日本におけるキャッサバ市場拡大の可能性

Cassava and Its Market Expansion Possibilities in Japan

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1. Introduction

Cassava (*Manihot esculenta* Crantz) is a perennial plant cultivated in many parts of the world (Photo 1). According to FAO, after maize and rice, cassava is an important source of calories and it plays an important role in guaranteeing food security for millions of people in poor areas of developing countries in Latin America, Africa and Asia (FAO, 2013a). Apart from being an important crop for both human and animal consumption, cassava has many uses in the industrial sectors. Recently, the importance of this crop also gained great attention due to its use as biomass for the production of bioethanol.

Photo 1:
Cassava cultivation in Brazil
Photo taken by Edson Tomyama, Brazil (Jan, 2017).

Cassava is produced in more than 100 countries in Latin America, Africa and Asia. In 2014, cassava world production was of 272,937,222 tonnes and the cultivated

area totaled 24,153,262 hectares. The largest producing countries were Nigeria, Thailand, Indonesia, Brazil and Ghana. These countries' production accounted for around 54% of world's production. In many countries, cassava is cultivated for subsistence purposes whereas in countries such as Thai and Brazil apart from serving as a crop for human and animal consumption, it is also processed and used as inputs for many industries.

In Japan, cassava is still not well known by Japanese people as a crop for consumption "in natura" or processed. A cassava-derived product, the "tapioca" pearls became very popular in Japan for being used in drinks, yogurts and desserts and are easily found in the Japanese market. The word "tapioca" in Japan became very familiar due to these "tapioca" pearls. However, it is still not of public knowledge that "tapioca" pearls are made from cassava. Moreover, among the Japanese people, the cassava root itself is not well known.

On the other hand, cassava is very popular among the innumerous foreign residents living in Japan. Many foreigners come from countries where cassava is cultivated and highly consumed such as Brazil, Peru, Philippines, African and various Asian countries. As a result, these foreign communities living in Japan represent an important market niche for cassava and cassava-derived products. Recently, an increasing number of cassava and cassava products can be found at the so-called "ethnic business" shops such as the Brazilian shops. In addition, cassava has also been successfully cultivated in Japan by foreigners and Japanese producers.

In light of the above, this paper will present the growing importance of cassava in the world, its uses and applicability. In addition, as a preliminary investigation made by the author, this paper aims at demonstrating the growing presence of cassava in the Japanese market, especially among foreigners and shed some light on cassava market opportunities and expansion in Japan.

This paper will be divided in 4 parts. The first is this introduction. The second part will present a brief history of cassava origin, its several uses and applications. The third will present an overview of cassava production in the world and consumption in main producing countries. The fourth part will analyze Japan's imports of cassava and cassava products based on COMTRADE and Japan's Ministry of Finance database[1]. As a result of the author's preliminary survey, this section will also present products derived from cassava and cassava starch that can be found in Japan, especially at the Brazilian shops. The final part will address the concluding remarks and future research.

[1] Import data for cassava, cassava starch and cassava-derived products (HS classifications 0714.10, 1108.14 and 1903.00) from COMTRADE and Ministry of Finance of Japan were compared and the data were equal in terms of kilograms.

2. Cassava (*Manihot esculenta* Crantz): origin, migration and its multiple uses

2.1 Cassava: possible origin and migration to other regions

Nowadays a great portion of cassava world production is concentrated in African and Asian countries. The origin of cassava, however, is considered to be Latin America where native Indians have cultivated it for at least 4000 years (Howeler, 2006). As a great number of varieties of cassava are found in Latin America, more than in Africa and Asia, it is believed the crop was originally native to this continent (JICA, 2016, page 3). "While some studies indicate that cassava has multiple centres of origin, others suggest that the cultivated species originated on the southern edge of the Brazilian Amazon" (FAO, 2013b). According to the Brazilian Agricultural Research Corporation - EMBRAPA, defining the center of origin of a determined plant is a difficult task when there are no paleontological studies. In the case of cassava, around 80% of *Manihot* native species are found in Brazil. This fact supports the theory that the center of origin and domestication of the species may have occurred in the Central Area of Brazil, due to its large incidence of biological diversity in this area[2]. (EMBRAPA, 2006, page 18).

