"Agribusiness Essential for Food Security: Empowering Youth and Enhancing Quality Products"

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Advancing the Root Crop Industry in the English Speaking Caribbean

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Abstract

Root and tuber crops have one of the highest potential for value-added development as well as capacity for addressing the food and nutrition security needs in the CARICOM region. However, it appears that the micro, small and medium enterprises, which are leading value-added activities on the ground, face several constraints to growth and development. The Inter-American Institute for Cooperation on Agriculture (IICA) and the Caribbean Agricultural Research and Development Institute (CARDI) undertook a situation assessment through a census of cassava and sweet potato processors in 7 participating countries in the region- Barbados, Dominica, Guyana, Jamaica, St. Kitts and Nevis, St. Vincent and the Grenadines and Trinidad and Tobago. The census focussed on business operations, the business and marketing environment, and financing and accessibility of business support services.

The census found that most processors are micro (56%), linked to subsistence and small-farmer farm production systems, mainly focused on cassava processing and produced a range of products using traditional methods. Major constraints were found in the processing technology; food safety management; business development for small entrepreneurs and product development. From these findings, specific evidence-based recommendations were made to inform national and regional initiatives that could support cassava and sweet potato processing in the Caribbean.

Keywords: IICA, cassava, sweet potatoes, census, food safety, product development, capacity building, value-added, Caribbean.

1.0 Introduction

1.1 Purpose of the Paper

The CARICOM[1] Region has identified cassava (*Manihot esculenta*), sweet potato (*Ipomea batatas*) and yam (*Dioscorea alata*) as the root and tuber crops with the highest potential for value-added development and for addressing the Caribbean's food and nutrition security needs. These strategies and directives have been iterated in the CARICOM Regional Food and Nutrition Security Policy[2], CARICOM Ministers' request regarding Roots and Tubers[3], IICA's Caribbean Agricultural Development Strategy 2010-2014 (www.iica.int) and CARDI's Medium Term Plans 2008-2010 and 2011-

[1] The Caribbean Community (CARICOM) is a grouping of 15 nations and dependencies in the Caribbean region. These are Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago.

[2] Council for Trade and Economic Development (COTED) 34th Special Meeting (Grenada, 14th October, 2010)

[3] Director General, IICA to Ministers of Agriculture, CARICOM caucus meeting Caribbean Week of Agriculture (Grenada, October, 2010)

2013 (Commodity Development Programme, Roots and Tubers).

Past studies have included evaluations of some regional sweet potato varieties suitable for processing into downstream products undertaken by the Caribbean Agricultural Research and Development Institute (CARDI)[4], roots and tubers projects funded by the Common Fund for Commodities (CFC) and a fairly detailed assessment of the root crop processing sector in Dominica Wickham[5] (2009). However, the development and promotion efforts of the root and tuber processing sector within regional markets is an identified focus, and requires adaptive technology transfer and upgrading of existing processing and product development technologies, availability of characterized quality planting material, education, training and capacity building of producers and processors for attaining the critical mass necessary for sustainable impact.

The objectives of the paper are twofold: firstly to present the findings of a situation assessment[6] of cassava and sweet potato processors that was conducted through a census of processors in 7 CARICOM countries - Barbados, Dominica, Guyana, Jamaica, St. Kitts and Nevis, St. Vincent and the Grenadines and Trinidad and Tobago and secondly to contribute to the design and implementation of the broader programme for enhancing the competitiveness and sustainability of value-added processing of roots and tubers in the Caribbean through the transfer of improved technologies.

1.2 Background

1.2.1 Supporting Food and Nutrition Security

Root and tuber crops have high nutritive and starch content (Moorthy 2000), providing ample amounts of Vitamin A, Vitamin C, protein, fibre, and many essential nutrients. As an example, sweet potato has comparatively high contents of vitamins A, C and E, antioxidants that are important in reducing the risk of heart disease and cancer, and also enhancing nutrient metabolism (Men's Health 2012). Sweet potato is also an excellent source of copper, manganese, potassium, iron and vitamin B-6 – micronutrients that are often lacking in the diet (Linus Pauling Institute 2011).

