



Analysis of Production and Trade of Selected Root and Tuber Crops within the CARICOM Region, USA, Canada and the United Kingdom



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[An output of the CFC/EU-financed project: “Increased Production of Root and Tuber Crops in the Caribbean through the Introduction of Improved Marketing and Production Technologies” being implemented by CARDI in Barbados, Dominica, Haiti, Jamaica, St. Vincent & the Grenadines and Trinidad & Tobago]

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1.0 Background

There are concerns about the food and nutrition status of the Caribbean Community (CARICOM) residents, especially vulnerable groups of poor families who comprise approximately 20% of the total population. The food crisis in 2008 which was a result of a significant increase in the prices of imported staples has resulted in renewed focus on development of local crops, including roots and tubers.

Within the Region roots and tubers, especially cassava have been eaten for centuries by indigenous people and continues to be a staple in local diets. Many Caribbean countries have identified roots and tubers as important to their food and nutrition security goals, and are making efforts to expand current acreages, increase yields and reduce the cost of production.

The Caribbean Agricultural Research and Development Institute (CARDI) in conjunction with European Union (EU) and the Common Fund for Commodities (CFC) established a project to contribute to the improvement of livelihoods along the Root and Tuber Crop Commodity Chains in the Caribbean through appropriate marketing and production technologies.

The objectives of the project are:

- i. To increase the demand for fresh and value-added products of the selected root and tuber crops in the local and regional markets.
- ii. To strengthen existing production groups and the formation of clusters that will improve the activities along the commodity value chains.
- iii. To improve the knowledge and skill of actors along the value chains through training in and dissemination of production, post-harvest, processing, and marketing techniques
- iv. To produce and distribute high quality planting materials of cassava, sweet potato and yam through the establishment of appropriate propagation facilities
- v. To demonstrate and, as necessary, validate technological innovations in root and tuber crop production and use

This market analysis is an output of objective (i) above and focuses on selected root and tuber crops, namely, cassava, sweet potato, yam and coco yam in the CARICOM Region as well as on their export to the USA, Canada and the United Kingdom.

2.0 Root and Tuber Crops Market Analysis

The market analysis draws on secondary data from the following local, regional and international databases: Central Statistical Office within the Ministry of Planning and Sustainable Development in Trinidad and Tobago, the National Agricultural Market Information System of Trinidad and Tobago (NAMIS), the Ministry of Agriculture in Barbados, the Jamaican Agricultural Market Information System (JAMIS), the United Nations Food and Agriculture Organisation (FAO) and the United Nations International Trade Centre (ITC).

3.0 Introduction

Roots and tubers are used for human food (primary or processed), for animal feed and for manufacturing into starch and other products..

Individually, cassava, sweet potato, and yam rank among the most important food crops worldwide and, in terms of annual volume of production, they rank among the top 10 food crops produced in developing countries.

Roots and tubers play a significant role in developing-country food systems because:

- 1) they contribute to the energy and nutrition requirements of over 2 billion people in developing countries today and will continue to do so over the next two decades;
- 2) they are produced and consumed by many of the world's poorest and most food insecure households;
- 3) they are an important source of employment and income in rural areas, especially for women;
- 4) they adapt to a wide range of specific uses, from food security crop to cash crop, from food crop to feed crop and raw material for industrial uses, and from fresh food to high-end processed products.

Root and tuber crops are second only in importance to cereals as a global source of carbohydrates. They also provide some minerals and essential vitamins.

It is considered by many authorities that the increasing dependence in developing countries on imported cereals is unsustainable and the trend should be reversed by stimulating reliance on indigenous crops, in particular roots and tubers. The importance of roots and tubers as a source of food carbohydrates is well established. Regrettably, research and development on roots and tubers is limited and tends to be focused on pre-harvest production only, especially genetic improvement. What is needed is a well-designed, integrated strategy of production, processing, and marketing to stimulate increased consumption and to establish in developing countries the full potential of roots and tuber crops, particularly with reference to their contribution to food self-sufficiency.

4.0 Description of Root Crops

4.1 Cassava (*Manihot esculenta* Crantz)

Cassava also known as manioc, mandioca, yuca and tapioca-root, is a semi-permanent crop grown in tropical and subtropical regions.

It is grown in over 90 countries and provides 500 million people with food and a livelihood. It is one of the main crops supporting food security worldwide. It is highly rich in carbohydrates, being the third source of calories in the tropics after rice and corn (FAO, 2000).

Cassava is used as a basic food staple for human consumption, starch source, and also for animal feed. It is mainly consumed as boiled flour obtained by processing the root. The roots are very rich in carbohydrates, mainly starch. Cassava is almost entirely produced and consumed in developing countries. It is highly productive, tolerant to poor soil fertility and periods of drought and is relatively free of diseases and pests. It is a major source of food energy for the world's tropical human population providing 37% of the energy in the African diet.

The bulk of global cassava utilisation (Table 1) is in the form of food – fresh roots and processed products such as flour, and is largely concentrated in Africa. Both cassava roots and leaves are suitable for human consumption. Growth in non-food and feed usage at the global level has surged in recent years. Much of this growth has been witnessed in markets for cassava starch which is used as a raw material for a wide range of food products and industrial goods including paper, cardboard, textile, plywood, glue and alcohol.

Table 1. Global utilisation of cassava.

Food	Manufacturing industry
Raw as salad or snack. Boiled or roasted. Roasted chips. Flour for baking. Snack foods. Bakery and pastry products.	Paper, cardboard and plywood. Textiles. Pharmaceuticals and other chemicals. Animal feed.

4.2 Sweet potato (*Ipomea batatas*)

Sweet potato is a starchy tuber of the Convolvulaceae family and is grown seasonally in tropical and subtropical regions. It is used mainly for human food. Often thought to be related to white potato from the Solanaceous family, sweet potato is much more nutritious and comes in a variety of skin colours including red, purple, brown and white, and of flesh colours of white, yellow, orange or purple.

Sweet potato, of which the orange-coloured flesh varieties are the most common, is rich in complex carbohydrates, dietary fiber, beta carotene, vitamins A (200 grams contain 76.9% of the recommended daily requirement), B6 and C. These nutritional and health benefits together with a long shelf-life and ease of food preparation, make sweet potato a highly sought-after commodity with growing demand.

Sweet potato is a crop with a significantly unrealised potential. It is capable of producing high yields of dry matter per unit area of land under a wide range of agro-climates and farming systems.

4.3 Yam (*Dioscorea spp.*)

Dioscorea rotundata, the "white yam", and *Dioscorea cayenensis*, the "yellow yam", are native to Africa and they are the most important cultivated yams in the Caribbean Region.

The yam plant forms edible tubers that have a rough skin which is difficult to peel, but which softens after heating. The skins vary in colour from dark brown to light pink. The majority of the vegetable is composed of a much softer substance known as the "meat". This substance ranges in colour from white or yellow to purple or pink in mature yams.

Several varieties of edible yam are widely grown throughout the tropics. It is a starchy staple foodstuff, normally eaten barbecued, roasted, fried, grilled, boiled, baked, smoked and when grated it is processed into a dessert recipe.