Following the "discovery of the Americas" by Portuguese and Spanish navigators and the "Triangular Trade" that occurred among Europe, Africa and Latin American countries, in the 16th century, cassava was taken to West African countries. Cassava production also increased due to the intensification of slave trade between Africa and the Americas, being a source of food during the long maritime journeys across the Atlantic (Ankei, 2003, page 212). In the 17th and 18th century it continued to spread to many parts of Africa as a useful and potential food crop. From Africa, cassava also continued its migration to other countries. It was taken to Asia to be cultivated for food security purposes and also for the extraction of starch (Howeler, 2006). It was also introduced in India, Malaysia and then to Thailand and Indo-China (presently Laos, Cambodia, Vietnam). In the 17th century cassava was also taken to the Philippines by Spanish traders and in the 18th century was introduced in Indonesia by the Dutch (JICA, 2013, page 4) . Due to its expansion to many countries, cassava has many denominations and also various ways of consumption. In Brazil, depending on the region, it is called "*mandioca*" or "*aipim*". In northern and northeast states of Brazil, "*mandioca*" is called "*macaxeira*". In general, Spanish-speaking countries call it "*yuca*" and English-speaking countries "*cassava*". In French-speaking African countries it is called "*manioc*" and in Asia, cassava is known as "*tapioca*". These are the most common denominations for cassava around

[2] But at the same time, plants of this same gender, species were also found in many other Latin Americas countries, with a great concentration in Mexico (EMBRAPA, 2006, page 18).

the world. However, cassava has many other denominations depending on the country.

2.2 Cassava uses and applications

Due to its high starch content, cassava is an important source of carbohydrates and an important crop for food security. Although the plant is highly productive and very tolerant to draughts, once removed from the soil, it deteriorates very fast. Thus, it has to be consumed or processed within a few days after harvesting. Harvesting can be done from 6 months to 2 years after plantation. Cassava cultivation and harvesting is very labor intensive and, compared to other crops such as maize and soybeans, it has been considered inappropriate for intensive agriculture. As a result, for a long time cassava has been neglected as a potential crop.

Due to advancements in research, this reality has changed and cassava has gained greater importance in many countries not only as a crop but also for utilization in industrial sectors. As observed in Table 1[3], cassava has several uses and applications. Including its leaves, stems and roots, cassava plants can be used for multiple purposes, ranging from human consumption and animal feed to usage in several industries. It is important to note that depending on the variety, cassava may contain a high content of cyanogenic glycosides that are not suitable for human consumption.

The aerial parts, leaves and stems, can be used for animal feed and in many countries, such as Brazil, the leaves are also consumed by humans after extensive boiling. In the northern and northeast states of Brazil, cassava leaves and roots are important ingredients in the traditional regional culinary. Fresh cassava roots are consumed in various countries after boiling, roasting or frying or can also be included in cakes, biscuits, bread, pies, rusks, creams and puddings. Due to its fast deterioration, processed cassava roots are also commercialized such in frozen packs. The roots of the cassava can be used for animal feed in raw states, cooked or dehydrated in the form of flour, chips and pellets. Another important product derived from cassava roots is the cassava flour that is used for both human consumption and animal feed.

Processed cassava roots have a large range of usage in the industrial sector such as in the production of cassava starch. There are two types of starch derived from cassava, the native starch and the modified starch and both are used in food and industrial sectors. Cassava starch can be used directly for household consumption in various dishes such as tapioca pearls, noodles, desserts, crepe, etc. And it also has many applications in the food industry as ingredients for the production of sweeteners, thickeners, etc.

[3] Original table translated to English by the author.

Modified starches have many applications in the industrial sector such as in the production of adhesives, paper, plywood, pharmaceutical products, footwear, among many others. Another kind of starch is the fermented starch used in the production of bakery and confectionary products, biscuits and bread. From cassava roots, cassava chips can be used especially for animal feed. Cassava has also been given a great importance due to the production of ethanol to be used as fuels or in the production of disinfectants, drinks, beverages, fragrances and pharmaceutical products.