Many of the developing world's poorest producers and most undernourished households depend on roots and tubers as a contributing, if not principal, source of food and nutrition (Scott et al. 2000). These crops are efficient in their production of food energy per calorie of labour input (Hahn et al. 1979), tolerant to extreme stress conditions as well as being suited to local farming conditions (from small-scale to commercial) making them good choices for combating food insecurity at multiple levels but particularly at the micro/household level. Root and tuber crops are a traditional part of life for many people around the world, including the Caribbean.

1.2.2 Sustainable Economic Development

Most root and tuber crops – especially cassava and sweet potato - can be substituted in virtually any recipe that calls for apples, squash or white (Irish) potatoes (Bailey 2012). In addition, through new food processing techniques, corn and wheat can be replaced in everything from pasta to breakfast cereals. Even small inroads in these areas could contribute to reducing CARICOM's escalating food import bill while also supporting sustainable, competitive industries at home. Incremental investments in value addition can have substantial

[4] In collaboration with University of the West Indies (UWI) St. Augustine and the National Agricultural Research Centre for Kyushu Okinawa Region (KONARC -Japan)

[5] Root Crop Processing – Commonwealth of Dominica TCP/DMI/3201; March 2009

[6] The assessment was part of a regional project *on "Enhancing the value-added processing of roots and tubers in the Caribbean through the transfer of improved technologies". This project was a collaboration* between the Inter-American Institute for Cooperation on Agriculture (IICA) and the Caribbean Agricultural Research and Development Institute (CARDI).

potential benefit to the overall competitive position of developing countries such as in the Caribbean (IFAD 2008).

1.2.3 Market Potential and Development: Opportunity, Appeal and Growth Prospects

CARICOM cassava and sweet potato producers have traditionally delivered primary products (tubers) for lucrative fresh consumption markets, but important food market opportunities exist in miscellaneous edible residues, cereal and cereal foods, and baby foods. Thus, there are opportunities for investment into primary and secondary processing. Investment opportunities can arise from endemic/indigenous advantages that favour and support sustainable local production; technological advances which expand the productive potential for utilising roots and tubers (for example, food extrusion); consumption trends/patterns which create market/marketing opportunities for products derived from root and tuber crops; market access criteria which are important to market participation; and value chain coordination, which includes interventions for a more enabling operating environment.

2.0 Methodology for Data Collection on the Root and Tuber Industry

A census on cassava and sweet potatoes processors was conducted in mid-2011 in seven Caribbean countries - Barbados, Dominica, Guyana, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, and Trinidad and Tobago. Prior to administering the census instrument a pre-census exercise was carried out to develop lists of cassava and sweet potato processors in each country with contact information and basic data on their operations. The IICA and CARDI Offices in each country undertook the task of building the lists from various sources, such as Ministries of Agriculture, Bureau of Standards, and displays on supermarket shelves. This pre-census exercise identified 83 establishments.

The census questionnaire was developed and pre-tested before full data collection was started. The questionnaire comprised of the following main sections: Administrative Details; Business Characteristics; Labour; Training; Root Crop Processing Details; Marketing; Finance/Business Support; and Group/Other Processors. The questionnaire contained questions to allow for an examination of the linkages between processing and production and marketing/consumption. Trained enumerators with close supervision by the various IICA/CARDI offices administered the questionnaire over a period of two weeks. The data was collated and analysed using the software Microsoft Excel (Microsoft Office 2010) and SPSS Statistical packages (2009).

3.0 Presentation of Census Findings

A total of 80 agro-processors of cassava and sweet potato were interviewed. The distribution of agro-processors across the seven countries is provided in Table 1. Six of the 80 questionnaires were incomplete. It was also found that twenty-two of the eighty establishments processed both cassava and sweet potato. Table 1 also differentiates the figures for the twin island State of Trinidad and Tobago (T&T) due to the difference in size of establishments between the two islands. The data showed that 75% of the establishments in the twin-island Republic are in the island of Tobago.

3.1 Overview of the Operating Environment

Overall, the processing activities of Caribbean processors/operators are focused on cassava. Most operators (71.3%), process only cassava with 20% processing both cassava and sweet potato and just 7.5% processing only sweet potato. The majority of these processing enterprises (56%) exist as sole ownerships, partnerships and family enterprises (i.e. micro-enterprises) with 0 - 2

employees. The greater proportion of processors operate out of a separate, dedicated processing space at home (31%), dedicated facility space away from the home (28%) or in a home kitchen (28%). Micro-enterprises were mainly based in the home kitchen or a separate and dedicated processing space at home. Larger enterprises used dedicated facilities away from the home. Communal facilities were in the minority (11%) and largely restricted to Dominica.

