markets such as the EU. These volumes are reportedly relatively low when compared with the volume of tapioca flour exported in 2020. However, qualitative feedback from suppliers suggests that export volumes are slowly growing.

2.2 Substitutes

Sweet potato starch and flour compete with products made from different base cereals, tubers, nuts and grains. These products have different origins and compete with each other

² Thuy, N.M., Chi, N.T.D., Huyen, T.H.B. and Tai, N.V. (2020) Orange-fleshed sweet potato grown in Viet Nam as a potential source for making noodles. *Food Research*, 4(3): 712–721.

to be bought by the same importers and used by the same manufacturers.

In general, one starch can easily be substituted for another. Sweet potato starch can be used in a recipe in place of potato, rice or cassava starch, for example. There are many possibilities for the substitution of sweet potato starch for other starches, with more being developed each year.

It may be beneficial to view the market for sweet potato starch and flour as a market for gluten-free starches, especially because the market for sweet potato starch and flour is young. To understand the opportunities in this market – whether sweet potato starch has a chance of competing successfully, and if so, how this can be done – we need to consider the usage of these competing starches and their relative strengths and weaknesses.

Potato starch³

Germany, Poland, Belgium and the Netherlands are the leading exporters of (regular) potato starch globally. Together they export 82% of global potato starches, with all but Poland and Belgium exporting above the global average price per tonne (Table 2).

Table 2. Leading exporters of potato starch, 2020

	Volume (tonnes)	Share of global exports	Price (€/tonne)
Germany	264,057	52%	€780
Poland	97,534	19%	€658
Belgium	41,975	8%	€683
Netherlands	15,915	3%	€773
World	389,972		€741

Source: ITC trade Map, annual average exchange rate for 2020

Companies in these countries produce a range of native (pure) starches as well as modified starches, which are used in the food ingredients sector as well as in assorted industrial applications, such as in paper products manufacturing.⁴

Potato starch is particularly valued for its

high binding strength, texture, clarity, low tendency to yellow and foam, and its neutral and flavourless taste.

In 2021, all five major potato exporting countries – Germany, France, Poland, the Netherlands and Belgium – harvested fewer potatoes than in 2019 and 2020, as a result of planting fewer potatoes due to low prices, heavy rains and adverse weather conditions.⁵ As a result, potato starch became less available. Buyers outside of these countries have thus struggled to source and supply the product to other prospective buyers, leading to unusually high prices for potato starch.

Rice starch⁶

Rice starch is chiefly produced in the world's biggest rice producing markets in Asia. A large proportion of this starch is used in the region for noodle production. However, despite high demand in the region, these processors produce at such a large scale that exports are possible. In fact, the Asia-Oceania-Pacific market, which includes all countries in that region, was worth €2.09 billion in 2020 and is estimated to be growing at a CGAR of 4.2% to reach €4.3 billion by 2026. Demand for rice flour is expected to continue to grow. Estimates suggest that the market will be valued at US\$15.7 million by 2026, an increase of nearly 30% over a 6-year period from 2020.⁷

Trade data on rice flour alone is difficult to source. However, India data provides some insight. Between April 2020 and June 2021, India exported €12.5 million worth of rice flour. The USA, United Arab Emirates and the United Kingdom absorbed more than half of this volume (Table 3).

³ HS code 110813

⁴ Starch Europe, 2021, <https://starch.eu/>

⁵ Sourced from <https://spudsmart.com/european-potato-production-to-drop-seven-per-cent-this-year/>

⁶ HS Code 11081910

⁷ <https://connect2india.com/>

Table 3. Rice starch exports from India
April 2020-June 2021, in Euros

Country	Value (million €)	Share (%)
USA	€3.6	29%
United Arab Emirates	€1.5	12%
United Kingdom	€1.25	10%
Canada	€1.05	8%
Australia	€0.89	7%
Saudi Arabia	€0.79	6%
Qatar	€0.69	5.5%
Kuwait	€0.49	4%
Oman	€0.32	3%
Singapore	€0.32	3%

How is rice starch used?

Rice starch is very effective in absorbing moisture. It is therefore particularly useful in the manufacturing of items that must be crispy and extremely dry, such as noodles, biscuits and crackers. Rice starch performs particularly well as a substitute flour in gluten-free baking; because it is gluten-free, it has a higher binding capacity and aids in the mixing of components. Rice flour is also used as a thickening factor in cold or frozen recipes because it prevents liquid separation, while most other flours do not respond well to freezing and thawing.

Corn starch⁸

Corn starch is possibly the most widely used starch in industrial production and home cooking. It is commonly used in sauces and gravies as a general thickener. The low cost and wide availability of corn starch have made it popular in the food manufacturing sector. China, the USA, Germany and India supply more than half of the corn starch sold on global markets (Table 4). The market leader, China, is responsible for more than a quarter of global exports, largely because of its ability to sell corn starch at low prices. This low-cost strategy has ensured that the average prices of Chinese supplies in 2020 were 23% lower than the average global price.

Table 4. Corn starch sold on global markets, 2020

	Volume (tonnes)	Price (€/tonne)	Share of international exports
China	623,095	€329	26%
United States of America	272,936	€573	11%
Germany	202,912	€756	9%
India	165,566	€316	7%
Turkey	118,369	€342	5%
Spain	118,369	€419	5%
Netherlands	74,237	€667	3%
Italy	70,126	€546	3%
Ukraine	68,506	€366	3%
Brazil	54,267	€345	2%
Egypt	50,195	€437	2%
Argentina	47,985	€321	2%
Korea, Republic of	45,553	€399	2%
Indonesia	44,537	€325	2%
Other	422,331		18%
World	2,378,984	€404	

Source: ITC Trade Map

Tapioca (cassava⁹) flour¹⁰

Tapioca flour is made from the cassava or tapioca root. It is particularly valued for its excellent binding and thickening properties and is used in a variety of food products, including soup and baked goods. It is also used for brewing beer in some countries, such as Mozambique. More recently, African governments have been encouraging bakers to substitute at least a portion of the wheat flour used in bread recipes with tapioca flour. This is an ongoing effort towards the implementation of import substitution projects. With the recent increases in wheat prices, these projects may receive additional support.

Despite extensive production in Africa, or perhaps because of widespread consumption

⁹ Tapioca and cassava refer to the same tuber, but the name changes from one region to another and depending on the buyer or seller. The product sourced from Asia tends to be called tapioca, but when it originates from Africa, it tends to be called cassava. However, this is not definitive as variations also occur within regions.

¹⁰ HS code 110814

⁸ HS Code 110812

of fresh cassava, the continent is not a global leader in the export of tapioca flour. Most tapioca flour comes from Asia, which exported 85% of the global trade in 2021.

In contrast, Côte d'Ivoire and Brazil are the only significant suppliers from Africa and Latin America. Together, the two countries account for around 3% of global exports at prices in the region of about €1500 per tonne (Table 5).

Table 5. Global export volumes and prices of tapioca starch by country

Country	Volume (tonnes)	Price (€/tonne)	Share of international exports
Taipei, Chinese	52,026	€1,865	36%
Thailand	40,624	€828	28%
China	11,459	€718	8%
India	10,025	€1,664	7%
Netherlands	8,847	€805	6%
Indonesia	3,230	€809	2%
Brazil	3,071	€1,475	2%
USA	2,811	€1,004	2%
France	2,645	€1,568	2%
Belgium	1,944	€3,739	1%
Côte d'Ivoire	1,677	€1,528	1%
Viet Nam	1,658	€2,231	1%
World	144,580	€1,390	

Source: ITC Trade Map

Other flours and starches

All the starches described above are mainstream starches that have been produced and used at a large scale for decades. However, there are at least 20 other starches on the market that are far less common and produced in much smaller volumes. All of these starches have useful properties that could make them potential substitutes for sweet potato starch. Examples of these starches and flours are buckwheat, coconut, chickpea, fonio, spelt, almond, chestnut and barley.

These flours tend to be more expensive and compete for limited space on retail shelves. Sales tend to be limited to larger supermarkets and special health and organic stores, as well as drug stores in some larger, wealthier cities. This limited distribution is the most significant challenge facing these flours. In addition, due to their relatively high price, usage in the food industry is very limited. When these flours are used in the industry, often only a tiny amount is added in order to make a claim on the packaging.

Around the world, usage of all types of starches and flours in homes is very limited.



For something well known such as corn starch, the average household might buy one pack a year. Likewise an especially adventurous, knowledgeable and health-conscious home cook might buy one pack of almond flour a year. Most households will never purchase these items.

In contrast, for every bread, pastry, roll or cake baked at home, at least 200 are bought in the store or bakery. Starches sold to the manufacturing industry compete in a far larger market. Those that rely on usage in people’s homes have a far smaller chance of succeeding.

As pricing is an important part of the decision to select a specific starch, it is crucial to understand the relative price of each product. Corn starch is very affordable, readily available and easy to use, which makes it an ideal choice for many food manufacturers. Rice starch is also very versatile, available in large quantities and resistant to cold temperatures, which makes it ideal for use in frozen products. However, demand for rice starch in Asia, which tends to use the starch in noodle production, keeps prices buoyant, at up to twice the price of corn starch.