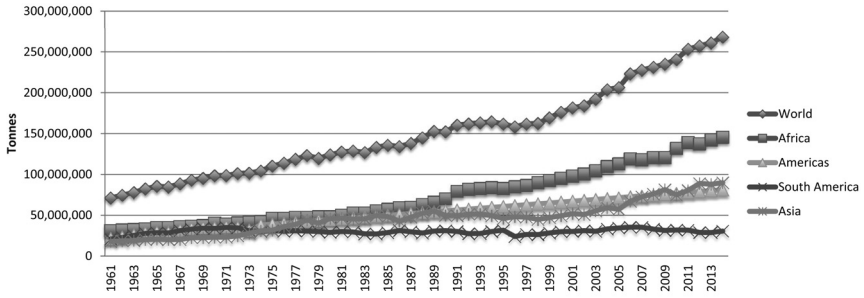
Table 1. Cassava Uses and Applications

Cassava	Aerial parts	Leaves	Animal feed (chopped) and human consumption(suplement)		
		Stems	Animal feed (silage, forage, *in natura*)		
	Root	Human Food	Cooked, fried, cakes, biscuits, bread, pies, rusks, creams, pudins, etc.		
		Animal Feed	Raw, cooked or dehidrated (flour, chips and pellets)		
		Industrial Use	Starch	Food purpose (native & modified starch)	Glucose, Maltose, Gelatin, Starch
				Industrial starch (native & modified starch)	Adhesives, Textile, Paper and Pulp, Pharmaceutcal, explosives, footwear, paints, food industries, etc)
			Fermented starch	Human consumption, food	Bakery, confectionary, biscuits and bread
			Flour	Human consumption	Table flour Bakery flour
				Animal consumption	Animal feed
			Chips	Chips flour	Human&animal consumption
				Animal consumption	Animal feed
			Ethanol	Fuels, desinfectant, drinks, beraveges, fragrance, pharmaceutical products	

Source: EMBRAPA, updated by CONAB *in* Chicherchio (2013).

3. Overview of cassava production in the world

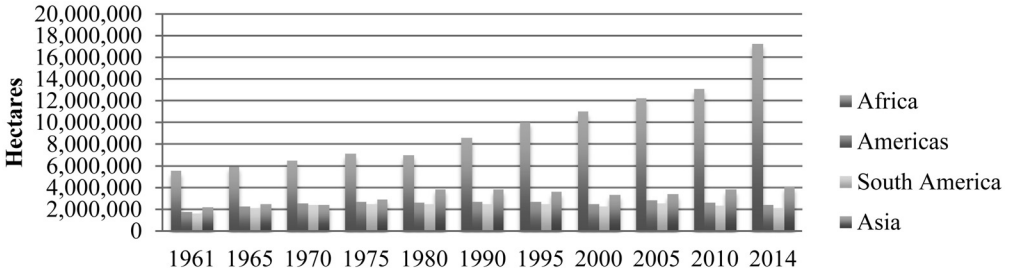
Cassava world production increased substantially in the past decades as shown in Figure 1. With an average annual growth rate of 3%, cassava world production increased from 71,259,839 tonnes in 1961 to 268,277,743 tonnes in 2014. Figures 1, 2 and 3 show respectively, the evolution of cassava production in the world in tonnes, cassava production by harvested area in hectares and yields in tonnes per hectar by regions.



Source: FAOSTAT (Accessed on October 21, 2017)

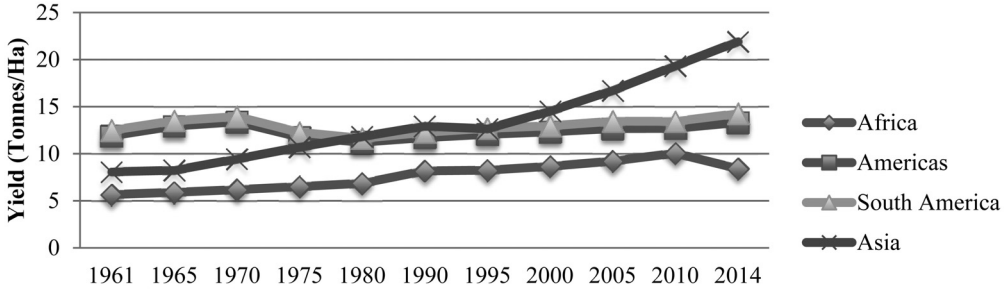
Figure 1. Evolution of Cassava Production (Tonnes) 1961-2014

Cassava is an important crop, rich in carbohydrates, and in Africa, it plays an important role in terms of food security and generation of income for small farmers. It is grown by low-income farmers with a few or no inputs and together with other crops such as maize, rice, legumes, fruits and palm oil. Most of the production is used for human consumption while only a small portion is semi-processed for on-farm animal feed (FAO, 2013b). In African countries, production increased from 31,494,319 in 1961 tonnes to 145,770,528 tonnes in 2014, at an average annual growth of 2.97%. And in terms of harvested area (Figure 2), cultivation area increased from 5,564,040 hectares in 1961 to 17,307,152 hectares in 2014. Countries in West Africa such as Nigeria and Ghana were responsible for substantial growth in output. "Productivity has increased as countries in the subregion recognized cassava's potential as an industrial crop that could help to diversify farmer's income, earn foreign exchange and generate jobs" (FAO, 2013b). In terms of yields, Ghana had substantial improvements, reaching 19 tonnes per hectar in 2014. In the case of Nigeria, although it had substantial productivity gains in the past decades, reaching 12 tonnes per hectare in 2012, it has declined slightly in the following 3 years. In other African countries, yields improved from 6 tonnes per hectare in 1961 to 10 tonnes per hectar in 2010. As a result of more intensive production, with the implementation of improved varieties, mineral fertilizers and other inputs, yields have improved and countries such as Malawi has also obtained increasing cassava production. Although African cassava yields are still low compared to other regions, with proper policies and research, there are many possibilities for its cultivation and the development of more value added production and further applications in industrial sectors.