4.4 Coco yam (dasheen and eddo)

Coco yam or Taro is a common name for the corms and tubers of several plants in the Araceae family. Of these, *Colocasia esculenta* (L.) Schott, commonly known as dasheen and eddo, is the most widely cultivated.

These products are aroids cultivated for their edible starchy corms or underground stems which are usually peeled and boiled or fried. Coco yam is grown throughout the tropics for food. Both aroids are known for their love of a humid environment and their ability to flourish in shaded conditions. They are among the most shade tolerant of terrestrial food crops.

5.0 World Production

5.1 Cassava

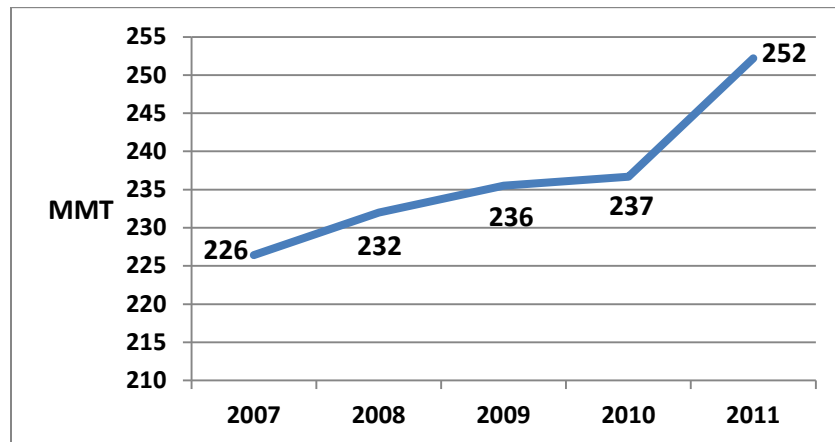
The world production of cassava grew by about 11 % over the period 2007-2011. In 2011 production was 252.2MMT (Figure 1). There are six major producers spread across Africa, Latin America and the Far East; together they account for about 60 % of total production (Table 2).

The main cassava producers in the Americas (Figure 2) were Brazil (25.5MMT), Peru (3.5MMT), Paraguay (2.5MMT) and Colombia (2.3MMT). Amongst the English speaking CARICOM countries, Jamaica was the largest producer with 20,500MT, followed by Guyana with 10,300MT.

The total area harvested in the world in 2011 was 19.644M ha.

Footnote: In this document, M denotes million; MT denotes metric tonne; and, MMT denotes million metric tonnes.

Figure 1. World production (MMT) of cassava 2007-2011.



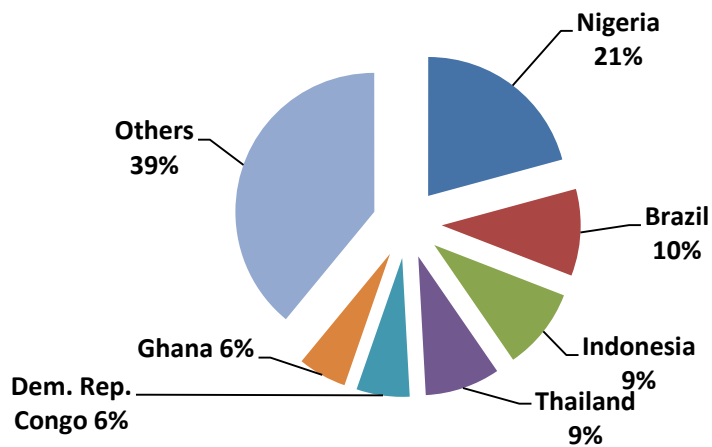
Source: FAOSTAT, 2013

Table 2. Major cassava producers by volume (MMT) 2011.

	Production (MMT)
Nigeria	52.4
Brazil	25.5
Indonesia	24.0
Thailand	22.0
Democratic Republic of Congo	15.6
Ghana	14.3
Others	98.4
Total	252.2

Source: FAOSTAT, 2013

Figure 2. Major cassava producers by volume (%) in 2011.



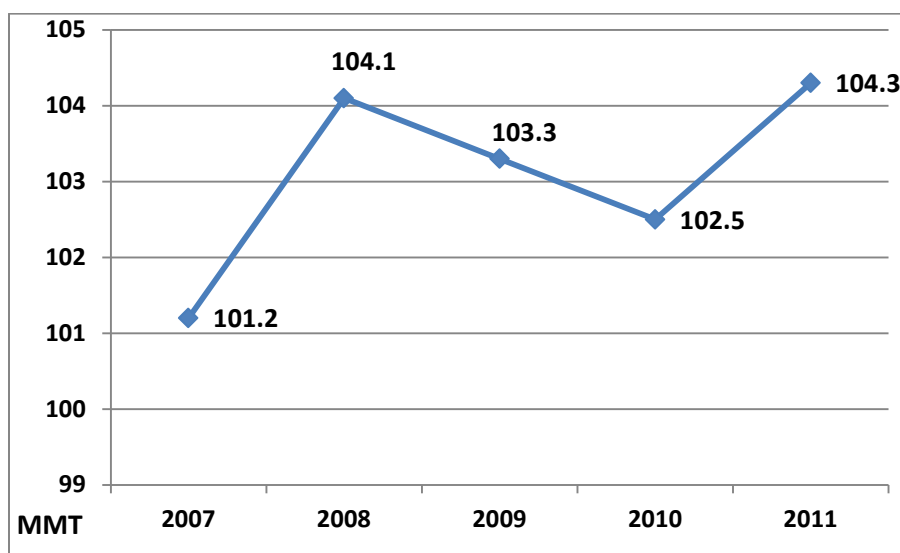
Source: FAOSTAT, 2013.

5.2 Sweet potato

This commodity ranks among the world's seven most important food crops (along with wheat, rice, maize, potato, barley, and cassava) and is cultivated in over 100 developing countries.

World production of sweet potato was consistent at just over 100MMT during the years 2007-2011 (Figure 3). In 2011, world production of sweet potato was 104.26MMT with the top producer, China, accounting for 72% of the total production (Figures 3 and 4/Table 3). In the Americas, the main producers were USA (1.2MMT), followed by Argentina, 390,000MT and Cuba 312,000MT. Within CARICOM, Jamaica was the top producer in 2011 with a harvest of 42,000MT.

Figure 3. World production (MMT) of sweet potato 2007-2011



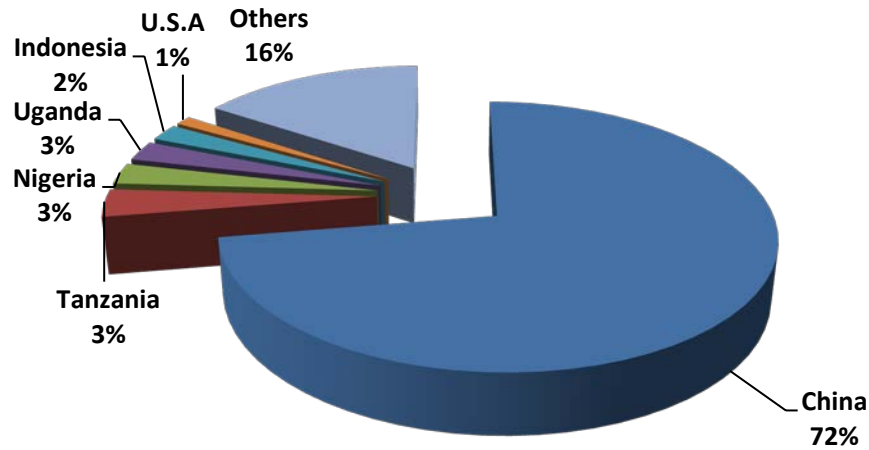
Source: FAOSTAT, 2013.