3.1.1 Experience, Training and Expertise

Although many of the owners/managers/ senior-level staff had not received much formal education (often not going beyond the primary school level), they tended to be well-experienced (often with 11 years or more) in processing. The processing operations of most establishments (62.5%) were based on training in traditional knowledge/methods of root-crop processing (Table 2). This was the major source of knowledge in every country except Barbados: 76.9% of respondents in Dominica, 75% in Guyana, 63.6% in St. Vincent and the Grenadines, and 79.2% in Trinidad and Tobago. In Barbados and St. Kitts and Nevis, 'formal training courses' and a 'mixture of tradition and formal training courses' were significant. Apprenticeships were more common in St. Vincent and the Grenadines and Jamaica.

The majority of managerial/technical personnel (73%) received their training from Government agencies. Processors in Dominica and Jamaica, in particular, have relied exclusively on Government training whereas Barbados, St. Kitts and Nevis and Trinidad and Tobago relied mostly on private (national and international) institutions for their training.

3.1.2 Employment

Companies, co-operatives and other collaborative forms of operation on average, employed more staff (between 10 – 20 employees and with manager-level opportunities), but sole ownerships were the main employers amongst operations between 1 to 20 employees.

3.1.3 Profitability

The majority of cassava (83%) and sweet potato (80%) processors consider their operations to be profitable (Table 3). The State enterprises (2 of 3 for cassava; 2 of 2 for sweet potato) were the notable standouts as the group in which loss-making establishments outnumbered the profit-making ones. In examining the country data, Dominica's loss-making enterprises ranged the highest at 45% for cassava, whereas Barbados reported 100% loss-making establishments for sweet potato. The other countries reported less severe loss-making for cassava and sweet potato establishments.

3.2 Business and Marketing Environment

3.2.1 Processing Arrangements

The region processes a larger range of cassava than sweet potato varieties. Overall, the data suggest that processors are far more particular about the choice of sweet potato variety as compared to cassava. A total of 22 varieties of cassava and 13 varieties of sweet potato are being used. The most popular varieties are presented in Table 4.

3.2.2 Procurement of Cassava and Sweet Potato Raw Materials

The majority of enterprises have a low throughput of raw material. This reflects their typical small size. Close to 65% of the cassava processors purchase less than 1,000 pounds of cassava per month. At 20 working days per month, 1,000 lbs of raw material equates to 50 lbs per day. However, all processors indicated that they receive adequate supplies of both cassava and sweet potato. Processors sourced the majority of their raw material from a few main sources. The most popular were middle men, contract

farmers, the local wholesale market and their own farms.

3.2.3 Product Diversity

The region processes a much wider range of value-added products from cassava than it does from sweet potato. Figures 1.A-7.B show the range of products produced by the respective countries. St. Kitts and Nevis showed the greatest diversity of products for both cassava and sweet potato. Notwithstanding the range of products being developed, they remained largely in the scope of minimal processing and indicate a need for greater investment in product development from root and tuber crops.

3.2.4 Product Demand

Most processors (cassava and sweet potato) face a situation of excess demand for their products. For cassava, 48% of respondents said that the demand for the product was greater than the supply (Table 5). Just 16% said that there was no excess demand and 36% said that this was occasional/sometimes. For cassava, all countries had establishments reporting excess demand for at least part of the year as shown in Table 5. Adding the 'yes' and 'sometimes' responses suggest that the large majority (in excess of 80%) of cassava processors have a situation of excess demand - for at least part of the year. In the case of sweet potato only 27% of processors claimed to have unmet demand for their products whereas 54% of the processors indicate that demand exceeds supply.

3.2.5 Market Behaviour

Another observation was the close association of processors with their customers. A significant number of cassava and sweet potato processors reported having received special requests to develop a specific product. Thirty-one (31) of 71 cassava processing establishments (44%) across the 7 countries reported that they received a request to develop a specific product (Table 6). More than 50% of the cassava processing establishments that received such requests were sole owners.