Source: FAOSTAT (Accessed on October 22, 2017)

Figure 2. Cassava Production: Harvested Area, Selected Years (Hectares)



Source: FAOSTAT (Accessed on October 22, 2017)

Figure 3. Cassava Production: Yields, Selected Years (Tonnes/Ha)

In case of Asia, cassava production increased substantially from 18,008,348 tonnes in 1961 to 89,833,397 tonnes in 2014, at an average annual growth of 3.3%. In terms of harvested area, however, cassava harvested area expanded from 2,228,843 hectares in 1961 to only 4,100,218 hectares in 2014 (Figure 2). In terms of yields, it had substantial gains in productivity ranging from 8 tonnes per hectar in 1961 to 22 tonnes per hectar in 2014 (Figure 3). These results were driven by the intensification of cultivation and gains in productivity with introduction of higher yield varieties and improved access to mineral fertilizer. In Asia, cassava is an important food crop and is consumed in many countries such as in the Philippines. It is worth noting that in many Asian countries, cassava competes with other crops such as maize or vegetables. In the case of Thailand, production was pushed by the growing demand of cassava for animal feed in Europe

during the 70s and 80s. However, with the introduction of the Common Agriculture Policy (CAP) in Europe, Thailand's exports could not compete in the European market anymore. Thailand soon shifted to the production of starch and starch-derived products and started exporting to China where the demand for chips and pellets for animal feed increased substantially due to fast economy development in that country. The growing demand for cassava starch, pellets and chips (especially from China) also prompted the production in other Asian countries such as Vietnam, Indonesia and Cambodia and these countries started competing with Thailand in this growing market. Apart from the utilization for human and animal consumption, the utilization of cassava for the production of biofuel has also motivated cassava production in Asian countries.

In Latin America, although the region is considered to be the center of domestication of cassava, production has not increased as in other regions. Whereas cassava production was 21,009,972 tonnes in 1961 it only reached 30,641,834 tonnes in 2014. Cassava harvested area in South America had only a slight change from 1,682, 264 hectares in 1961 to 2,148,121 hectares in 2014 and yields did not improve substantially. In Latin America, cassava is cultivated in marginal areas with other crops by small farmers and few inputs are applied. The largest cassava producer is Brazil, which accounted for 76% of all cassava production in Latin America in 2014 (Table 2). Apart from Brazil, Paraguay, Colombia and Peru are also important producers. Cassava is still an important staple food especially in Colombia, Peru and in the north and northeast states of Brazil. Apart from human consumption, in Brazil, cassava is highly used for animal feed. In the North and Northeast states of Brazil, cassava is consumed *in natura* or processed for the production of cassava flour. In the states of center and southern Brazil, cassava is mostly produced for industrial purposes and for the production of cassava flour and starch (Felipe et al., 2010).

Table 2. Cassava Production in the Americas 2014 (Tonnes)

	Production	(%)
Americas	32,421,670	100
South America	30,641,834	95
Brazil	23,253,514	76
Paraguay	3,060,000	10
Colombia	2,186,207	7
Peru	1,195,926	4

Source: FAOSTAT (Acessed on October 21, 2017)

As observed previously, cassava production throughout the world varies substantially in terms of quantity, harvested area and yields. In addition, cassava uses and applications also have many facets, being an important crop for subsistence in many countries and also for animal feed. And due to its large applications in industrial sectors, cassava production has gained attention in the past years. In 2014, the top 12 leading countries in cassava production were Nigeria, Thailand, Indonesia, Brazil, Ghana, DR Congo, Vietnam, Cambodia, India, Angola, Mozambique and Malawi. These countries' production accounted for 76% of world production and represented 69% of total harvested area in the world (Table 3). Highest yields were obtained in Asia in countries such as Thailand, Indonesia, Vietnam and Cambodia. In Latin America, Brazil's was the largest cassava producer but yields (15 tonnes per hectar) were not competitive compared to Asian countries. And although African countries such as Nigeria and Ghana were the largest producers, yields were still low compared to Asian countries.