2.3 Relative pricing

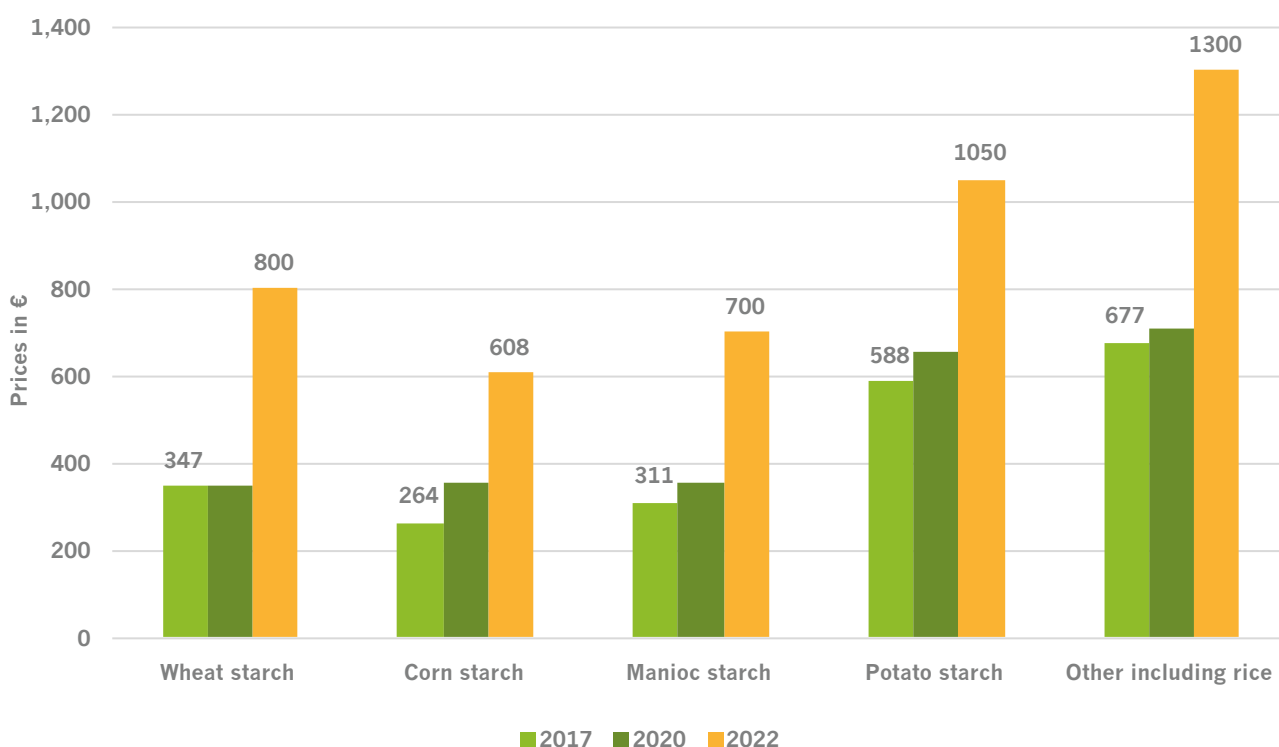
2.3.1 Mainstream starches

The current global crises of COVID-19 and the conflict between Ukraine and Russia have created upward pressure on commodity prices. The price of starches has likewise skyrocketed over the last 2 years, while logistics issues continue to hamper the availability of these products. Figure 4 shows the increase in the price per tonne of various starches in 2017, 2020 and 2022.

2.3.2 Competitiveness of sweet potato starch

Sweet potato starch is still too rare and new on the market to have an established and widely known price. However, it is currently a relatively expensive product and analysis of the production costs suggests that it will remain so. A key reason for this is that there is increasing competition for fresh sweet potatoes. Many processors are simply unable to secure enough raw material to convert into starches and flour at an affordable price. Fresh sweet potato prices are usually around €300 per tonne, compared with €200 to €250 for

Figure 4. Comparative pricing of various starches, 2017, 2020 and 2022



Source: ITC Trade Map 2017 and 2020 data and qualitative interviews with importer-distributors (2022 data)

regular fresh potato. This already represents a price premium compared with most other starches.

The conversion ratio of fresh sweet potato to a final starch also raises the price. After the removal of excess water and peel, only about 30% to 40% of the weight of fresh sweet potato remains. This means that 2.5–3 tonnes of fresh sweet potato is needed to produce 1 tonne of starch. With higher raw material prices and a lower percentage of starches recovered in the final product, sweet potato seems likely to remain more expensive than potato starch and other starches for some time.

Starch processing economics

It is important to consider whether sweet potato starch production is an economically feasible activity. To better understand the business case, we model two directions: direction 1 assumes a sales price in line with potato starch (€1,000 per tonne), while direction 2 assumes that a higher price can be achieved, in line with rice starch (€1,300/tonne).

Within each direction we model three scenarios: an efficient, realistic or pessimistic conversion from sweet potato to a final product.

- Scenario 1 assumes the best case, where the factory can source starch-rich sweet potatoes and is as efficient as experienced Asian starch processors, which achieve a 40% conversion rate.
- Scenario 2 is a more realistic. It assumes that the factory can secure a reasonable quality of sweet potato and is relatively efficient at producing a starch. In this scenario, the factory converts 35% of the sweet potato into a final product.
- Scenario 3 assumes that the processor is less efficient and potentially has sourcing issues that limit their conversion of sweet potato to 30%. A final assumption is that raw materials, i.e. sweet potatoes, account for 80% of the variable costs.

Table 6. Profitability analysis of sweet potato starch production – Direction 1

	Direction 1: Potato starch prices		
	Efficient	Realistic	Pessimistic
Farm gate price per tonne of sweet potato	€300	€300	€300
Recoverability rate	40%	35%	30%
Raw material volume required per tonne of finished starch	2.5 tonnes	2.8 tonnes	3 tonnes
Total cost of raw materials for 1 tonne of starch	€750	€857	€900
Other variable costs	€188	€188	€188
Total variable costs per tonne	€938	€1,045	€1,088
Sales price (potato starch benchmark)	€1,000	€1,000	€1,000
Gross profit per tonne	€63	-€45	-€88
Gross profit margin	6%	-4%	-9%

For direction 1 (Table 6), the gross profit per tonne is exceptionally low. At these prices – more than three times the price of corn starch – a sweet potato starch supplier cannot make sufficient profit to make the investment worthwhile. Even in the best-case scenario, the gross profit margin is just 6%, which is insufficient to cover additional fixed costs of production. It also leaves the business very vulnerable to any shocks.

Direction 2 (Table 7) allows for a higher sales price and gives a better financial result. Production generates a gross profit percentage ranging from 16–28%. Under this scenario, when the factory is at optimal efficiency there is a chance of a reasonable profit. However, this assumes excellent control of processing and sourcing. It also does not allow for much leeway if prices of starch fall, or if sweet potato prices rise.

Despite this analysis using broad stroke assumptions, it is quite helpful in shedding light on the potential reasons for the scarcity and high prices of sweet potato starch. It suggests that most processors need to achieve prices significantly higher than the price of rice starch to make producing sweet potato starch worthwhile. This is reflected in the market.

A final consideration is the variable recovery rate of starches in the final product. In years when the starch content is low, margins shrink further. With changing weather conditions and an unpredictable economic and policy environment, such low margins may not be tolerable for African investors.

Table 7. Profitability analysis of sweet potato starch production - Direction 2

	Direction 2: Assume rice starch prices		
	Efficient	Realistic	Pessimistic
Farm gate price per tonne of sweet potato	€300	€300	€300
Recoverability rate	40%	35%	30%
Raw material volume required per tonne of finished starch	2.5 tonnes	2.8 tonnes	3 tonnes
Total cost of raw materials for 1 tonne of starch	€750	€857	€900
Other variable costs	€188	€188	€188
Total variable costs per tonne	€938	€1,045	€1,088
Sales price	€1,300	€1,300	€1,300
Gross profit per ton	€363	€256	€213
Gross profit margin	28%	20%	16%

Source: Raw material prices and sales prices supplied by a Ghanaian fresh sweet potato supplier.

2.3.3 A niche product

The variability in pricing and the high price of sweet potato starch is visible in key EU markets.

In most cases, sweet potato flour and starch are not available at all. A recent study of online retailers in the United Kingdom, one of the largest importers of sweet potato products in the EU, showed that despite many stores stocking alternative gluten-free flours, they did not stock sweet potato flour or starch.

During store visits in Ireland, London, Germany, Belgium and the Netherlands, no sweet potato flour or starch was found. Food products tend to be made with more familiar starches (rice, potato and cassava).

An online study showed that sweet potato flour is generally not available in the EU. The product was found to be available in a few online stores based in the United Kingdom (see Table 8). This suggests that sweet potato flour is still fairly unknown and that demand for the product is limited.

Table 8. Overview of price and available of starches in selected UK online stores

	Pack size (kg)	Price (£)	Price per kg (£)	Price per kg (€)	Supplier	Country	Online store
Tapioca flour	0.5	3.59	7.18	8.47	Your Health Store	UK	Amazon
Potato flour	0.5	3.99	7.98	9.42		UK	Amazon
Corn starch	0.5	3.99	7.98	9.42		UK	Amazon
Coconut flour	1.0	5.79	5.79	6.83		UK	Amazon
Oat flour	0.4	3.99	9.98	11.78		UK	Amazon
Rice flour	0.5	6.99	13.98	16.50		UK	Amazon
Sweet potato flour	not stocked						UK
Sweet potato flour	0.3	9.99	33.30	39.29	Natural Evolution	UK	Amazon
Sweet potato flour	0.3	5.80	19.33	22.81	Jinhailin	UK	Amazon
Tapioca flour	1.0	2.61	2.61	3.08	Buy wholefoods	UK	Buy wholefoods
Potato flour	1.0	3.55	3.55	4.19		UK	Buy wholefoods
Brown rice	2.5	4.23	1.69	1.99		UK	Buy wholefoods
Sweet potato flour	not stocked						UK
Coconut	0.4	4.89	12.23	14.43	Holland and Barret	UK	Holland and Barret
Rice	0.5	2.69	5.38	6.35		UK	Holland and Barret
Potato	0.5	2.29	4.58	5.40		UK	Holland and Barret
Sweet potato flour	not stocked						UK

Source: Desk research of the various retailer online stores

In the few instances where sweet potato flour is stocked, it costs far more than competing starches. On the Amazon website, for example, the next most expensive starch (rice flour) costs €16.50, whereas the cheapest sweet potato starch is €22.81.

2.4 Market trends

Several market trends suggest that there are both reasons to be hopeful and to be cautious.

2.4.1 Gluten-free products

Over the last decade, food retailers in major markets have steadily expanded their offer of gluten-free foods. This has resulted in a growing assortment of gluten-free flours for household consumption, as well as gluten-free breads, crackers, snacks and frozen foods.

Typically, gluten-free foods are prepared by substituting gluten-containing flours, such as wheat, rye and spelt, with natural gluten-free starch alternatives. Rice, potato, corn and tapioca (cassava) are common alternatives.

The growing market for gluten-free flours is thus a cause for optimism. However, it remains to be seen whether sweet potato flour will manage to get a foothold in this highly competitive market.

2.4.2 Home baking

Household cooks who experiment with gluten-free recipes may also substitute gluten-free alternatives for traditional wheat flour. Gluten-free flours are therefore becoming more available in physical stores and online retailers, although more specialised flours are more commonly found in health and organic shops. This is especially true for products such as sweet potato starch.

While home baking became more popular during Covid-19 lockdowns, the home baking market remains small compared with industrial baking. Furthermore, with the end of lockdowns, home baking has declined.

2.4.3 Food safety and transparency

Food laws in end markets such as the USA and the EU require accurate labelling on packaging.

In the pursuit of transparency, many EU retailers also now share product ingredients on their websites. This puts great pressure on food manufacturers to maintain their recipes and avoid changes to packaging, which can be costly and time consuming. This also makes it harder to introduce new ingredients such as sweet potato flour. The best chance of success may lie in new product innovations, rather than in replacing the starches in the existing products.