Table 3. Major sweet potato producers by volume (MMT) 2011.

	Production (MMT)
China	75.6
Tanzania	3.6
Nigeria	2.8
Uganda	2.6
Indonesia	2.2
U.S.A	1.2
Others	16.3
Total	104.3

Source: FAOSTAT, 2013

Figure 4. Major sweet potato producers by volume (%) in 2011.



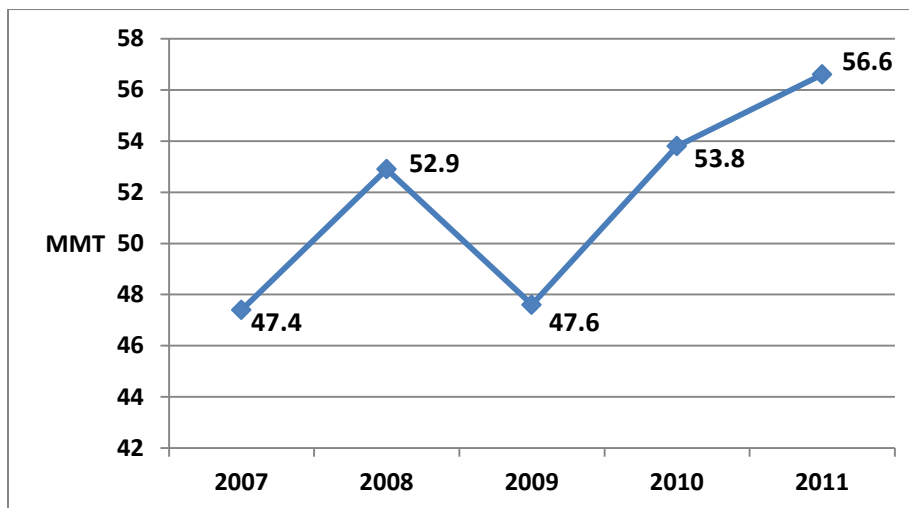
Source: FAOSTAT, 2013

5.3 Yam

The world production of yam increased over the period 2007-2011. The quantity produced went up from 47.6MMT in 2009 to 56.6MMT in 2011, an increase of 19 % (Figure 5).

The total area harvested around the world in 2011 was 4.9M ha. The largest producer was Nigeria (37.1MMT) followed by Ghana (6.3MMT) and Cote d' Ivoire (5.5MMT) (Table 4/Figure 6). The top producers in the Americas were Cuba (350,000MT) and Colombia (347,000MT) while the main CARICOM producer was Jamaica with 134,000MT.

Figure 5. World production (MMT) of yam 2007-2011.



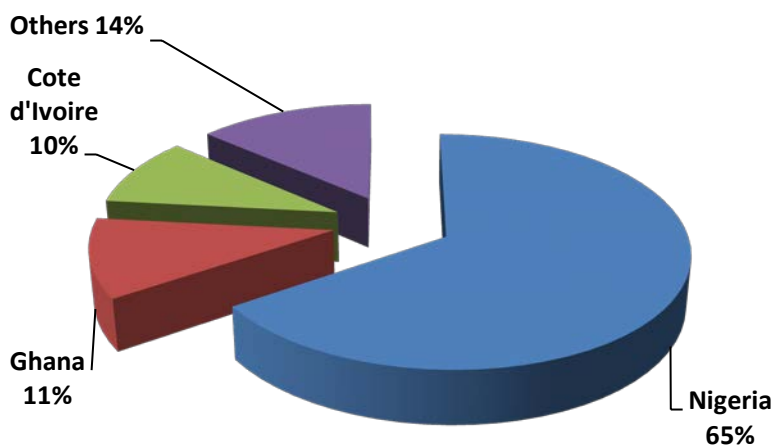
Source: FAOSTAT, 2013

Table 4. Major yam producers by volume (MMT) 2011.

	Production (MMT)
Nigeria	37.1
Ghana	6.3
Cote d'Ivoire	5.5
Others	7.7
Total	56.6

Source: FAOSTAT, 2013

Figure 6. Major yam producers by volume (%) in 2011.



Source: FAOSTAT, 2013

5.4 Coco yam (dasheen and eddo)

The world production of coco yam in 2011 was 9.624MMT. In Latin America and the Caribbean, Cuba was the largest producer, followed by Venezuela and El Salvador (Table 5/Figure 7).

Within CARICOM, there were four producers listed, namely, Belize, Dominica, Trinidad & Tobago and St. Lucia. Dominica was the largest of these with 5,413MT followed by Trinidad & Tobago with 1,771MT. Within the Caribbean Region as a whole, the total production in 2011 was 18,718MT harvested from 1,902ha with an average yield of 9.84MT/ha (FAOSTAT, 2013).

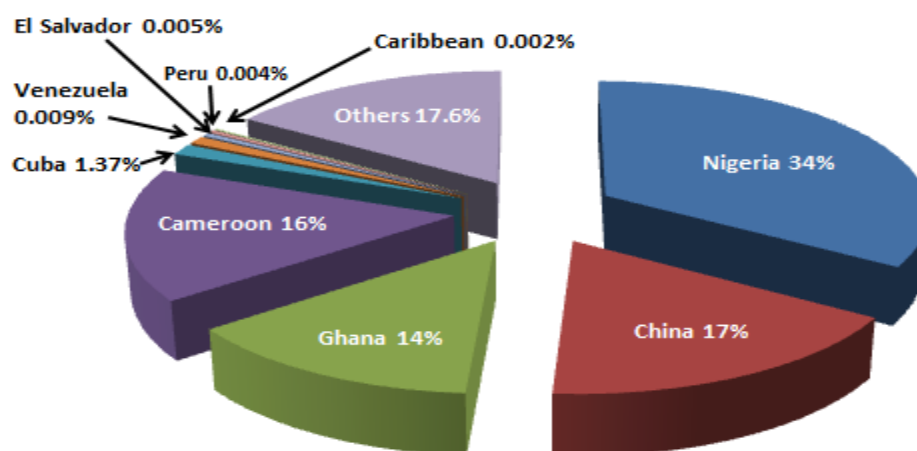
The total area harvested around the world in 2011 was 1.269M ha.

Table 5. Major coco yam (dasheen and eddo) producers by volume (MT) 2011.

	Production (MT)
Nigeria	3,265,740
China (mainland)	1,650,000
Ghana	1,299,645
Cameroon	1,568,804
Cuba	132,000
Venezuela	90,336
El Salvador	42,961
Peru	34,771
Caribbean aggregate	18,718
Others	1,520,863
World total	9,623,838

Source: FAOSTAT, 2013.

Figure 7. Coco yam (dasheen and eddo) producers by volume (%) in 2011.