Table 3. Cassava Production: Top 12 countries (2014)

Countries	Production (Tonnes)	Harvested Area(ha)	Yields (Tonnes/ha)
Nigeria	54,831,600	7,102,300	8
Thailand	30,022,052	1,348,996	22
Indonesia	23,436,384	1,003,494	23
Brazil	23,253,514	1,568,253	15
Ghana	16,524,000	889,000	19
DR Congo	14,683,266	1,812,743	8
Vietnam	10,209,882	552,760	18
Cambodia	8,325,098	329,781	25
India	8,139,430	228,280	36
Angola	7,638,880	755,874	10
Mozambique	5,304,188	870,300	6
Malawi	5,012,763	222,750	23
Other countries	65,556,165	7,468,731	
Total	272,937,222	24,153,262	

Source: FAOSTAT (Accessed on October 11, 2017)

Table 4 shows the food balance sheet of cassava and cassava products for the 12 largest cassava producers in the year 2013. It is interesting to note that among these countries, cassava production is mostly consumed domestically such as in African countries. In Brazil, only a residual part was exported to neighboring countries (38,000 tonnes).

The largest part of its domestic production was consumed as food, *in natura* or processed as flour or starch; used for animal feed or applied in industries. Among these cassava producers, Thailand was the leading exporter in the world, exporting 83% of its production of cassava and cassava products. Apart from Thailand, Vietnam and Indonesia also became important players in the international market with increasing production and exports.

Table 4. Food Balance Sheet (2013): Cassava and Products (1,000 tonnes)

	Nigeria	Thailand	Indonesia	Brazil	Ghana	DR Congo	Vietnam	Cambodia	India	Angola	Mozambique	Malawi
Production	53,000	30,228	23,937	21,226	15,990	1,250	9,758	8,000	7,237	16,412	4,814	4,814
Import Quantity	15	1,250	1,102	91	2	0	1,143	0	79	0	0	0
Stock Variation	0	0	0	0	0	0	0	0	0	0	0	0
Export Quantity	11	25,214	820	38	9	0	8,973	254	21	0	0	0
Domestic supply quantity	53,004	6,264	24,219	21,279	15,983	1,250	1,928	7,746	7,295	16,412	4,814	4,814

Source: FAOSTAT (Accessed on October 12, 2017)

4. Cassava and cassava products in Japan: imports and market expansion possibilities in the foreign community

“The consumption of cassava as a staple in non-cassava producing countries is generally restricted to immigrants who learned to eat cassava in their country of origin. For others, they tend to know cassava as a novelty food or a dessert, not as a staple” (FAO, 2004). As mentioned in the introductory part of this paper, in Japan, tapioca pearls are well known among Japanese people mainly as a dessert, served in drinks, yogurts, etc. However, cassava is neither known as an edible crop nor is it known that tapioca pearls are made from cassava.

On the other hand, cassava is very well known among the numerous immigrants living in Japan. Many foreigners living in Japan are from countries where cassava is cultivated and highly consumed such as Brazil, Peru, Philippines, African and Asian countries. According to the Japanese Ministry of Justice, in December 2016, the number of foreign residents living in Japan was 2,382,822 people. Among them, Chinese and Koreans represented the first and second largest numbers of foreigners living in Japan (29.2% and 19.0% of total foreigners, respectively). Philippines represented the third largest number of foreign residents (10.2%), followed by Vietnamese (8.4%) and Brazilians (7.6%). Peruvians were in the ninth position, representing 2.0% of total foreigners. In total, foreign residents living in Japan are from 196 nationalities/regions (Ministry of Justice, 2017). Apart from the nationalities mentioned above, many foreign residents

come from Asian and African countries too. This foreign community represents an important market opportunity for cassava and cassava products.

In the following sub-sections, Japanese imports of cassava and cassava-derived products are analyzed. In parallel, as a result of a preliminary investigation by the author, some cassava and cassava-derived products sold in Brazilian shops (Brazilian ethnic business shops) are also presented, showing the various market opportunities created by cassava and its products in the foreign community.

4.1 Japan's imports of cassava (HS 0714.00)

Cassava roots have many uses and applications both for human consumption and for animal feed as mentioned in section 2.2. In case of cassava for human consumption, as the root deteriorates rapidly after harvesting, exports of fresh cassava are not possible. As a result, exports of cassava are made after some processing and commercialized, for example, in frozen packs. In the case of animal feed, cassava roots are highly commercialized in the form of flour, chips and pellets. Although many countries produce cassava, cassava produced in the majority of countries is mostly consumed and/or processed for domestic consumption. Among cassava producers, Thailand is the largest exporter of cassava and cassava-derived products and China is its main trade partner.