2.4.4 Cost of living crisis

The current record price increases on food and energy have created severe pressure on disposable incomes. This may prove to be at the expense of more luxury foods, such as specialty flours and starches.

2.5 Importing countries

2.5.1 Gluten-free starch markets

The gluten-free goods market was worth US\$4.3 billion in 2019 and is expected to grow to US\$7.5 billion by 2027, with a 7.2% CAGR from 2020 to 2027. The EU (€6.3 billion) and the USA (US\$5.7 billion) are now the two largest markets for gluten-free products.¹¹

2.5.2 The rice starch market as a proxy

While specific sweet potato starch data is difficult to find, lessons can be found in the sales and distribution of rice flour, which is expensive and is used relatively sparingly. Growth since 2017 reflects the growth rate of gluten-free products, with a 9% CAGR between 2017 and 2019.

This analysis excludes Asian markets, which could be importing rice flour for noodle production. In western markets, the top 10 leading importers of rice flour are the USA, Germany, Denmark, Italy, Czech Republic, the Netherlands, France, Canada, Austria and the United Kingdom (Table 9). Together, these countries account for 55% of global rice flour imports. In Africa, Nigeria and Tanzania are the two largest importers of rice flour.

¹¹ <https://www.alliedmarketresearch.com/gluten-free-products-market>

Table 9. Import value of rice flour, 2021¹²

Import value 2021	Import value (Euros)
Country	Euros
United States of America	36,747
Germany	13,838
Denmark	10,612
Italy	10,351
Czech Republic	9,899
Netherlands	7,831
France	7,515
Canada	5,273
Austria	4,976
United Kingdom	4,429
Poland	3,803
Spain	3,014

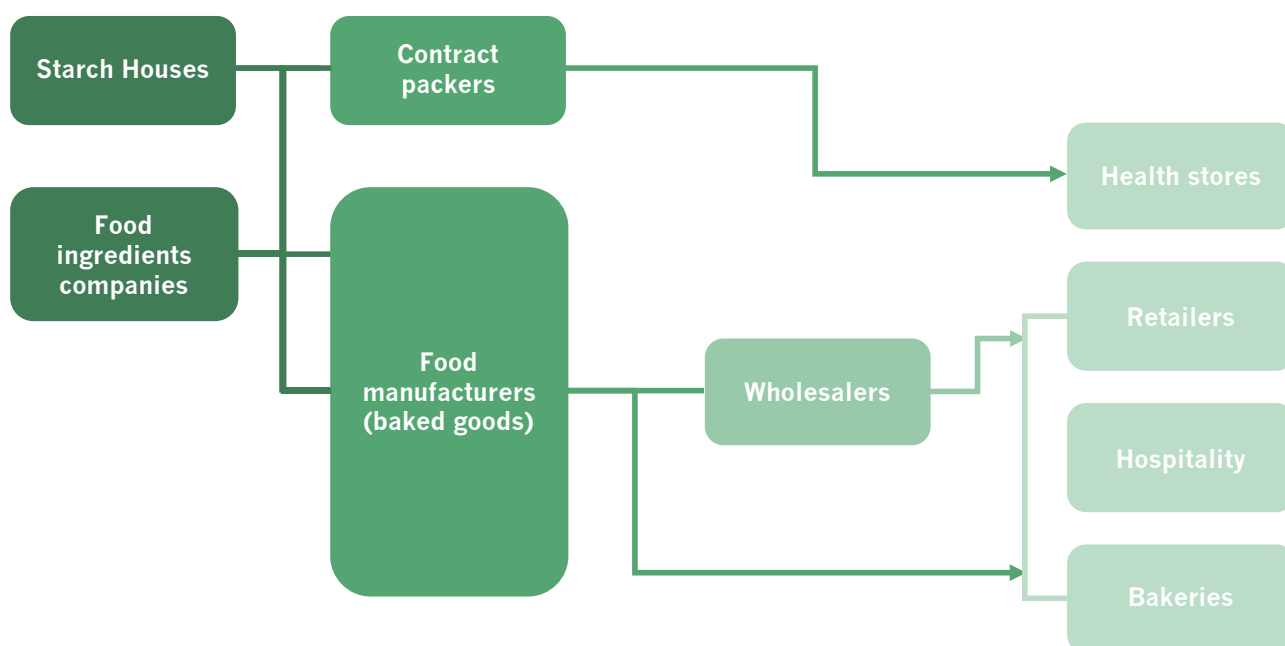
Source: ITC Trade Map



2.6 Market structure

Starches make their way to households via food products sourced from bakeries, health stores and retailers and through food enjoyed in the hospitality sector.

Figure 5. Distribution of sweet potato flour and starch in the foods sector



¹² HS Code: 11081910

These businesses are in turn supplied by wholesalers, or via contract packers and food ingredients companies. For example, food ingredients companies produce a variety of sauces that are sold to retailers for home consumption, or to restaurants, hotels and canteens.

There are two important actors in this chain that require special consideration: food ingredients companies and specialist starch houses.

2.6.1 Food ingredients companies

Food ingredients companies are an important part of the value chain. They source a wide variety of products for food manufacturers, who use the ingredients to manufacture packed goods for retailers and the food services sector. Some food ingredients companies have specialist starch divisions, while others offer starch as part of their wider range of products.

Food manufacturers face more pressure than ever before to produce foods that are affordable, innovative and safe, and to do so in ways that protect the environment, workers and communities. These demands have led many companies to simplify their

supply chains and establish relationships with a few trusted suppliers. This trust allows for open innovation and to rapidly bring new innovations to market. Suppliers can help to balance supply and demand, assist in maintaining quality standards and support manufacturers in their attempts to innovate. For example, a trusted supplier may suggest new types of starches that can improve the mouth-feel of products such as cookies or yoghurt, while reducing costs. Manufacturers who use a range of different suppliers might be less able to respond to these ideas.

Food ingredients companies and specialist starch suppliers perform an important role in the value chain for food manufacturers. However, this has consequences for new suppliers, especially of starches. Direct sales to food manufacturers have become more complicated and food ingredients companies now have far more choice around the suppliers they will allow into the sourcing system.

2.6.2 Starch houses

There are, broadly speaking, two different types of starch houses: those that source and modify starches and those that source and distribute starches.



The technology needed to modify starches means that this is a specialised, technical business. Companies based in Europe or the USA tend to modify starches in those countries, but some sweeteners can be modified in Asia or other countries, depending on the level of technology available. Modified starches extend the number of possible applications for starches and have been a key driver of the wide use of starches in food manufacturing. Specialist starch house companies are large and have high technical capability. There are relatively few companies carrying out this type of production. Some starch houses are a division of a larger food ingredients company (for example, Döhler and Cargill).

On the other end of the spectrum are smaller, specialist starch suppliers. These companies tend to source starch globally and provide the products to smaller manufacturers and specialist retailers. In key markets, specialist starch suppliers may supply product to contract packers linked to specialist retailers. They trade in smaller volumes, which could make these companies better suited to introducing newer, less well-known ingredients, such as sweet potato flour.

Organic and conventional products are often sub-specialities of different importers, with some importers only handling organic products. These smaller importers form a more fragmented market and are difficult to reach. Establishing longer term relationships that promise reliable sales is also more challenging with smaller importers, as they themselves have an insecure role in the value chain.

Some large global modified starch suppliers are Agrana Stärke, Roquette Frères, Tereos, Döhler, Symrise, Ingredion and Cargill.

2.7 Buyer requirements

To export sweet potato starch to Europe, suppliers need to comply with European legislation for food, cosmetic or health ingredients, depending on the intended use of the starch in Europe. For use in food, sweet potato flour and starch products must comply with the European General Food Law.



2.7.1 Quality requirements

The overall quality of sweet potato starch is determined by its purity (moisture, protein and ash content), chemical composition, textural features and gel consistency. An example of acceptable specifications is shown in Table 10.

Table 10. Example of product specification of sweet potato starch from an Asian Supplier

Item	Specification
Appearance	White to off-white powder
Moisture	≤ 20%
Spot	≤ 8 unit/cm ²
Protein	≤ 0.10%
Ash	≤ 0.30%
Viscosity (4%) 700cmg	≥ 1300 BU
Fineness	≥ 99.9% pass 100 mesh
Electric Conductivity	≤ 100μ/cm
Whiteness	≥ 90.0%
SO ₂ (%)	≤ 10.0mg/kg
pH	5.5–8.0
Arsenic (As)	≤ 0.3 mg/kg
Lead (Pb)	≤ 0.5 mg/kg
Total Plate Count	≤ 5,000 cfu/g
Mould and yeast	≤ 500 cfu/g
E. coli	≤ 30 MPN/100g

Source: <https://sinofoodsupply.com/food-supplier-manufacturer/sweet-potato-starch/>

Each food ingredients company or starch house has their own set of standards and product specifications based on the end application. Many customers have higher quality expectations. The quality requirements and the extent to which exporters can satisfy them should be discussed with customers.

2.6.2 Food safety and quality management

Demonstrating food safety and quality management is particularly important for the health market segments. If exporters can show that they have good food safety and quality management systems, they can create a competitive advantage.

To do this, there are several standards that might be advantageous:

- International Standard Organization (ISO) 22000: international standard assists food manufacturers to identify and manage food safety risks. The standard includes HACCP.
- International Food Standard: this is a safety standard for food processors and packers. As this is an important standard for rice

protein, it could be helpful in allowing producers/suppliers to access the EU market.

- British Retail Consortium (BRC): this is originally a British standard that is now widely accepted in Europe. It is essentially a more advanced level of HACCP.

2.6.3 Sustainability and certifications

- Products in the gluten-free market are valued for their general health benefits, in addition to the strict gluten-free characteristic of the product. Being able to produce an organic certified sweet potato starch could be a point of differentiation for new suppliers. This is often the case with food ingredients sold in the health or vitality markets. However, the small size of the market means that this will be an opportunity for only a few suppliers.
- Among consumers, fair trade products do not seem to be highly valued for food ingredients, so achieving this certification may be unlikely to help suppliers to access the market.