Source: FAOSTAT, 2013

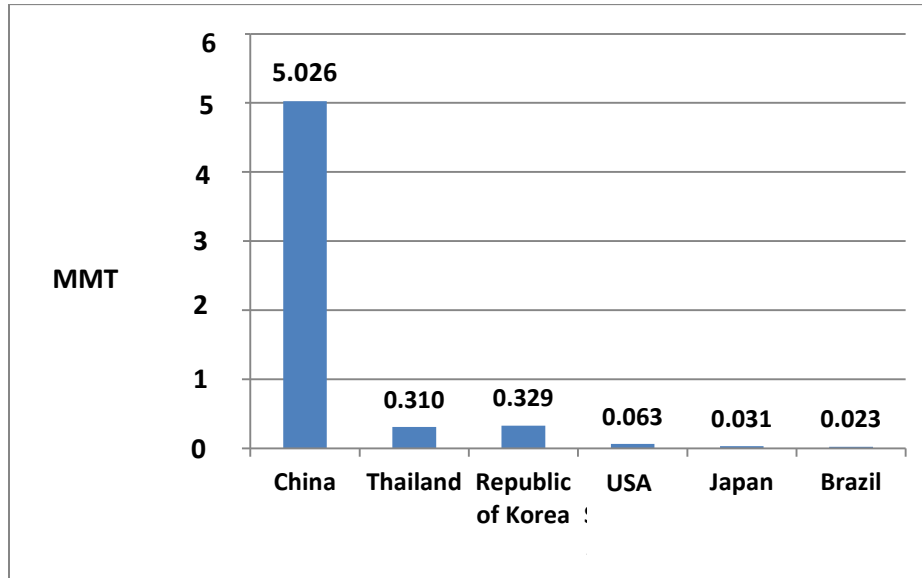
6.0 World Trade

6.1 Cassava

In 2011, approximately 6MMT of cassava was traded internationally. This was 2% of world production. The total value of world trade in 2011 was US\$1.6B. In 2011, China was the biggest importer with 5MMT and Vietnam the largest exporter with 3.7MMT (Figures 8/9).

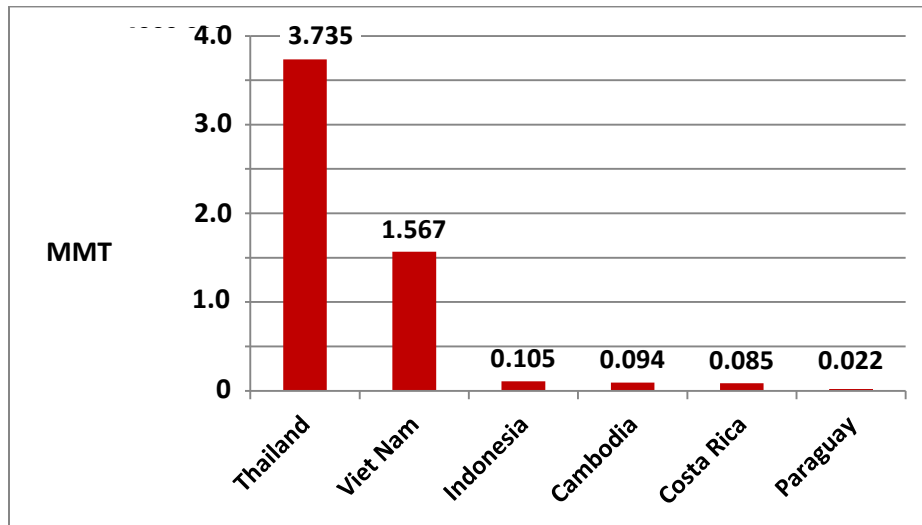
The majority of production was consumed fresh domestically, and some converted into industrial starch.

Figure 8. Major cassava importing countries and volume (MMT) imported 2011.



Source: UN International Trade Centre, 2013.

Figure 9. Major cassava exporting countries and volume (MMT) exported 2011.



Source: UN International Trade Centre, 2013.

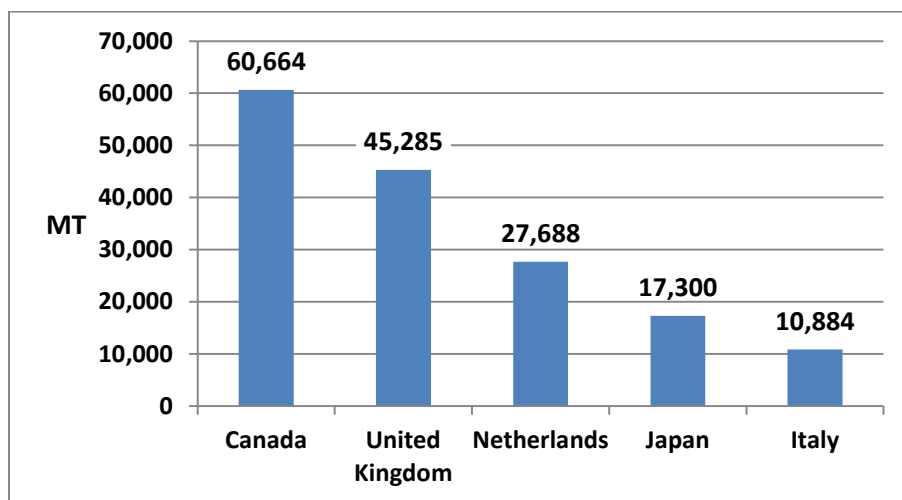
In many countries, cassava is processed into starch which is used in many sectors, including the food industry, pharmaceutical chemistry, foundry, textiles, paper and adhesives. In Latin America and the Caribbean starch extraction is developing slowly and it is estimated that the Region only represents 4% of global cassava starch supply (UNCTAD, 2012). World trade in cassava starch in 2011 was 2.467MMT. Thailand was the number one supplier with 1.861MMT. The biggest importer was China with 0.90MMT.

6.2 Sweet potato

In 2011, the international trade in fresh sweet potato was 267,000MT with a total value of US\$210.5M.

Canada was the main importer with 61,000MT followed by the United Kingdom and the Netherlands with 45,000MT and 28,000MT, respectively (Figure 10).

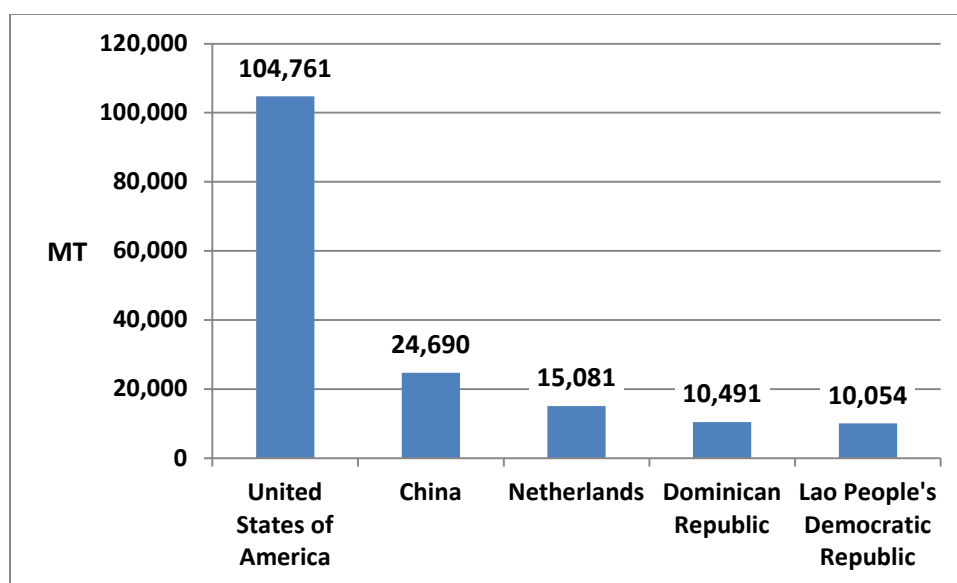
Figure 10. Major sweet potato importing countries and volume (MT) imported 2011.