Table 5 shows Japan's imports of cassava from 2012 to 2016 in kilograms. As can be observed, more than 95% of Japanese imports of cassava are from Thailand. Although total import numbers have shown many fluctuations in the past years, it is interesting to note the increasing imports of cassava from Vietnam denoting the country's increasing presence as a producer and exporter in Asia, competing directly with Thailand.

Table 5. Japan's Imports of Cassava (HS 0714.10)

Year	World		Thailand		% on total imports	Vietnam		% on total imports
	US$	Kg	US$	Kg		US$	Kg	
2012	8,376,910	31,814,080	8,371,270	31,810,180	99.9	5,640	3,900	0.0
2013	7,354,908	28,686,560	7,301,094	28,664,045	99.3	53,814	22,515	0.0
2014	3,980,285	13,958,765	3,906,109	13,928,990	98.1	74,176	29,775	0.0
2015	1,638,305	6,063,180	1,549,021	5,825,336	94.6	89,284	237,844	0.1
2016	2,882,851	12,545,430	2,807,061	12,502,730	97.4	75,790	42,700	0.0

Source: COMTRADE (Accessed on October 31, 2017)

More detailed cassava imports are shown in Table 6. This data is based on Japanese Custom Tariff Classification according to the Harmonized System (HS). As can be observed in this table, the largest imports were of non-frozen cassava, imported mostly for animal feed in form of pellets of flour or meals (HS 0714.10.110 and HS 0714.10.210). Although not specified, cassava in “other” forms (HS 0714.10-190 and HS 0714.10-290) had also substantial participation in total imports.

It is also interesting to note the growing imports of frozen cassava (HS 0714. 10.390). Although import quantities are still small, imports of frozen cassava from Thailand and also from Vietnam have increased. Recently, it has been noticed that there has been a growing supply of imported frozen cassava in popular e-commerce sites such as Rakuten and Amazon, sold by companies specialized in Latin American products (e.g. Latin Yamato, Kyodai Market and other Japanese distributors). In addition, frozen cassava from Thailand and Vietnam can also be found at Brazilian shops (Photo 2).

Table 6. Japan's Imports of Cassava - Detailed HS Classification

HS Code	Manioc (cassava)	2012 (Kg)	2013 (Kg)	2014 (Kg)	2015 (Kg)	2016 (Kg)
	1 Frozen					
0714.10.310	For feeding purposes (materials for fodder and fedding)					
0714.10.390	Other	33,000	39,945	43,635	47,600	43,635
	2 Other					
	(1) Pellets of flour or meal					
0714.10.110	For feeding purposes (materials for fodder and fedding)	15,928,270	10,928,840	949,450	437,000	949,450
0714.10.190	Other	63,000	165,830	225,840	61,580	225,840
	(2) Other					
0714.10.210	For feeding purposes (materials for fodder and fedding)	4,885,410	9,841,245	6,786,740	4,029,100	6,786,740
0714.10.290	Other	10,904,400	7,710,700	5,953,100	1,487,900	5,953,100
Total		31,814,080	28,686,560	13,958,765	6,063,180	13,958,765

Source: Ministry of Finance, Japan. Accessed on October 6, 2017.

Photo 2 shows pre-cooked cassava imported from Vietnam (left side) and from Thailand (right side). It is worth noting that the package of the cassava imported from Thailand has descriptions in 5 languages (Japanese, Portuguese, English, Thailand and Spanish) denoting an attempt to reach all possible consumers for the product. Cassava roots are consumed in various ways (salty or sweet) and is part of the culinary of several countries of Latin America, Africa and Asia. The foreign community in Japan also represents an important consumer market for cassava and cassava products.

Another interesting aspect of cassava is due to its gluten-free characteristic. The increasing incidence of celiac disease and/or gluten-allergy worldwide has also increased the demand for cassava and cassava products. As a result, apart from the

demand from the foreign community, demand for gluten-free products may also boost demand for cassava in Japan.

Photo 2:
Imported Pre-Cooked Frozen Cassava from Vietnam (left) and Thailand (right).
Photo taken by the author.