2.8 Market opportunity assessment

2.8.1 Key opportunities and challenges

Table 11. Opportunities and challenges for sweet potato flour and starch

Opportunities	Challenges
<ul style="list-style-type: none"> Sweet potato flour and starch are naturally gluten-free products. Respected for nutrition and inclusion in a variety of popular styles of eating. The gluten-free category is expected to continue to grow in the coming years. Gluten-free products also appeal to shoppers who do not have gluten sensitivity. They can be a proxy for better health and nutrition, as in organic markets. Premium prices are achievable, albeit at smaller volumes. Innovation is important to growth in the gluten-free category. The technology to produce flours and starch is relatively simple. Small-scale production is well tested in Asia, albeit with sophisticated systems for aggregation of orders. 	<ul style="list-style-type: none"> Sweet potato flour and starch are relatively unknown and highly substitutable. A variety of known and newer competitors can easily be used instead. There are larger, more established starch producers in Asia, with access to the major gluten-free markets. Premium prices of sweet potato starch are a barrier to growth of this product. However, prices must remain high for the product to be commercially viable. Competition for sweet potato is expected to keep raw material prices high. Buyers tend to be large food ingredients companies that require consolidated orders in relatively large volumes.

Table 11 lists the key opportunities and challenges in expanding the sweet potato flour and starch market.

The starches opportunity is not a simple one. It requires a business to compete on the global market for starches with a product that is more expensive and is not well known. Those companies opting to invest would need to overcome several challenges, some of which are common to businesses exporting products to countries with stringent food safety legislation. Other challenges link to the production process and the economics of production. However, those who seek to invest should be aware of a few crucial ingredients for success. These are described in further detail below.

2.8.2 Ingredients for success

Sourcing capability for raw materials

Crucially, investors must have good capability in sourcing large volumes of sweet potato.

Being able to develop relationships with small-scale and emerging producers is essential.

However, with growing competition for fresh sweet potato, it is also important for companies to have control over a significant share of production. Typically, 50% of own production helps to manage side-selling in outgrower programmes and provides some buffer against farmers selling produce to alternate buyers, such as the fresh market.

The quality of the product should be well controlled to allow for efficient processing and raw materials should be internally and externally consistent:

- Externally: A regular shape and size, few blemishes
- Internally: consistent colour and texture with few blemishes, high in starches

Partner for market development

The sweet potato starch and flour market is still at an early stage of development. For producers to succeed, they must reach an agreement with a dedicated buyer in the EU (or in the target region) who is committed to developing the market for sweet potato flour



or starch. This buyer should be invested in building awareness of these products and their uses and potentially creating understanding around the many applications of sweet potato flour and starch. This is a task that requires patience and commitment as well as access to food manufacturers or food ingredients companies.

Differentiating claims

There is growing interest from more established starch producers in Asia with a proven track record in gluten-free tapioca. Competitors in Africa should prepare for pressure from these suppliers by developing differentiators that are more difficult for these suppliers to offer. Organic certification could provide access to specialised health and wellness stores and increase the likelihood of building relationships with larger food ingredient suppliers.

Commercially competitive scale

Export to the EU and USA requires that the supplier can either supply a range of gluten-free starches in a single container or can supply a full container of product at a time.

Developing the capability to consolidate volumes, or to produce at a relatively large scale, is recommended. Successful exporters should be able to regularly consolidate at least 20 tonnes of product to fill a single container. This means being able to process at least 50 tonnes of raw material per container if no other starches are being processed.

Investment costs/suitable equipment

The equipment required for starch and flour production is relatively simple and can be modular. Lines producing as little as 500 kg per hour are available, making it possible to produce 20 tonnes of starch per week.

The line consists of nine separate modules that allow for cleaning, maceration and drying. A simple production line producing at this scale can be sourced from China for €105,000.

This does however come with concerns around the quality of the equipment, and whether spares are available and repairs can simply be carried out. A European or American equivalent typically costs two- to four-times as much, but will be more reliable, more efficient, and have a longer life span.

Food safety and quality

Sweet potato flour and starch are key ingredients in the health and nutrition segment, so, it is essential that food safety is prioritised. With the expected strength of competitors in Asia, it would be sensible to develop products that are consistent in quality, safety and offer little risk to the buyer. HACCP certification is thus required for all raw materials prior to processing. This allows for easy export and ensures consistent quality of the finished product. It also allows for control points when inspecting crops for purchase, as all raw materials must fall within the specification to proceed to the processing stage. Annual audits and spot audits are held to ensure that products fall within specification and the finished product must be within the country-of-use specification regarding starch content, moisture content, protein content and ash level.

2.9 Conclusion

Although there is a global move towards healthier starches and gluten-free options, the market potential for sweet potato flour or starch remains limited.

From the market perspective, sweet potato starch would compete in a very established and well-developed market. Maize, potato, rice and cassava starch are all gluten free, have a long history and are always available in high volumes at competitive prices. In addition to these starches, there are at least 20 other readily available starches that are gluten free, ranging from chick-pea flour to rye, spelt, lentil, almond and oat flour. Sweet potato starch would compete with most of these. The demand for new speciality starches in large volumes is limited.

While sweet potato starch has a minor advantage from the popularity and health credentials of fresh sweet potato, is this enough? Most starch is used in the food industry, where performance in the application, price and stable supply are the most important selection criteria for buyers. As starches are mostly a hidden ingredient, the type of gluten-

free starch used is not as important as when it is directly sold to the consumer. The company only needs to ensure that it can claim that its products are 'gluten-free'. At the same time, very few consumers directly buy starch regularly, limiting interest from retailers.

To compete in this crowded market, a product must be competitive on price, which is difficult with sweet potato starch. The cost of the raw material, fresh sweet potato, is considerably higher than that of rice, maize, oats and even potato. At the same time, sweet potato only has half of the starch content of regular potato. This also contributes to a high product cost and will make the product more expensive compared with other gluten-free starches, such as maize or rice. The only real advantage to an investor is that the necessary investment in the plant and machinery is not high.



3. SWEET POTATO PUREE

3.1 What is sweet potato puree?

Sweet potato puree is a functional food ingredient that is used in a variety of culinary applications, from baked goods to beverages and baby food. To produce the puree, sweet potatoes are ground to a pulp and then blanched. The cooked puree is then frozen, canned or pasteurised and either aseptically packaged or frozen (Figure 6).

Figure 6. Production stages of sweet potato puree



Typically, orange fleshed sweet potatoes are used for puree, canned goods and frozen goods.

Aseptically packed sweet potato puree is sold industrially and is used in a variety of products, including frozen ready-to-eat foods, baby foods, baked goods, as an extender and in brewing (in rare cases).

3.1.1 Frozen ready-to-eat foods

Sweet potato puree is increasingly available as an ingredient in frozen foods and as a standalone frozen product that can be used as a topping for pies, or as a side dish. Often, sweet potatoes can replace potatoes in home cooking.

3.1.2 Baby foods

Its soft texture and slightly sweet flavour make sweet potato a popular vegetable for use in baby foods. Baby food manufacturers have different strategies for production: some source raw ingredients and process on site, while others use aseptic puree.

3.1.3 Baked goods and product extender

Sweet potato puree is used as an extender – a substance that allows the manufacturer to remove or reduce other ingredients – in a number of baked goods, savoury foods and even beverages. For this purpose, food manufacturers source an aseptically packed and pasteurised sweet potato puree.

Figure 7. Examples of products using sweet potato puree



3.1.4 Beer brewing

In some rare instances, sweet potato puree is used as a component in brewer's mash, which is the raw material for beer. Traditionally, various cereals, such as barley and hops, are used as the basis of the brewing process during beer making. However, a variety of other ingredients have been successfully used around the world. Asian brewers have developed beers based on rice, while African brewers have had some success using sorghum and even cassava. Sweet potato has not been widely used in beer brewing. The few examples identified are craft brewers who have used sweet potato puree to produce relatively small batches of beer (see Figure 8). Therefore, brewing does not seem to represent a promising opportunity.

Figure 8. Sweet potato brewing examples



Source: <https://www.themanual.com/food-and-drink/best-sweet-potato-beers/>

Production process

Sweet potato puree can be made in two different ways. The first method involves slicing, steaming and then pureeing the sweet potato. In the second method, the sweet potato is ground and heated with an injection of steam at 110°C. The steam injected method creates a more stable product that is less prone to separation of the liquid (syneresis). However, it is also technologically more complicated and requires more expensive equipment.

The steamed puree can be either frozen or aseptically packaged. Canning is not common. Frozen packing requires freezing of the puree at -18°C. Typically, the puree is frozen in different sizes, allowing for flexibility to meet customer orders. A 3.5l, 10l or 20l bib, a 200 kg drum and a 1,000 kg jumbo drum are some of the typical pack sizes available from various suppliers.

Aseptic packing can be achieved using a standard aseptic packaging line such as that used for juice production. The typical process is shown in Figure 9.



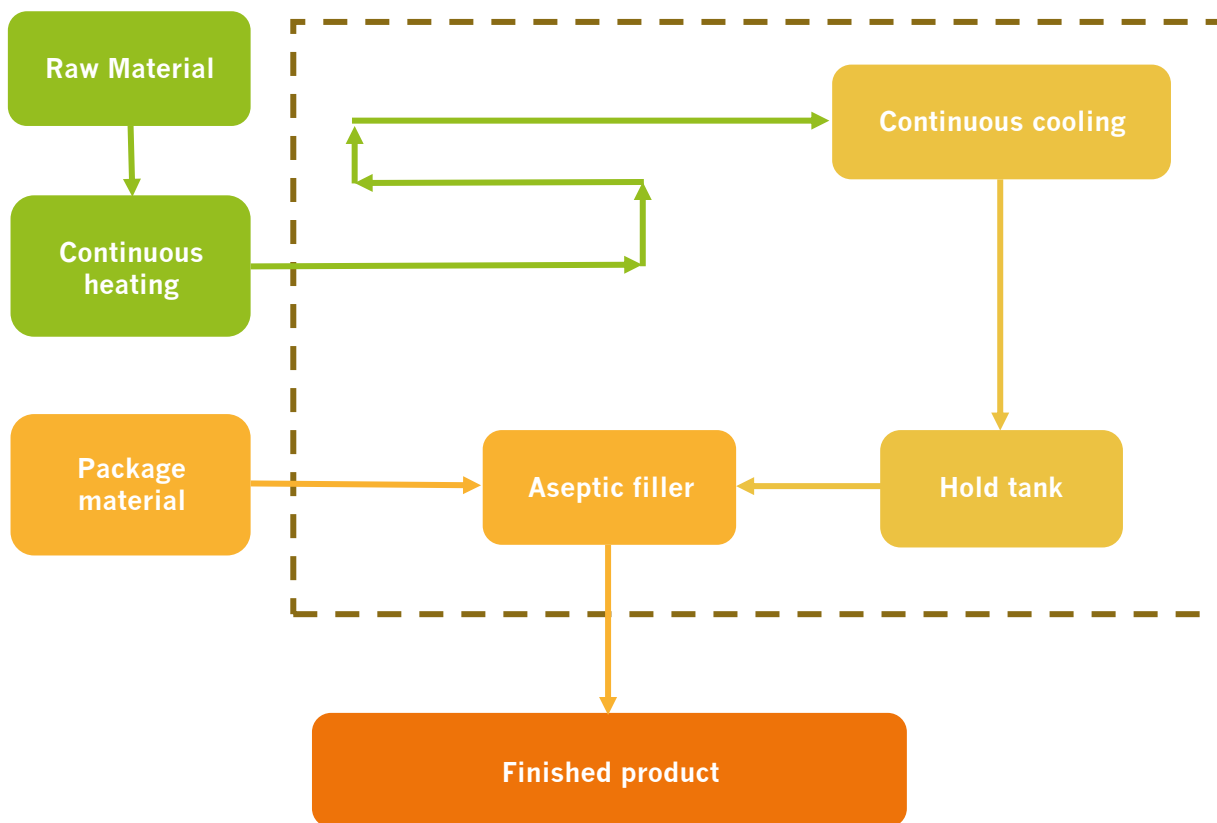


Figure 9. Aseptic packaging process flow¹³

Aseptic packaging provides a shelf-stable product that is easier to store and transport than the frozen product. The aseptically packed product typically has a shelf life of 12–18 months, can be processed to retain much of the flavour and colour and is resistant to the temperature changes and more challenging conditions (such as storage problems caused by heat or an unreliable electricity supply) typical of developing markets.