3.2.6 Business Sophistication and Development

One of the dimensions of business sophistication and commercial orientation covered in the data gathering process was branding where 60% of cassava processors and 48% of sweet potato processors had no registered brand. The notable exception was Jamaica where all cassava processing establishments had registered brands.

3.2.7 Legal and Regulatory Requirements

Most respondents reported that their business was not registered with the relevant authorities. Only 30 out of 80 establishments (38%) were registered. The larger proportion (50%) said that they were not registered and 13% did not provide an answer to the question. Most unregistered businesses were in Dominica (all 13), Tobago (12/18), St. Kitts and Nevis (6/7), and Trinidad (3/6). The most registered establishments were in Guyana (7/8 with the exception being a sole owner), Jamaica (10/13, with 3 not stated), Barbados (3/4 with the exception being a 'sole ownership'); and St. Vincent and the Grenadines (5/11 with 2 not stated and the 4 unregistered being of the 'sole ownership' form). Along a similar pattern, a significant number of cassava and sweet potato establishments (82.5%) were unaware of the Food Safety regulatory agencies within their own country. This was most common amongst sole ownership and family operations.

3.3 Business Support Services and Financing

3.3.1 Business Support Services

The survey showed that processors receive a range of business support services from both Government and other national, regional and international partners. However, even when support services were available, most institutions did not make use of or had not received them (Figure 8). Even the most commonly accessed source of business support services, the Government, was low (20%).

On average, only 28 processors from the 51 who access the various support services (55%) received some level of satisfaction. In general, respondents were mostly satisfied with research and development institutions support (77%) followed by marketing institutions (71%), networking and government institutions (both 50%) and international organizations (33%) support (Figure 9). Only 2 processors made use of the support services offered by financial institutions, however, none were satisfied (0%). While networking accounted for 50% satisfaction, only 4 processors from a total of 80 processors access the services with just 2 being satisfied. Dominican processors stood out in that they did not make use of any provider of business support services. In addition, some processors (16%) were themselves members of a support organisation or body providing support services.

3.3.2 Financing

The main source of financing for processors of cassava and sweet potato (88%) was 'own funds/reinvestment'. The only other source of financing of note was commercial banks, reported by 7 of the 80 (8.8%) processors. Commercial bank loans were significant for processors in Guyana (2/6) and Jamaica (2/11). Jamaica and Guyana are two countries with larger commercial processors, thus commercial orientation and size may be a factor in loans from the commercial banks. Loans from Agricultural Banks were of note only in Jamaica and Trinidad and Tobago (1 each). Government assisted loans (1 each) were used in Jamaica, St. Kitts and Nevis and Trinidad and Tobago. One (1) processor in St. Kitts and Nevis reported a loan from a credit union. One processor in Barbados reported a foreign grant. The disaggregated data for Trinidad and Tobago show that all 18 producers in the island of Tobago relied on "own funds/reinvestment" while those in the island of Trinidad relied on a mix of loans and own/reinvestment of funds.

3.4 Preferred Interventions

The main issues affecting processors were limited access to finance, inappropriate machinery, high input costs, a lack of business and marketing support, marketing problems and product presentation. Figure 10 provides information on their priority solutions proposed by processors for improving competitiveness.

These were proposed as the most essential interventions for addressing their major concerns; namely: limited access to finance, inappropriate machinery, costly inputs, a lack of business and marketing support, and product presentation. Table 7 is a simplified representation of processor priorities for improving their processing operations juxtaposed against their ability to respond in the short to medium term. In effect, it identifies those areas with high priority and to which processors may be able to respond to in the short to medium term as the most highly recommended interventions for real impact on processor performance. These are primarily areas for business operations improvement (labelling and packaging; more efficient peeling), processor capacity building (training in food safety, best practices and innovations and use of technology) and related areas such as corresponding upgrades to processing facilities and research into product development. Table A.1 in the Appendix gives additional indications for training/capacity building.

Given that the majority of cassava processors (82%) and sweet potato processors (67%) are interested in altering their processing practices and business operations to increase profits, this is insightful

and builds a case for introducing new interventions on a wide scale in areas that offer additional scope for enterprise development and competitiveness.