Source: UN International Trade Centre, 2013.

The USA was the largest exporter with 104,761MT (Figure 11).

Figure 11. Major sweet potato exporting countries and volume (MT) exported 2011.



Source: UN International Trade Centre, 2013

6.3 Yam

In 2010, 57,663MT of yam were traded in the world market. The USA was the largest importer in 2102 with 34,582MT.

6.4 Coco yam (dasheen and eddo)

The quantity traded internationally was very small with the average annual quantity over the period 2006-2010 being 1,906MT.

7.0 CARICOM production and trade

In this section the status of the selected root crops in the CARICOM countries is analysed. Production, trade and market prospects were reviewed for these commodities.

7.1 Production

7.1.1 Cassava

Cassava production fluctuated in the English-speaking CARICOM countries over the period 2007-2011. This was largely due to a reduction in the area harvested in Guyana, which decreased by 50%. However, Trinidad and Tobago's production went up by 62% (Table 6/Figure 12).

This reduction in CARICOM production must be a cause of concern, as this commodity is one which can help meet the Region's food security and nutritional needs.

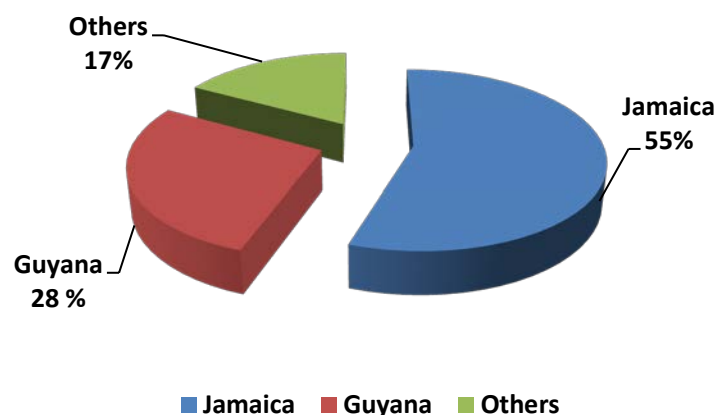
While the area under production increased in the majority of the countries, the yield per ha remained the same or declined.

Table 6. CARICOM cassava production by volume (MT) 2007-2011.

	2007	2008	2009	2010	2011
Antigua and Barbuda	78	72	77	99	108
Bahamas	190	175	188	241	262
Barbados	448	466	691	400	308
Dominica	819	752	809	1,037	1,127
Grenada	172	170	159	204	222
Guyana	20,184	4,127	7,100	10,092	10,269
Jamaica	18,519	14,991	13,995	18,490	20,533
Saint Lucia	1,030	1,100	898	1,151	1,251
St. Vincent and the Grenadines	770	707	780	1,000	1,087
Trinidad and Tobago	1,200	1,350	1,400	1,794	1,950
Total	43,410	23,910	26,097	34,508	37,117

Source: FAOSTAT, 2013.

Figure 12. Major cassava producers by volume (%) in CARICOM 2011.



Source: FAOSTAT, 2013.

7.1.2 Sweet potato

The regional production of sweet potato increased by 35% over the period 2007-2011 (Table 7). In 2011, the area harvested decreased in all of the countries, except for Jamaica which went up by 46% and Guyana, 8%.

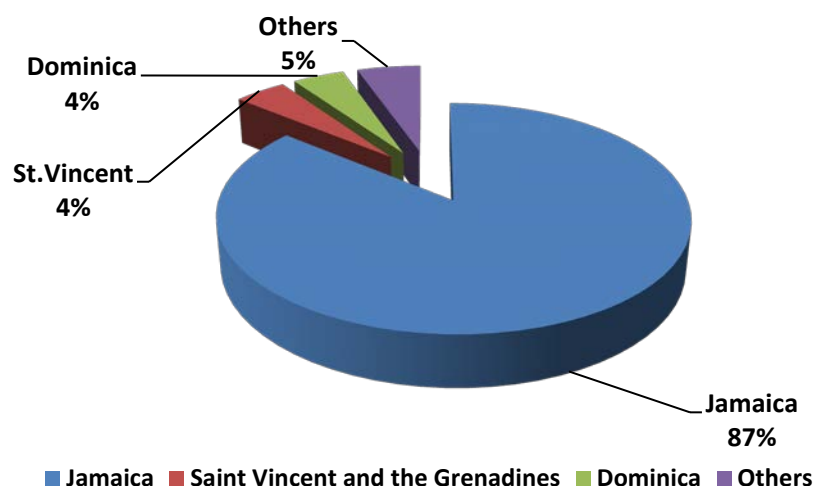
In 2011, Jamaica was the largest producer of sweet potato in the region with 42,091MT, followed by the St. Vincent and the Grenadines with 2,162MT (Figure 13).

Table 7. CARICOM sweet potato production by volume (MT) 2007-2011.

	2007	2008	2009	2010	2011
Antigua and Barbuda	311	280	330	301	255
Bahamas	868	834	982	896	758
Barbados	1,335	884	888	1,176	507
Dominica	2,371	2,278	2,680	2,446	2,069
Grenada	73	117	128	135	114
Guyana	1,510	1,541	1,522	1,566	1,730
Jamaica	26,055	25,797	34,229	34,512	42,091
Montserrat	30	29	34	31	26
St. Kitts	193	199	230	198	216
Saint Lucia	529	604	397	362	306
St. Vincent and the Grenadines	2,300	2,200	2,800	2,556	2,162
Trinidad and Tobago	320	310	380	347	294
Total	35,895	35,073	44,600	44,526	48,366

Source: FAOSTAT, 2013.

Figure 13. Major sweet potato producers by volume (%) in CARICOM 2011.



Source: FAOSTAT, 2013.