This form of packaging does have some disadvantages. The machinery and set-up costs are high, and the process requires specific packaging materials and an ultra-clean environment for the filling and sealing process.

A small-scale aseptic packing line is able to pack around 500 kg per hour, enabling a packaging volume of 20 tonnes per week.



¹³ Mauer, L. (2003) Packaging | Aseptic Filling, in Encyclopedia of Food Sciences and Nutrition (Second Edition).

3.2 Market trends

3.2.1 Frozen and chilled

Figure 10. Sweet potato hash browns in the EU



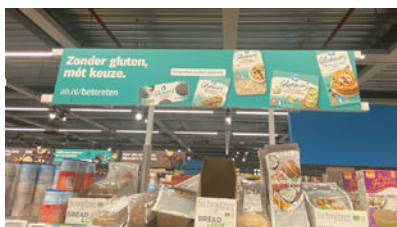
Source: Trade visits, July 2022

Sweet potato is becoming more popular every year. Much of the growth in demand comes from the fresh and frozen segments of most major markets. New innovative products are arriving on supermarket shelves, expanding their offer of meals that contain sweet potato.

Despite this innovation, however, sweet potato puree is much less available than sweet potato fries and wedges. As a result, sweet potato puree is harder to find in stores.

3.2.2 Gluten-free foods

Figure 11. *Gluten-free products aisle, Netherlands*



Source: Trade visits, July 2022

Gluten-free foods are predicted to experience significant growth in the coming years. Currently, much of the growth in these products comes from replacing wheat products, such as bread, crusts and toppings. Sweet potato puree is, however, being used increasingly in whole foods and ready-made meals, such as sweet potato fish pies. The general health and gluten-free credentials of sweet potato make it an ideal solution for food manufacturers, so further growth is likely to be possible.

3.2.3 Japanese sweet potato

Figure 12. Japanese sweet potato



Source: www.canva.com

Typically, western markets prefer orange fleshed sweet potatoes, both for reasons of taste and nutrition. However, there is great interest in purple fleshed Japanese sweet potatoes, which are prized for being nutritionally dense. There are also some perceived associations with longevity because this is a key food enjoyed by the residents of Okinawa, Japan, which has one of the longest life expectancies in the world. This could potentially explain the relatively high price per tonne of sweet potatoes from Japan.

Awareness of the different varieties of sweet potatoes and the differences in their health benefits is an asset for companies aiming to produce sweet potato puree. Being able to supply different varieties with specific health claims or associations could be an interesting point of differentiation that is rarely available in the fruit and vegetable market.

3.2.4 Baby weaning on vegetables

Figure 13. Baby-weaning foods



Source: www.freepik.com

Weaning guidelines increasingly emphasise the importance of weaning on vegetables rather than fruits. Food manufacturers have been introducing sweet potato both as a puree and in other processed food products for babies. This creates more potential opportunities for processors.

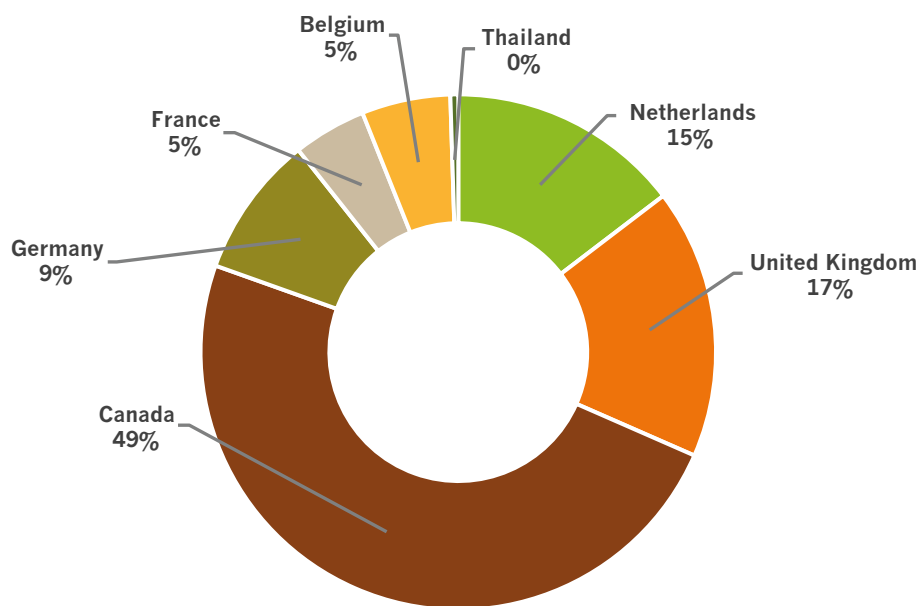
3.3 Importing countries

Specific data for aseptic sweet potato puree is scarce. However, we can assume that those countries that show good appetite for frozen sweet potatoes are more likely to desire aseptic sweet potato for industrial food production.

The largest importer of frozen and chilled sweet potato products is Canada, which

accounts for 50% of the total product (by value) imported by the top five countries (Figure 16). This arrives largely from the USA and includes all forms of frozen sweet potato, including chips and wedges. The United Kingdom (17%) and the Netherlands (15%) also import a significant quantity of frozen sweet potato products. Together, these three countries absorb more than 80% of the frozen and chilled sweet potato value globally.

Figure 14. Main importing countries of processed sweet potato products in value (thousand dollars)

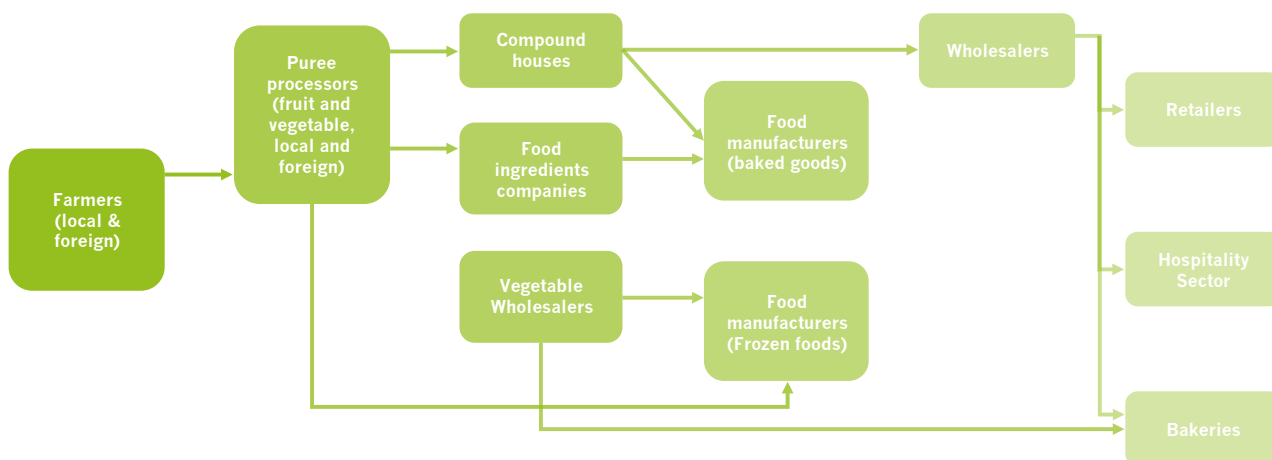


Source: ITC Trade Map



3.4 Market structure

Figure 15. Value chain map for sweet potato puree



Food manufacturers have a number of options when selecting their specific strategy for sweet potato puree. They can source fresh sweet potatoes and then clean and puree the potatoes; source product from food ingredients companies; or source puree from a specialist puree supplier.

3.4.1 Fresh product

Large frozen food manufacturers have a distinct preference for purchasing raw materials from trusted suppliers in their own network. This could be from nearby farmers, as is the case for companies such as Nomad Foods (Birds Eye, Captain Igloo), General Mills and Kellogg's. Vertical integration is an important characteristic of frozen food companies. As a result, these companies often work with a closed network of contract farmers who supply the vegetables they need. In return, the frozen food companies provide the contract farmers with training, seeds and agricultural supplies. This safeguards the quality and food safety of their finished foods.

3.4.2 Food ingredients companies

Frozen vegetable companies and food ingredients companies also specialise in producing frozen sweet potato puree. This can be used by food manufacturers or to supply retailers looking for products for their own brands. Greenyard and Döhler are

two examples of large EU-based ingredients companies that play this important role in the value chain.

For new suppliers, the challenge is to establish lasting relationships with well-known importers, who usually already work with selected suppliers. Well-known importers perform audits and visit producing countries on a regular basis. To build a relationship with these importers, many new contacts find they must offer the same quality at lower prices than their competitors.

From the top down, the supply chain dynamics are determined by the higher demands imposed by the retail industry. Pressure from retailers on importers and food manufacturers leads to lower prices, and results in the development of added-value features such as 'sustainable', 'natural', 'organic', or 'fair trade' products. Transparency is required in the supply chain. To that end, many importers create their own codes of conduct and cultivate long-term relationships with preferred suppliers in developing countries.