4.2 Japan's imports of cassava starch (HS 0714.00)

Cassava roots, apart from being an important edible crop and consumed in many countries, are also a rich source of starch. Starch can be obtained from many sources such as potatoes, sweet potatoes, corn, wheat, among others. In Japan, domestically produced starches are taken from potatoes and sweet potatoes. As addressed in section 2.2, starch can also be obtained from cassava roots and have a large range of usage for human consumption and also it is utilized in various industries. Cassava starch can be used directly for household consumption in various dishes such as tapioca pearls, noodles, desserts, crepe, etc. Cassava starch can be of two types: native starch and modified starches and both are used in food industries and industrial sectors. Applications in the food industry can be used for the production of sweeteners, thickeners, etc. Modified starch has many applications in the industrial sector such as in the production of adhesives, paper, plywood, pharmaceutical products, footwear, among many others. In Japan, cassava starch competes with other kinds of starch but as can be observed in table 7, Japan imports cassava starch and it is used in industrial sectors such as food industries and other sectors (HS 1108.14.00).

Table 7. Japan's Imports of Cassava Starch - Detailed HS Classification

HS Code	Manioc (cassava) starch	2014 (Kg)	2015 (Kg)	2016 (Kg)
1108.14.010	For manufacturing starch sugar, dextrin, dextrin glue, dissolve starch, roasted starch or starch glue	107,863,000	99,913,150	108,041,200
1108.14.020	Other	9,331,600	6,116,500	7,349,500
1108.14.090	Other	31,242,900	27,346,890	15,442,483
Total		148,437,500	133,376,540	130,833,183

Source: Ministry of Finance, Japan. Accessed on October 6, 2017.

Thailand is Japan's main supplier of cassava starch and Japan's imports from this country represent around 96% of total Japanese imports of cassava starch, as shown in Table 8. This table shows Japan's imports of cassava starch in recent years by country of origin. Vietnam is the second largest supplier of cassava starch to Japan followed by smaller suppliers such as Myanmar and other Asian countries. In 2016, it is interesting to observe that although in very small quantities, Brazil also exported cassava starch to Japan and this fact may be explained by the demand from the Brazilian community living in Japan. Cassava starch, apart from its industrial applications, has many uses in Latin American and other countries' cuisines and is also used as an ingredient for many other products such as bakery and confectionary products. An increasing number of cassava starch brands and types sold by Brazilian companies or companies specialized in Latin American countries' products have been observed and some of them are shown in Photo 3. The countries of origin of these products are Thailand, Vietnam and Brazil.

Table 8. Japan's Imports of Cassava Starch (HS 1108.14)

2016			2015			2014			2013		
Country	Kg	US$	Country	Kg	US$	Country	Kg	US$	Country	Kg	US$
Thailand	126,511,750	46,455,390	Thailand	128,072,898	55,595,796	Thailand	143,376,100	62,590,008	Thailand	146,471,636	67,437,497
Viet Nam	3,789,920	1,409,161	Viet Nam	2,844,700	1,210,850	Viet Nam	3,010,000	1,355,297	Viet Nam	4,893,750	2,177,869
Myanmar	510,000	185,630	Myanmar	2,040,000	894,132	Myanmar	2,040,000	878,002	Myanmar	4,590,000	2,010,837
Other Asia	14,286	26,110	China	408,000	173,453	Other Asia	11,400	19,211	Other Asia	9,354	15,104
Brazil	7,227	18,667	Other Asia	10,944	18,867	_	_	_	Cambodia	18,050	8,874
World	130,833,183	48,094,958	World	133,376,542	57,893,097	World	148,437,500	64,842,519	World	155,982,790	71,650,181

Source: COMTRADE (Accessed on october 31, 2017)

Photo 3:
Cassava starch for food use available at Brazilian shops, Japanese shops and/or e-commerce sites in Japan.
Countries of origin: Thailand, Vietnam and Brazil.
Photo taken by the author.

Another important product derived from cassava starch is the cassava starch hydrated mixture (“massa pronta para tapioca”, in Portuguese), available at many Brazilian establishments and is used to make a traditional and famous Brazilian delicatessen: the tapioca snack as shown in photo 4 below. These mixtures are ready-to-cook hydrated doughs made by cassava starch. In the course of the investigation many local producers, especially in Shizuoka and Aichi Prefecture were identified and some of them are shown in Photo 5. These are examples of small businesses that originated from cassava in the Brazilian community. It is worth noting that the origin of the cassava starch used for the production of these mixture were not investigated and these will be object of further studies.