7.1.3 Yam

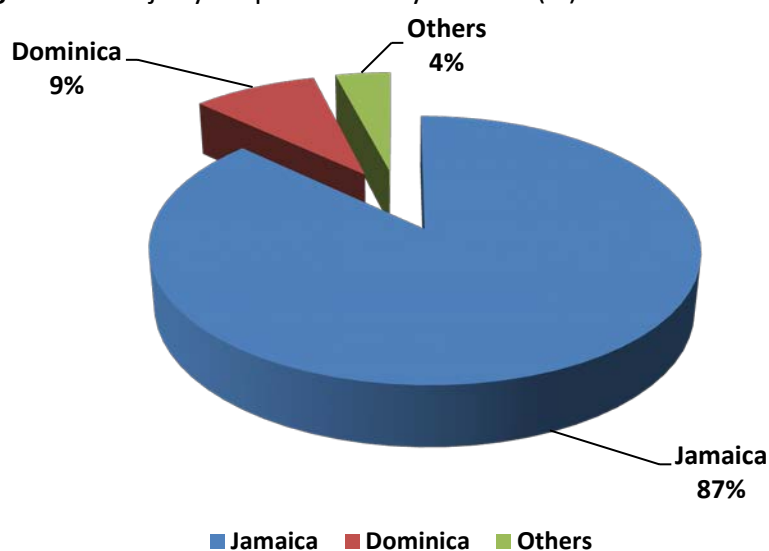
The production of yam in the Region fluctuated over the period 2007-2011. The average annual production was approximately 141,000MT (Table 8). The main contributor to the Regional production was Jamaica which increased its harvested area by 15% over the period and accounted for 87% of the 2011 CARICOM production (Figure 14).

Table 8. CARICOM yam production by volume (MT) 2007-2011.

	2007	2008	2009	2010	2011
Antigua and Barbuda	87	88	115	132	121
Barbados	647	280	824	807	243
Dominica	10,111	10,179	13,275	15,268	13,961
Grenada	506	509	520	598	547
Guyana	1,553	1,752	1,381	1,246	1,250
Jamaica	113,124	102,284	124,516	136,785	134,620
Saint Kitts and Nevis	15	19	18	27	37
Saint Lucia	471	504	508	584	534
Saint Vincent and the Grenadines	2,500	2,300	2,800	3,220	2,944
Trinidad and Tobago	17	18	25	29	27
Total	129,031	117,933	143,982	158,696	153,924

Source: FAOSTAT, 2013.

Figure 14. Major yam producers by volume (%) in CARICOM 2011.



Source: FAOSTAT, 2013.

7.1.4 Coco yam (dasheen and eddo)

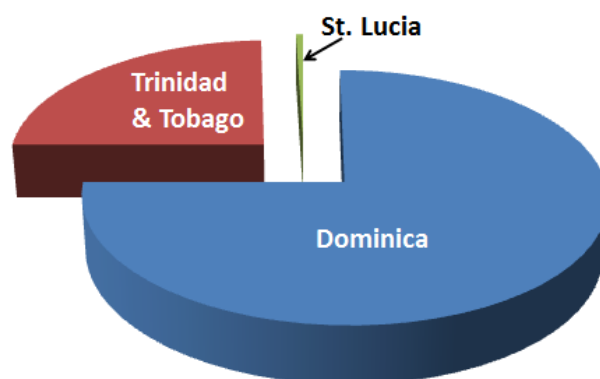
Three CARICOM countries were shown as coco yam producers (Table 9). Production in 2011 was 7,229MT, up from 6,287MT in 2007. The largest producer was Dominica accounting for 75% of the total output (Figure 15).

Table 9. CARICOM coco yam production by volume (MT) 2007-2011.

	2007	2008	2009	2010	2011
Dominica	4,551	4,496	4,917	5,500	5,413
Saint Lucia	36	50	55	40	39
Trinidad and Tobago	1,700	1,892	1,635	1,800	1,777
Total	6,287	6,438	6,607	7,340	7,229

Source: FAOSTAT, 2013.

Figure 15. Major coco yam producers by volume (%) in CARICOM 2011.



Source: FAOSTAT, 2013

7.2 Trade

7.2.1 Exports of cassava

The majority of cassava produced in the Region was used for domestic consumption. The total CARICOM exports in 2011 were 112MT, that is, less than 1% of total production. The value of exports was US\$1.5M (Table 10). Guyana was the main exporter in 2011 with 86MT.

Table 10. CARICOM exports (MT) of cassava 2008-2011.

Exporters	Quantity exported, MT			
	2008	2009	2010	2011
CARICOM aggregate	43	30	165	112
Guyana	42	29	151	86
Jamaica	1	1	1	14
Suriname	0	0	13	8
Haiti	0	0	0	4

Source: UN International Trade Centre, 2013.

7.2.2 Imports of cassava

The quantity of imports of cassava by CARICOM member countries was also small being 219MT in 2011 at a value of US\$1.6M (Table 11).

Table 11. CARICOM imports (MT) of cassava 2011.

Importers	2011
	Quantity imported, MT
CARICOM aggregate	219
Bahamas	58
Jamaica	47
Suriname	46
Antigua and Barbuda	38
Trinidad and Tobago	15
Dominica	7
Saint Kitts and Nevis	5
Barbados	3

Source: UN International Trade Centre, 2013

7.2.3 Exports of sweet potato

Exports of sweet potato grew by a modest 8% over the period 2008-2011 (Table 12). In 2011 exports of sweet potato were 2,917MT at a value of just under US\$0.5M. The quantity exported was 0.6% of total production in 2011. St. Vincent and the Grenadines accounted for 56% of the exports in 2011, followed by Jamaica, 43%. The destination points for these exports were intra-regional (CARICOM), as well as the United Kingdom and Canada.

Table 12. CARICOM exports (MT) of sweet potato 2008-2011.

Exporters	Quantity exported, MT			
	2008	2009	2010	2011
CARICOM aggregate	2,702	3,293	2,711	2,917
St. Vincent and the Grenadines	1,544	2,191	1,621	1,627
Jamaica	1,058	1,016	1,007	1,266
Guyana	10	5	45	10
Suriname	0	0	9	6
Dominica	78	67	24	4
Saint Kitts and Nevis	0	2	3	2
Saint Lucia	0	8	0	2
Barbados	8	3	1	0
Trinidad and Tobago	1	1	1	0

Source: UN International Trade Centre, 2013.

7.2.4 Imports of sweet potato

All of the sweet potato imports were intra-regional (CARICOM) averaging about 1,500MT per year; however, 2010 was an exceptional year when imports rose to just over 5,000MT because of an increase in Trinidad and Tobago's purchases (Table 12).

Approximately 1,700MT of sweet potato were imported in 2011. The largest importer was Trinidad and Tobago whose main supplier was St. Vincent and the Grenadines (Table 13).

Table 13. CARICOM imports (MT) of sweet potato 2008-2011.

Importers	Quantity imported, MT			
	2008	2009	2010	2011
Caribbean aggregate	1,428	1,382	5,045	1,665
Trinidad and Tobago	1,004	1,219	4,872	1,540
Bahamas	368	100	98	95
Others	56	63	78	35

Source: UN International Trade Centre, 2013.

7.2.5 Yam

An analysis of the trade databases did not show any trade in yam and coco yam which could be an indication that all the production was consumed in the domestic markets.

8.0 International Trade

The potential extra-regional markets for CARICOM producers are the USA, Canada and the United Kingdom. Within these countries, the defined niche market segments for cassava are consumers with a Caribbean or Hispanic background. In the case of sweet potato, the market for this product can be considered as mainstream, given the growth in consumption amongst the wider population.

8.1 USA production and trade

8.1.1 Cassava

The USA market accounted for approximately 2% (71,247MT) of total world imports of cassava (fresh and frozen) in 2012, at a value of US\$66.9M (Table 14).