3.4.3 Puree specialists

Both frozen sweet potato puree and aseptically packed product can be sourced from specialist puree companies. These companies typically supply fruit and vegetable purees to food manufacturers and bottlers.

Sweet potato puree is still a comparably

new type of puree that requires further development. Amongst the few existing suppliers, several are based in the USA. However, there are examples of Spanish manufacturers of products such as lemon concentrate expanding into sweet potato puree production. Chinese producers (e.g. SinoFoods) are also known to supply sweet potato puree. Finally, Austchilli is an Australian-based company supplying frozen sweet potato globally.

Some additional specialist companies supplying sweet potato puree in the EU, USA and Australia that supply vegetable purees and sweet potato puree specifically include Yamco, Integrity Foods, Tema Trading and Chiquita Processed Foods (the Bon Vivant Group).

3.4.4 Relative pricing

Sweet potato puree has benefits that ordinarily would allow it to trade at premium prices. However, the product faces some challenges. First, there are reference prices in the market, including regular potato puree and other vegetable purees and products. Second, while sweet potato puree is itself a food ingredient, in many cases it is not a large component of the recipe and substitutes can be used if becomes too expensive. For example, carrot puree can be added to sweet potato mash and used as a topping on a frozen fish pie.

Sweet potato also competes with carrot, pumpkin and butternut. Table 12 shows the prices of these competing products (aseptic and available in units of 4x200 kg drums)

Table 12. Market prices (B2B) of various comparable vegetable purees

	*Aseptic carrot puree	*Aseptic orange pumpkin	*Aseptic white pumpkin	**Aseptic sweet potato puree
Factory gate price per kg	€1.06	€2.99	€3.10	€2.95

Source: *Prices from a company called SNV, available at <https://www.12taste.com/food-ingredients/fruit-vegetable-based-ingredients/svz-pumpkin-puree-acidified-aseptically-filled/>
 **Prices from SunSnack, available at <https://www.sunsnack.com.vn/>



3.5 Buyer requirements

3.5.1 Quality requirements

Each importer has specific quality and sourcing standards that processors need to meet. These include flavour, colour and starch content. However, to market a product, processors also need to achieve certain global standards: aseptically packed products must be stored at a stable ambient temperature, whereas frozen product must be stored at -18°C .

Food safety

The European Commission Regulation establishes maximum levels of certain contaminants in food. This regulation is updated on a regular basis. In addition to the general limits, there are a number of specific limits that apply to contaminants in certain products, such as frozen vegetables. Pesticide residues, heavy metals and microorganisms are the most common contaminants in frozen vegetables.

Pesticide residues are particularly well-monitored in vegetables, including in both frozen vegetables and vegetable puree. Companies processing these products need to be particularly careful about sourcing and testing.



There are multiple food safety certification methods that are generally founded on similar principles. However, groups of consumers have preferences that influence importers. For example, British shoppers might prefer the British Retailer Certification Standard (BRC), while German shops prefer the International Food Standard. It should also be mentioned that food safety certification is merely a starting point for exporting to Europe. Most trustworthy buyers will generally insist on visiting manufacturing facilities.

Organic

Organic frozen vegetables are becoming increasingly popular throughout Europe. To be marketed as organic in Europe, frozen vegetables must be farmed using organic agricultural practices in accordance with European regulations. Growing and processing facilities must be evaluated by a recognised certifier before the producer can use the European Union's organic mark on their products. The same is true for the logos representing other standards and certifications (for example, the Soil Association in the United Kingdom and Naturland in Germany).

3.5.2 Packaging requirements

Ultra-high temperature (UHT) sterilisation, a rapid heating treatment at temperatures greater than pasteurisation temperatures, is used in aseptic systems. At the conclusion of the production line, paper and plastic packaging materials are sterilised, shaped, filled and sealed in a continuous operation. Metal cans, large plastic or metal drums, or large flexible pouches are also utilised for aseptic packing. Heat, chemicals, irradiation, or a mix of these technologies, can be used to sterilise packages for aseptic processing. Aseptic packages (e.g. Tetra Pak®) are made by combining polyethylene with paperboard and aluminium foil. The multi-layered construction enables the carton to protect the contents from various environmental factors responsible for spoilage.

Aseptic packaging options are Tetra Pak®, double-walled foiled bags for bulk, Doy packs and glass bottles (often used for baby food) and tin (least common).

3.6 Market opportunity assessment

3.6.1 Key opportunities and challenges

Table 13. Opportunities and challenges for sweet potato puree

Opportunities	Challenges
<ul style="list-style-type: none">▪ A relatively familiar product, with consumers able to understand how to use the product.▪ A growing demand for sweet potato products for frozen foods, baby foods and other manufactured foods.▪ Aseptically packed sweet potato is a stable product that is easier to ship and store. This is a major advantage for food manufacturers.▪ The technology is well known and reliable.▪ Contract packing and investing in a new line are possibilities for production, giving investors a degree of flexibility in determining their production model.	<ul style="list-style-type: none">▪ Expensive, technical equipment is required for producing frozen and aseptically packed product.▪ Demands good quality control and the ability to maintain an aseptic working environment▪ Large food ingredients companies and specialised puree producers already supply to the market. Frozen vegetable manufacturers also provide product, making this a fairly contested market segment.▪ Additional products would need to be identified to fill the production season. This could be fruit or vegetables.

Sweet potato puree appears to offer a promising opportunity for investors, but one that may not be easy to seize. Processing plants require considerable investment. Selling frozen sweet potato puree to the EU requires producers to build a relationship with a specialised importer of frozen vegetables, or a food ingredients supplier who imports frozen or aseptically packed product. This is particularly important, as supplying directly to retailers and food manufacturers is challenging, involving significant expenditure in logistics and account management. Most retailers and food manufacturers contract suppliers who can deliver product year-round. They should be adept at global sourcing and managing an annual sourcing calendar.

3.6.2 Ingredients for success

Ability to invest in technology or find a contract packer

For aseptic production of sweet potato puree to be viable, there are a few factors to consider, due to the fact that the set-up of such a plant requires a high initial investment, complex machinery and skilled staff.

Ability to manage traceability and quality

Contamination and shelf stability are two important considerations in allowing a company to compete. As a result, investors are best placed to succeed if they are able to invest in quality controls and tractability systems. Skilled staff and reliable systems need to be developed as a core business capability.

In the event that a contract packer is used, the investor needs to be equipped to monitor these factories so that quality and safety is assured.

Build an annual calendar

Experience in juice production suggests that it is exceptionally challenging to build a professional business based on production in a single season. It is important to either diversify or work with contract packers or act as a contract packer to ensure a full annual production calendar. For example, this could be working with mango or apple juice companies to ensure that the aseptic line is continuously in use.



This allows the business to invest in the skilled professional staff needed for maintenance of the plant and equipment, for investments in packaging and equipment, and for production planning.

Scale of production

Scaling up production makes sense from the perspectives of both demand and supply. Importers require relatively large volumes of product per shipment. Typically, this is at least one 20-foot container that can ship 20 tonnes of product. This makes it easier to access customers, particularly if this is complemented with additional products and where sweet potato puree is available throughout the season (i.e. at least 80 tonnes per month). This makes it more likely that a food ingredients supplier will consider building a longer-term relationship, which mitigates some of the risks of investing.

At this scale, the factory is able to invest in a 500 kg per hour line, which enables the 20 tonnes of product per week to be packaged and readied for customers. It does, however, require the processor to source approximately 22 tonnes of fresh sweet potatoes per week and to manage production of this product.

3.7 Conclusion

Ready-made foods are a large and growing market. Within this market, potato puree is a classic ingredient or product. Sweet potato puree has also become a common ingredient in ready-made meals and has found a well-developed market globally. Demand for sweet potato puree is increasing.

Sweet potato is recognised for its many health benefits and is often used to replace regular potato as a topping in an oven dish, soup base, stew or curry ingredient. It is also a key ingredient in many baby foods, fruit juices and sauces. It is common to find sweet potato oven chips, wedges and hash browns in retail freezers for convenient home preparation.

Unlike sweet potato starch, puree is more of a consumer product, because even as an ingredient it is visible and always explicitly listed on the label. This suggests that the awareness and benefits of sweet potato as a 'healthy' food are more important than the price.

The conversion ratio from fresh sweet potato to puree is similar to that of normal potato, so the price difference between the two types of purees is modest. However, because fresh sweet potato is more expensive than regular potato, the price of sweet potato puree will always be higher than regular potato puree. Nevertheless, the perceived health benefits may outweigh the price difference for many consumers.

There are fewer competitors in the puree market when compared with the vast number of suppliers able to supply different types of starches.

Aseptically packed puree is technically simpler to produce and pack than frozen puree and offers simpler logistics. With the increasing demand for puree, and the favourable conversion rate, aseptically packed puree may represent the most viable opportunity for further investigation.

4. SWEET POTATO GARI

4.1 What is sweet potato gari?

Gari is a fine to coarse granular flour of varied texture prepared from cleaned and grated cassava tubers (the root of the cassava plant). The water and starch are squeezed out of the grated tuber, which is then fermented, fried and dried.

Cassava gari can be served in a variety of ways and is a staple in several African countries, such as Nigeria, Ghana, Benin and Togo. It is also enjoyed more widely across West and Central Africa. Gari can be served as a main dish or as a drink or snack.



Figure 16. Cassava gari

Source: www.ghanaweb.com (left); www.pexels.com (middle and right)

Sweet potato gari is an innovation that replaces cassava – entirely or in part – with sweet potato. Compared with cassava gari, sweet potato gari is relatively unknown.

Sweet potato gari is made using a similar process to cassava gari. First, the sweet potato is grated and pulped to a slurry. Water may be added to create a finely textured product that can be further blended.

In the second step, water is removed and the resulting pulp is separated. This is then dry fried, producing a dry, fluffy final product that is ready to eat. If orange fleshed sweet potato is used, the sweet potato gari will be a pale orange colour. If white sweet potato is used, the final gari will be a pale cream colour.

The product is packaged in printed polyethylene bags or in 5 kg, 10 kg or 25 kg plastic or lined jute or hessian sacks that can be repackaged at the destination. Bulk packaging must be of a good quality and well-sealed to prevent contamination of the product.



Figure 17. Example of packaged cassava gari

Source: www.amazon.co.uk

4.1.1 Relative pricing

Cassava flour is available in online stores in most countries with large communities of the African diaspora, such as the UK and the USA. These stores give an indication of the approximate pricing for gari to the consumer. However, the pricing trend is too varied to be able to pinpoint a specific suggested retail selling price. Prices range from €1.89–€6.30 per kg in the EU. However, the largest brand in the UK retails for €1.89 per kg, suggesting that this is the leading price and one that should be targeted by most retailers to be truly relevant. In the USA, prices from online stores are significantly higher (see Table 14), reaching €13.09 per kg, but this was from a far smaller pricing sample. In general, the available pack sizes vary. Smaller packs of 500 g can be found as well as larger bulk packs for 5kg.