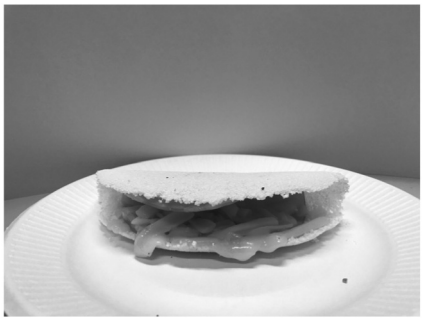


Photo 4:
Brazilian tapioca snack
Photo taken by the author.

Photo 5:
Cassava starch hydrated mixture produced in Japan
Photo taken by the author.

4.3 Imports of Tapioca Pearls (HS 1903.00.000 Tapioca & substitutes prepared from starch")

As mentioned previously, although cassava roots are not widely known in Japan, the cassava-derived pearls are very popular. Tapioca pearls are made from cassava starch and nowadays there is a great variety of tapioca pearls in the Japanese market, of various sizes and colors. Table 9 shows import figures for "tapioca & substitutes prepared from starch" (HS 1903.00)[4]. Japanese imports of this item totaled US$3,284,086 in 2016. Imports from Thailand accounted for almost 60% in the observed years, followed by Asian countries.

Table 9. Tapioca & substitutes prepared from starch* (HS1903.00.000)

	2013	%	2014	%	2015	%	2016	%
World	3,315,326		3,196,397		3,504,952		3,284,086	
Thailand	1,915,367	57.77	1,867,742	58.43	2,073,049	59.15	1,952,234	59.45
Other Asia	981,976	29.6	863,916	27.0	1,028,843	29.4	1,019,849	31.1
Malaysia	412,795	12.5	454,841	14.2	390,210	11.1	309,961	9.4
Brazil	5,188	0	6,060	0	7,115	0	0	0

* Tapioca and substitutes therefor prepared from starch, in the form of flakes, grains, pearls, siftings or similar forms

Source: COMTRADE. Accessed on October 30, 2017.

4.4 A brief consideration on local production of cassava and products derived from locally produced cassava

Cassava has also been cultivated successfully in Japan. Although the country is located in a temperate zone with a subtropical climate, cassava cultivation can be found in some locations such as Shizuoka, Aichi, Kagoshima (Tokunoshima) and Okinawa Prefectures.

In the case of Shizuoka and Kagoshima, small-scale individual producers and small companies[5] have invested in the production of cassava for the domestic market, targeting especially the foreign community living in Japan such as the Brazilian one. In addition, not only foreign residents are producing cassava. It was observed that there is

[4] It is worth noting that this classification includes other tapioca and substitutes in various forms as described on the lower part of table 9.

[5] Information contained in this section was a result of the author's visits and interviews to cassava producers in Shizuoka and Kagoshima Prefectures.

a growing number of Japanese farmers involved in the production of cassava and engaged in the production of cassava products. This represents an important step towards dissemination of cassava in Japan. In addition, cassava may be an important crop for the regional development, local vitalization of agriculture and deeper integration among foreigners and Japanese communities. Photo 6 and 7 show, respectively, cultivation of cassava in Shizuoka Prefecture and the production of cassava starch hydrated mixture from locally produced cassava. Photo 8 shows locally produced cassava from Kagoshima Prefecture.

Photo 6:
Cassava cultivation in Shizuoka Prefecture (November, 2017)
Photo taken by the author.

Photo 7.
Cassava starch hydrated mixture made from locally produced cassava in Shizuoka Prefecture
Photo taken by the author.

Photo 8.
Pre-Cooked Frozen Cassava from Kagoshima Prefecture (Tokunoshima)
Photo taken by the author.

5. Concluding remarks and further research

This paper addressed the importance of cassava in many countries both as a crop for human consumption and animal feed and also as an important input for utilization in the industrial sectors.

Although in Japan cassava is not widely known among Japanese people, cassava-derived products such as tapioca pearls are very popular and cassava starch is also used in various industries. Cassava is well-known by the numerous foreign residents living in Japan and this ethnic community represents an important market niche for cassava and cassava products. In this paper, various cassava and cassava products available in Japan, especially at the Brazilian shops were shown, demonstrating that there is a substantial demand for cassava products by the Brazilian community in Japan. The possibilities of market expansion for cassava and cassava products are not limited to the immigrants' community. Due to its gluten-free qualities, the demand for cassava and cassava products have increased in many countries and it is believed that there is much room for expansion in Japan too. In this context, dissemination of information on cassava and cassava products to the Japanese community is an important aspect for further cassava domestic cultivation and market expansion. In this paper, cultivation of cassava in Japan was not addressed in detail. According to the author's preliminary investigation, there is a growing number of cassava producers in Japan and this will object of further studies.

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