Imports of the fresh product almost doubled in 2011, when compared to 2008. The two dominant suppliers of fresh and dried cassava were Costa Rica and Thailand, together providing 95% of the imports.

Notwithstanding the Caribbean immigrant presence in major cities like New York and Miami, the last recorded exports from CARICOM was in 2009 when Jamaica supplied 2,117MT. One possible reason for this could be competitiveness in relation to the larger producers. The average import value for fresh or dried cassava in 2012 was US\$0.58 per kg, and US\$1.15 per kg for the frozen product.

Table 14. USA Imports (MT) of fresh and dried cassava 2008-2012.

Exporters to USA	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	37,494	41,858	43,936	41,145	71,247
Costa Rica	30,370	36,582	39,434	35,791	40,147
Thailand	0	0	0	0	27,343
Nicaragua	1,345	591	851	1,549	955
Ecuador	4,048	1,672	1,086	1,413	888
Ghana	842	1,304	1,151	962	731

Source: UN International Trade Centre, 2013.

The average annual imports of frozen cassava from 2007-2011 have been consistent at approximately 21,000MT (Table 15). Costa Rica was the main supplier with 87% in 2011.

Table 15. USA Imports (MT) of frozen cassava 2008-2012.

Exporters to USA	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	21,961	20,133	20,795	21,624	22,286
Costa Rica	17,262	15,660	18,135	18,168	19,456
Philippines	561	701	633	639	746
Ecuador	1,801	1,312	573	718	502
Colombia	1,233	1,159	261	579	404
Fiji	248	326	282	291	336

Source: UN International Trade Centre, 2013.

8.1.2 Sweet potato

Production of sweet potato in the USA grew by 49% in 2011, when compared to 2001. The quantity produced in 2011 was 1.22MMT (UN International Trade Centre, 2013).

North Carolina has been the number one producer of sweet potato in the USA with more than 40% of the volume. There are several different types of sweet potato grown in North Carolina, including Beauregard, Carolina Rose, Carolina Ruby, Cordner, Hernandez, Jewel and NC Porto Rico 198.

Sweet potato consumption in the USA increased by 13% from 2006-2008 while exports also increased. New advances in packaging and preserving sweet potato offered expanded marketing opportunities. An increasingly health-conscious public, combined with value-added product diversity, has brought the once lowly sweet potato to a respected and reserved place on everyday menus. Only 10 years ago, it was rare to be offered a sweet potato as a side option with steak; now, many fine restaurants across the country offer sweet potato on the menu.

Value-added product development, such as the burgeoning sweet potato fries, has driven much of the new-found fame of the sweet potato.

The USA exported 111,360MT of fresh sweet potato in 2011, up by over 200% from 2008. Their major markets were Canada, United Kingdom and the Netherlands.

Imports of fresh sweet potato by the USA were about 1% of domestic production in 2012. The volume of imports (Table 16) grew by 61% from 2008 to 2012. The main suppliers in 2012 were the Dominican Republic (6,683MT), Peru (3,714MT) and China (1,128MT).

The imported value of the fresh product was US\$0.81 per kg.

Table 16. USA imports (MT) of fresh sweet potato 2008-2012.

Exporters to USA	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	7,500	10,564	9,555	10,448	12,059
Dominican Republic	6,597	7,302	6,845	7,045	6,683
Peru	444	311	444	890	3,714
China	426	2,801	1,938	1,990	1,128
Canada	0	100	317	487	526
St. Vincent and the Grenadines	0	0	0	32	5

Source: UN International Trade Centre, 2013.

The quantity of imported frozen sweet potato in 2012 was approximately 50MT (Table 17) at a value of US\$2.21 per kg.

Table 17. USA imports (MT) of frozen sweet potato 2008-2012.

Exporters to USA	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	96.2	63.1	270.1	96.2	49.7
Dominican Republic	40.4	3.6	12.3	39.1	19.7
India	7.3	6.6	19.3	27.6	14.9
Chinese Taipei	6.2	5.4	1.9	1.6	6.6
Philippines	1.6	4.7	3.2	1.7	5.4
Peru	9.3	7.8	10.0	10.3	2.6

Source: UN International Trade Centre, 2013

8.2 Canada imports

8.2.1 Cassava

The imports of fresh cassava into Canada were very small compared to the USA. The quantity imported in 2012 was 3,948MT (Table 18), up 43 % from 2008. Costa Rica was the main supplier with 77 %.

Table 18. Canada imports (MT) of fresh cassava 2008-2012.

Exporters to Canada	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	2,753	3,150	3,319	3,327	3,948
Costa Rica	2,149	2,288	2,540	2,591	3,030
Philippines	369	613	544	496	582
Cameroon	24	41	23	46	83
Vietnam	76	69	38	56	75
Fiji	16	18	19	14	22

Source: UN International Trade Centre, 2013.

The quantity of the frozen products imported in 2011 was 3,327MT. Again, Costa Rica was the dominant supplier with 79% (Table 19).

The unit value of imports in 2011 for the fresh product was US\$0.87/kg and US\$0.91/kg for the frozen product.

Table 19. Canada imports (MT) of frozen cassava 2007-2011.

Exporters to Canada	Quantity imported, MT				
	2007	2008	2009	2010	2011
World	2,958	2,753	3,150	3,319	3,327
Costa Rica	2,308	2,149	2,288	2,540	2,591
Philippines	439	369	613	544	496
Vietnam	65	76	69	38	56
Cameroon	18	24	41	23	46
Ghana	5.0	1.4	0.6	0	43

Source: UN International Trade Centre, 2013.

8.2.2 Sweet potato

Canada imported 54,618MT of fresh or dried sweet potato and 60,076MT of fresh chilled or frozen sweet potato in 2012 (Tables 20 and 21).

Compared to the figures in 2008, imports have almost doubled for the fresh product and more than doubled for the fresh chilled/frozen product.

The USA was the main supplier for both products with over 90% sourced from that country. In 2012, Jamaica had a small share of the market (2,000MT) for both the fresh and frozen products. Their exports to this market increased by just over 50% since 2008.

The unit value of imports in 2012 for the fresh product was US\$0.72/kg and US\$0.70/kg for the frozen product.

Table 20. Canada imports (MT) of fresh and dried sweet potato 2008-2012.

Exporters to Canada	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	28,042	35,778	52,871	60,664	54,618
USA	24,112	32,164	49,331	57,342	51,522
Honduras	882	546	706	1,264	1,004
Jamaica	693	843	853	1,016	986
China	924	971	742	286	459
Vietnam	173	183	285	159	206

Source: UN International Trade Centre, 2013.

Table 21. Canada imports (MT) of fresh, chilled and frozen sweet potato 2007-2011.

Exporters to Canada	Quantity imported, MT				
	2007	2008	2009	2010	2011
World	24,962	28,042	35,777	52,871	60,676
USA	21,606	24,113	32,163	49,331	57,355
Honduras	682	882	546	706	1,264
Jamaica	592	693	843	853	1,015
China	986	924	971	742	286
Ghana	256	355	282	254	253

Source: UN International Trade Centre, 2013.