Table 14. Cassava gari pack size vs price from online stores in the UK and USA

	Brand	Pack size	Price per kg
United Kingdom	Tropical Sun (white)	5 kg	€1.89
	Island Sun	500 g	€2.36
	Puregro	1.5 kg	€6.30
	Benny (yellow)**	1.5 kg	€2.35
United States of America	Ijebu Gari*	1.13 kg (2.5 lb)	€13.09

*Available from Amazon USA, all other prices are UK-based online stores

** Available from the oja app in the UK

4.1.2 Processing economics

The cost of production of sweet potato gari is likely to be similar to that of sweet potato flour and starch, at around €1–€1.3 per kg. The sales price for sweet potato gari would need to be at least double this production cost. Sweet potato gari would thus retail at a significant premium compared with cassava gari, which is usually one of the cheapest starches in fresh and processed markets. On price, sweet potato gari will likely remain a premium product.

4.2 Market trends

Demand for sweet potato gari, as an innovation, is difficult to assess. However, recent consumer focus groups that were asked to explore the interest in sweet potato gari and to pinpoint the potential applications of the product may offer some insights.

4.2.1 Exotic fresh foods

Exotic foods are more available in western supermarkets than ever before. Specialist stores and regular supermarkets now stock a wider range of fresh ingredients, such as mango, avocado, butternut, cassava, scotch bonnet peppers and Indian vegetables. This is particularly true in areas where there are large communities of Africans or Indians.

Specialist ethnic cuisine stores are also becoming more common. Oja in the UK and Shop Africa in the USA are examples of one-stop-shops for ethnic food ingredients. Both are online and both supply the very desirable Ijebu gari (Ijebu, in south-western Nigeria, is the best-known origin for quality gari in Nigeria). These changes in supply have allowed the African diaspora to prepare their traditional foods using fresh ingredients.

4.2.2 Convenience of gari

Communities of Africans in the EU and the USA are growing. Many yearn for traditional foods but cannot spare the time to prepare these foods. Participants in the focus group highlighted the benefit of having convenient to prepare gari at hand ready for drinking and as a snack. Gari could be described as the perfect convenience food: comforting, delicious and quick to prepare.

Gari is increasingly available from local or online stores, making it more convenient than ever to source locally.

4.2.3 Unfamiliar and counterintuitive

Cassava gari is a much-loved product; for many Africans living abroad, it is exactly as they remember it from Africa. However, this is not true of sweet potato gari. For many, this product is counterintuitive. They expect gari to be a savoury product, where sweet potato is not. Sweet potato unfamiliar, while cassava is a tried and tested reminder of home. Cassava gari has a clear place in their eating repertoire, where sweet potato still needs to be clarified and understood. Offering to innovate when it comes to traditional food is generally difficult. The dipstick consumer research carried out with some of the African diaspora confirmed that this is true for gari.

For EU consumers, sweet potato gari might be more understandable and familiar than cassava gari. But, in a time where authentic cuisine is popular, it remains to be seen how this can be developed. What is clear is that an importer with interest in developing the markets is needed to succeed with either group of possible buyers (EU consumers and the African diaspora).

4.3 Importing countries

To identify possible importing countries, it is helpful to look for those countries already importing cassava gari or other African food ingredients. However, specific data on this is scarce; instead, it is helpful to understand which countries already have a variety of African food products available on the market. The availability of cassava gari seems to be limited to major urban centres, particularly those with large African or Afro-Caribbean communities. In the UK, France and the USA, cassava gari can be found in the online stores of major retailers. There are also established brands importing and distributing exotic food products. This seems to suggest a more developed market and one that is now structured to be able to absorb larger volumes of product. Beyond these countries, although there seems to be a lack of African food ingredients available in major retailers, local food stores in urban centres distribute African food ingredients. These countries may therefore also be possible destinations for sweet potato gari processors in Africa.

As sweet potato gari is an innovation, there are no examples of companies producing sweet potato gari at any significant scale. Cassava gari – and to a certain extent how other African food ingredients – could be used as an example to understand the possible market structure of sweet potato gari (Figure 18).

Cassava gari is widely produced in homes and by informal processors for African markets. Larger producers, who produce gari in larger volumes in more formal factories, also exist. Cassava gari is sold in local markets or bulk packaged for export to larger markets. Countries with a large African diaspora, such as France, the UK and the USA, have more formalised systems of importing cassava gari and other African food ingredients.

4.4.1 Origins

Cassava gari, which is available in several western online stores and physical supermarkets, is by far the most established form of gari. Most of these outlets sell Nigerian cassava gari from Ijebu. This is particularly true for larger brands with distribution in larger supermarket chains in the USA and UK. Gari from Ijebu, Nigeria, is highly regarded and the scale of production in professional factories

4.4 Market structure

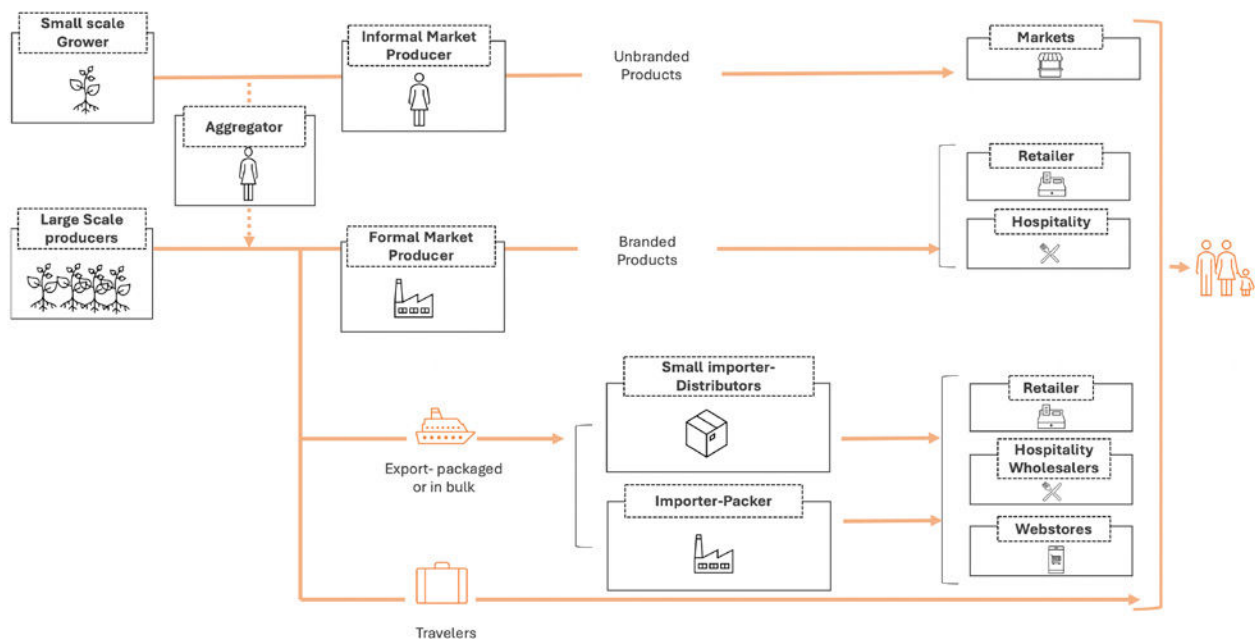


Figure 18. Market structure for cassava gari and other African food ingredients

makes this wide distribution possible.

Ghana is also an important origin of cassava gari. There are several examples of Ghanaian cassava gari in online stores, especially in the UK. Smaller brands and online stores tend to stock this origin.

4.4.2 Importers

There are several large importers of African food ingredients, some of whom specialise in exotic foods. In the UK, Tropical Sun Foods, which focuses on Afro-Caribbean foods, imports and supplies cassava gari from Nigeria. This is sold in various online stores and via large retailers such as Tesco. In France, Racine specialises in exotic foods, including cassava marketed under their own brand. This is available in the major retailer Carrefour. Finally, in the USA, Jeb Foods is a supplier of African food ingredients to Walmart, making this one of the most widespread African foods distributors in the country.

These large importers are skilled at sourcing product and typically work with established suppliers. However, they are not exclusive importers of African food ingredients to major markets. There are many smaller importers who import and distribute African food ingredients via their own online stores, via specialist food ingredients company websites or to small exotic foods supermarkets.

4.4.3 Retailing

Specialist exotic foods supermarkets sell products from a variety of origins, which might include palm oil, middle eastern spices, grains and packaged foods, for example.

The UK has a large number of Polish stores, which have developed as stockists of various ethnic food ingredients. In countries such as Germany and the Netherlands where there are large groups of Turkish and Moroccan traders, these small neighbourhood stores play an important role in supplying both fresh and processed exotic food ingredients. Finally, there are a few small African specialty food stores in major urban centres that may stock cassava gari.

Online stores play an important role in the

distribution of African food ingredients. In the EU and the USA, Amazon provides opportunities for companies to supply African food ingredients such as cassava and, potentially, sweet potato gari. These companies include Nigeria Taste and Jeb's Foods in the USA, Island Sun and Tropical Sun Foods in the UK, and Praise and Nina in Germany. The interest in exotic food ingredients and demand from African, Caribbean and South American communities in western countries have also created opportunities for independent online stores and for brands to sell directly to consumers. Gold Coast Supermarket, OSIAFRIK and ER African are some USA base stores. Some EU stores are OJA (app) and MP Foods in the UK.

4.4.4 Informal imports

As cassava gari and other African ingredients are a key part of their heritage, many Africans purchase these products when visiting African countries and bring them to western countries in their luggage. This is an important source of food ingredients for family and friends.

4.5 Buyer requirements

The novelty of sweet potato gari means that there are no specific quality standards available. If cassava gari is exported to western markets it needs to meet general food standards and legislation.

Larger brands that are stocked by major retailers have the highest quality standards. For example, the Tropical Sun factory and its suppliers tend to be BRC-certified and HACCP-approved, and their core factory in Jamaica is ISO 14001 certified.

Small importers who do not supply major retailers have more freedom when it comes to quality standards and certifications linked to quality standards.

Fair trade and organic certification are not yet standard, either for cassava gari or for many other traditional African food ingredients. However, this may not necessarily be the case in reaching Western consumers with sweet potato gari. This issue would need to be explored further with consumers and with

potential importers.

4.6 Market opportunity assessment

4.6.1 Key opportunities and challenges

Table 15. Opportunities and challenges for sweet potato gari

Opportunities	Challenges
<ul style="list-style-type: none"> ▪ Innovative and convenient product ▪ Perceived benefits for health and wellness ▪ Growing interest and availability of exotic fresh food and food ingredients ▪ Cassava gari already has many routes to market ▪ Demand for African food ingredients from Afro-Caribbean shoppers ▪ Ghana and Nigeria are respected origins for gari ▪ Several large and small importers sourcing and distributing gari ▪ Retail distribution of gari, making it available to new European buyers ▪ Growing number of online stores offering African food ingredients 	<ul style="list-style-type: none"> ▪ Competes with cassava, which is well known and affordable ▪ Relatively unknown product that is counterintuitive to Afro-Caribbean buyers ▪ Unknown to importers ▪ Large informal import market making cassava readily available and cheap (no import duties or logistics costs)

There are potentially three markets: (i) the African/Afro-Caribbean community who know cassava gari; (ii) European or western shoppers looking for exotic food ingredients; (iii) local or regional markets.

Afro-Caribbean market

This opportunity hinges on converting this community from cassava gari to sweet potato gari. This is a challenging task. For those surveyed in this study, sweet potato gari is a slightly odd concept. It is healthier, but its sweet profile means consumers may find it difficult to accept.

A second issue is how often African foods and food ingredients are being enjoyed. Newcomers to a country tend to adapt quickly to local food habits. Amongst those surveyed (first generation immigrants) western foods have become the norm. They, like many Europeans, are enjoying lighter, fresher foods associated with health and wellness. Traditional foods are only eaten occasionally, particularly if they are expensive. Cassava gari, despite being well liked, is also rarely consumed.

The growing distribution of cassava gari does suggest a growing interest in African foods. However, it is not clear just how large an opportunity this represents. Can the market absorb growing supplies of cassava gari, which is known, liked and affordable, and sweet potato gari, which is unknown, a little confusing and expensive?

Growing the market is of course possible. However, it would require investment from a food company, distributor or brand that would be introducing this product to people already familiar with consuming cassava gari. This is possible, but likely to be expensive.

New European buyers

While sweet potato gari could be a more familiar product to introduce to the European market, it is challenging to identify the role this food could play in the diet of even those Europeans open to experimentation with foods. Yet, with sufficient investment this might be possible. A committed investor would be needed, with good skills in market development.

Local or regional markets

Local and regional markets in Africa, where people purchase gari regularly, offer the best chance of success. Gari is well known, liked and widely consumed. Over the past decade, concerns around diabetes have increased significantly across Africa. There is a growing awareness that cassava-based products are high in carbohydrates and therefore regularly consuming this starch is potentially harmful for people with diabetes. Sweet potato gari could be a healthier alternative, particularly for those health-conscious shoppers in urban areas who are able to spend a little more on food.

Once the product is proven in countries more familiar with gari, the export market may become more promising.

4.6.2 Ingredients for success

Product development

For new food products to succeed, it is important that a shopper understands how to prepare it, where it fits into the menu of foods they enjoy and what benefit it brings to them and their families. For sweet potato gari to succeed with those who are familiar with cassava gari, more work needs to be done to ensure that they understand how it is different and when and with what they should serve sweet potato gari. It is important that those promoting the product give shoppers an opportunity to taste, try and understand this new innovation.

Skilled importers

For the innovation to succeed with European shoppers, the importer needs to have experience and the resources to develop the market for this product. This effort should include how to distribute the product, recipe development, advertising and promotion. Press and influencer work would also be helpful in clarifying the use of the product so that it performs well when prepared at home and in restaurants.

Distribution

For success in local markets, it is important that the investor has access to and builds

distribution in premium outlets. This is the most likely space for premium gari will succeed. This should also involve investment in building product awareness.

Processing economics

The challenging processing economics mean that sweet potato gari will be priced at a premium compared with cassava gari.

Managing waste can allow the product to come to market at a more affordable price, or can assist in improving profits/reducing losses.

4.7 Conclusion

The market potential for sweet potato gari is uncertain, and probably limited to local sales, or possibly trade in the African region. Though there is an African and Afro-Caribbean community in France and the UK, people there tend to prefer the traditional, authentic products they remember from home or visits to Africa. In general, they are not looking for innovation.

The other challenge for gari is that there is no known industrial application, and therefore the product can only be sold to consumers and not to the food processing industry. This requires investment in market development. Introducing sweet potato gari in Africa, in the country where it is being produced, would require a considerable investment in branding, sampling, distribution, public relations and advertisement, because the product is currently largely unknown. Therefore, this option would require an investor with significant skill, resources and patience, who would commit to building and growing the brand and product awareness. This is a challenging option, but it is the most likely to succeed.

Once success is achieved at a local level, a marketing plan could be developed to take the brand to markets where an export opportunity is identified. Again, this would be a niche or speciality product, which could grow with the right financial support and marketing. However, time and consumer education would be required.

5. STRATEGIC OPTIONS: WHICH PRODUCTS AND MARKETS OFFER THE BEST OPPORTUNITY FOR AFRICAN PRODUCERS?

This report attempts to answer one key question: which sweet potato product offers the best commercial opportunities for producers in Africa? In this section, we will discuss the opportunities for each of the three products described above and consider which of the three offers the most promising opportunity.

From the perspective of the market, **sweet potato puree** offers the best market potential. This is a growing market, where aseptically packaged sweet potato puree has several advantages that can help it to compete. Frozen foods, baby foods, cakes and pastries are all more likely to be priced at a premium when they contain sweet potato puree and the ingredient can be claimed in marketing efforts. Aseptic product is particularly easy to work with and the logistics are simple. Finally, as most of the tuber is converted into puree, this creates a good business case for processing. There are some challenges, as it is not advisable for an investor to invest in a production line for only one type of puree. However, contract packing offers a sensible option for new entrants to this market. This would be a win-win, as juice and puree processors are also searching for new ways to extend their production season. Despite starches being a large market, **sweet potato starch**, or flour, represents a far more challenging business opportunity than puree production. Demand from consumers for sweet potato flour or starch is low. The premium price of sweet potato starch suggests that this will remain the case. At the same time, sweet potato starch is often interchangeable with other gluten-free starches. Without a clear advantage, it is difficult to identify how food manufacturers could be tempted to switch from established starches to this expensive newcomer. Even if this was achieved, a considerable investment would be needed by importers to encourage the change. Most importantly, the business case struggles due to the challenging processing economics. Far too much of the original tuber is lost in production, with processors facing greater

challenges from varying starch content in tubers from year to year. This makes investing in the opportunity only really feasible for a few investors who are able to manage quality, processing and very small margins. With a significant growth in the size of the market, this is unlikely and possibly unwise.

Finally, **sweet potato gari** is a novel concept. However, it struggles from many of the issues faced by sweet potato starch. The competing product, cassava gari, is more available, better known and cheaper. As gari relies on drying of the sweet potato flesh, it faces similar challenges in processing economics. A large amount of sweet potato makes relatively little gari. European buyers are typically unaware of gari at all. So, while sweet potato might be more enjoyable and acceptable, this is still a product that needs to be explained and experienced before being accepted by consumers. These challenges are not insurmountable, but they do require skilled investors with the resources to commit to developing the market.

With the high demand for fresh sweet potato, it is important to consider whether it is not more profitable and easier to sell fresh sweet potato. International and regional demand is growing, with shortages of sweet potato in the fresh market in Nigeria and South Africa. Even if sweet potato puree is a good option, the profitability and risks of investing in processing versus fresh production must be compared. However, processing certainly offers the potential to manage the risks involved in fresh export. If this is indeed the case, a contract packing option might be the best route to test the market.

	Market	Product	Technology	Economic assessment	Summary
Starch	<p>A large, global, highly competitive market for starches</p> <p>There is a growing demand for gluten-free starches: household and for food manufacturing.</p> <p>There are many affordable alternatives and sweet potato starch is unknown and comparably expensive.</p> <p>Market development is required with food manufacturers and households.</p>	<p>Starches are a relatively simple product that can be produced for export.</p> <p>Starches are sold in bulk and exporters are required to export at least a container at a time. This introduces pressure to produce at a large enough scale to fill a container.</p> <p>Certifications are not valued.</p>	<p>The production process is relatively simple, requiring fairly simple technology.</p> <p>Conversion ratios from fresh product to dried starch must be carefully managed.</p>	<p>A core challenge will be in how to process starches profitably, which requires strong management of the production process.</p> <p>The variability of the starch content raises challenges for processors.</p> <p>It may not be possible to achieve the premium prices needed to build a profitable business.</p>	<p>The challenging economics, lack of price competitiveness, the established competition, the lack of a real competitive advantage and low market development makes this a challenging investment option.</p>
Puree	<p>A large, growing market for both aseptic and frozen sweet potato puree</p> <p>Seen as innovative and on trend</p> <p>Further growth potential is possible in the food ingredients sector.</p>	<p>Aseptic and frozen puree is relatively simple to make.</p> <p>Aseptic puree is easy to store and handle.</p> <p>Few certifications are needed to trade, but food safety is a priority.</p>	<p>The technology is well tested and robust. It can also be used to process a number of different products.</p>	<p>The initial assessment suggests that this is viable. It does however require an investor to process additional products, e.g. fruit purees. Alternately, they should partner with a company that can process and pack the product for them.</p>	<p>This business model raises challenges for an investor. However, the market potential, production advantages and established production techniques suggest that it is worth exploring further. Contract packing is the recommended route of production.</p>
Gari	<p>The market potential is unclear. Product acceptance from African/ Afro-Caribbean market segment is unlikely for all but a small part of this group. Significant investment will be needed to win over western shoppers.</p>	<p>As an innovation, consumer expectations and hence buyer requirements are unclear. But the product is simple to make, pack and ship if a buyer can be found and a winning recipe can be developed.</p>	<p>The technology is simple and affordable.</p>	<p>The processing economics, which are assumed to be similar to starches and flours, suggest that this will be a more expensive product than cassava gari. The limited market and unclear investment timelines make this a challenging business case.</p>	<p>The challenges are significant. The need to develop the market and the premium price make export markets, both for westerners and the diaspora, challenging. Likewise there are questions around the affordability of the product for most local market buyers. Only investors with experience in developing markets and significant resources to invest should consider proceeding. and even then with a great deal of caution.</p>

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France - Rue de la corderie, 5 - Centra 342 - 94586 Rungis Cedex
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network@coleacp.org | www.coleacp.org