8.3 United Kingdom imports

8.3.1 Cassava

The United Kingdom imported 2,928MT of fresh and dried cassava in 2012. This was a significant reduction from the 18,254MT imported in 2008 mainly from S.E. Asia. Costa Rica was the main supplier with about 50 % of the market share in 2012 (Table 22).

The landed value of imported fresh and dried cassava in 2012 was US\$1.38/kg.

Table 22. UK imports (MT) of fresh and dried cassava 2008-2012.

Exporters to UK	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	18,254	3,146	2,942	2,485	2,928
Costa Rica	1,638	1,868	1,637	1,482	1,538
India	194	132	170	327	377
Ghana	146	261	226	20	285
Sri Lanka	43	424	437	266	133
Indonesia	0	0	0	0	123

Source: UN International Trade Centre, 2013.

8.3.2 Sweet potato

The United Kingdom imported 51,934MT of sweet potato in 2012 at a value of US\$42M (Table 23). The USA was the main supplier with 40,371MT, followed by Honduras, and China. This market has grown by 29% over the period 2008-2012.

A recent report on the EU market (Watson, 2012) noted that “demand continues to increase in the U.K, especially in the retail supermarkets, strong future market growth was projected and value-added sweet potato products were considered to have significant market potential”.

Table 23. UK imports (MT) of sweet potato 2008-2012.

Exporters to UK	Quantity imported, MT				
	2008	2009	2010	2011	2012
World	40,267	39,022	42,617	45,285	51,934
USA	22,365	27,659	32,860	36,557	40,371
Honduras	4,374	2,931	2,648	1,985	3,620
China	189	217	238	595	1,721
Egypt	701	697	1,695	1,508	1,456
Spain	335	93	358	750	1,267

Source: UN International Trade Centre, 2013.

9.0 Import Regulations

9.1 Tariffs

The CARICOM members have duty free access to the USA, Canada and UK markets under the following Free Trade Agreements:

1. U.S.A –Caribbean Basin Economic Recovery Act (CBI).
2. Canadian - CARIBCAN.
3. United Kingdom-European Union–CARIFORUM Economic Partnership Agreement.

9.2 Phytosanitary/Import Regulations

Notwithstanding that CARICOM members have duty free access to the USA, Canada and UK markets, phytosanitary regulations are in place and these are paramount in the determination of entry of products into the respective countries (Table 24). For example, sweet potato from CARICOM countries are not allowed entry into the mainland USA.

Table 24. Phytosanitary/Import regulations in major roots and tubers importing countries.

Country	Product	Import Regulations	Website addresses for Regulations
USA	Cassava	Allowed into all ports	https://epermits.aphis.usda.gov/manual/index.cfm?NEW=1&COMMOD_ID=126&ACTION=commSummCountryP
	Sweet potato	Only US Virgin Islands and Puerto Rico	
	Yam	All ports	
Canada	Cassava	All ports	Agricultural Products Act (http://laws-lois.justice.gc.ca/eng/regulations/C.R.C., c. 285/index.html)
	Sweet potato	All ports	
	Yam	All ports	
United Kingdom	Cassava	All ports	http://phytosanitarysolution.com/wp-content/uploads/2012/02/EU-LEGAL-REQUIREMENTS-FOR-IMPORTS-OF-FRUITS-AND-VEGETABLES-SUPPLIERS-GUIDE.pdf
	Sweet potato	All ports	
	Yam	All ports	

10.0 Outlook for root and tuber crops in the Caribbean Region

10.1 Food products

The production of cassava in the Region has fallen over the last few years, while that of sweet potato and yam has increased. There is very little regional trade in these products and some of the reasons are:

- (i) the level of production is still low and most of the products are consumed within domestic markets.
- (ii) phytosanitary regulations that restrict exports to USA, Canada and UK markets.
- (iii) challenges with intra-regional transport infrastructure.
- (iv) lack of market information,
- (v) very few value-added products manufactured and virtually no promotion of them.

A study (FAO, 2012) noted that there were market opportunities for roots and tubers for import substitution of white potato including frozen products such as cassava and sweet potato fries and domestically produced white potato. In addition, other new semi-processed/retail-ready roots, tubers and staples could replace products currently only cooked in households and restaurants, i.e. frozen pre-cut cassava, dasheen and eddo packs for the domestic market. This also included mixed frozen root soup packs targeting the domestic market.

At the extra-regional level the picture is similar. CARICOM has a small presence in the Canadian and UK markets and while there is a growing demand for sweet potato in major markets such as the USA and the UK, phytosanitary regulations in the former country debar the export of this commodity from CARICOM countries. This would have to be resolved if this market is to be exploited.

Prakash, 2001, noted that trade, especially within regions could be promoted through the development of local processing, the establishment of market information systems and the promotion of niche markets for novel and specialty products. Moreover, consumption by urban dwellers could be stimulated through diversification into new value-added cassava products, such as bread, biscuits, noodles, cakes, baby foods and sweeteners. With growing rates of migration, cassava food demand may also rise in developed countries, as already witnessed in Europe and North America. Furthermore, in these regions, there are indications that "non-ethnic" communities are becoming more interested in "exotic" foods such as cassava. Unfortunately, most of the "non-ethnic" market does not know what cassava is, or how to prepare it. If this particular market and indeed other markets are to expand, the product needs to be promoted.

Apart from the potential for increasing consumption through value added products, an untapped area which represents an opportunity for developing the industry is the manufacture of flour. CARICOM countries agreed in 2008 to explore options for substituting up to 15% of wheat based flour imports with flour processed from regionally produced cassava by 2013.

10.2 Non-food potential of cassava and sweet potato

10.2.1 Biofuel

In many countries, significant research has begun to evaluate the use of cassava as an ethanol biofuel feedstock. In China (China View, 2008; Wikipedia, 2013), the plan is to increase the application of ethanol fuel by non-grain feedstock to 2MMT, and that of biodiesel to 200,000MT by 2010. This will be equivalent to a substitute of 10MMT of petroleum. As a result, cassava (tapioca) chips have gradually become a major source for ethanol production. In 2007, the largest cassava ethanol fuel production facility was completed in China, with an annual output of 200,000MT, which would need an average of 1.5MMT of cassava.

Compared to corn, industrial sweet potato has the potential to produce 30% more starch per acre (Biofuels Centre of North Carolina, 2011). The high potential for starch production makes it a crop of interest for bioethanol production. However, for industrial sweet potato to be profitable for farmers to grow and be sustainable for processing into ethanol, input costs must be kept at a minimum and yield must be maximized.

10.2.2 Animal feed

Cassava is also an important animal feed worldwide. Cassava hay is produced at a young stage of the plant's growth and has high contents of crude protein (20-27%) and condensed tannins (1.5-4%). It is used as a good roughage source for dairy or beef cattle, buffalo, goats, and sheep by either direct feeding or as a protein source in concentrate mixtures.

10.2.3 Ethno medicine

Cassava leaves of the bitter varieties are used to treat hypertension, headache, and pain. Cubans commonly use cassava flour paste to treat irritable bowel syndrome, the paste being eaten in excess during treatment. Also, as cassava is a gluten-free natural starch, there have been increasing incidences of its appearance in Western cuisine as a wheat alternative for sufferers of celiac disease.

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