4.0 Recommendations and Conclusions

4.1 Recommendations

Considerable support for the expansion of value-added processing of roots and tubers at all levels are required for improving food and nutrition security, enterprise development and in creating sustainable livelihoods. Although the majority of processors reported that their enterprises were profitable (82% of cassava processors and 80% of sweet potato processors), there were several indicators of unrealised potential, validated by the stated concerns/hindrances to operations.

4.1.1 Improving/Innovating Processor Operations

Processor operations can be improved through management practices including business and food safety management. These are important interventions to allow processors to firstly realise the potential benefits of improving their product within the scope of their current operations. An audit of current processor practices to specify corrective management practices in the process is required. This should also include capacity building in working capital and financial management which was identified as an important area for training.

Specific attention is recommended for interventions in area of food safety as most processors operate out of home kitchens and/or special facilities at home. The approach to doing so should be holistic and follow along a harmonious set of food safety principles and Good Manufacturing Practices (GMPs) such that the processor is also influenced to produce safer and more standardised products. This process could also see closer cooperation with local food safety agencies to create a basis for higher processor registration with food authorities to ensure food safety compliance.

4.1.2 Facilitating Technology Transfer and Capacity Building

Opportunities for networking and building collaborative advantages are key in technology transfer and capacity building initiatives for processors. Although few processors are currently members of networking associations/group, local collaboration offers opportunities for creating critical mass which would improve the cost-effectiveness and reach of on-going and future interventions in training, capacity building and general access to information, technical and technological resources.

Training also featured highly in priority areas on intervention (Table 7). Appendix 1 presents preferred areas for capacity building of processors as evidenced by their “interest and willingness” to participate in these sessions.

4.1.3 Support Systems

Research and development institutions were the preferred suppliers of business support services while Government programmes were the most accessed. Joint interventions provide an opportunity for improving the effectiveness of support systems and their delivery mechanisms through greater cooperation amongst the preferred service providers. This would greatly reduce overall costs and avoid unnecessary duplication of efforts. Moreover, Government, as a strategic partner could best facilitate the expanded involvement, cooperation and reach of services provided. This collaboration could be most effective in addressing:

a) Limited access to financing - for example, through a micro-enterprise fund to support business development for micro and small entrepreneurs. The aim of this fund would be to supplement the re-investment practice that most processors are already performing to finance their operations by filling a ‘gap’ not currently attended by banks and other lending

organisations. By establishing a revolving fund system, micro-enterprises can access finance to invest in small-scale/appropriate mechanisation and expansion of their operations.

b) Access to suitable small scale processing equipment – which remains very difficult in the region. Collaborative operating models could make investment more feasible and sustainable.

4.1.4 Value Chain Coordination

The production system for cassava and sweet potato processors requires careful selection of variety based on the end use given operational and market acceptance criteria. Table 8 identifies preferred improvements of raw inputs to support processing operations.

Noteworthy is the fact that the stringiness of both the cassava and sweet potato root/flesh and thickness of the cassava root skin were not major issues to most processors, although the latter may have influenced responses for ease of peeling which was a frequently requested improvement.

Cassava processors (48%) and sweet potato processors (73%) in the surveyed countries also noted that they experience unmet demand for their products. Further, some processors have experienced special requests to develop new products, giving evidence of avenues for increasing profitability and expanding the scope for business development. However, the production scale (i.e. low throughput/turn-over of raw material) may have affected the requirements of the processing activities (i.e. duration of operations or low scale of operation) effectively hindering processors from responding to market demand.

In meeting excess demand, careful coordination between supplies of raw materials, processing activities including equipment and movement to the market/buyers is needed. This may be facilitated through a commodity chain partnership system for establishing formal linkages between processors of varying scale with producers and other partners in the sub-sector to create and/or exploit areas of collaborative benefit such as: supply coordination, advisory services on packaging and labelling (i.e. sourcing bottles, labels, etc.); improved storage methods; and bulk purchase of common production inputs effectively making production costs lower for processors in the partnership system. A great opportunity also exists for entrepreneurs in manufacturing small scale equipment to meet the region's needs.

4.2 Conclusion

Processors are willing to expand and improve their practices, but interventions outlined above are needed in the short-term, and in the longer-term, to facilitate an enabling environment for processors to access business support and financing for their operations. IICA promotes an essential element of this enabling environment through strengthened regional and hemispheric integration, horizontal technical cooperation and institutional collaboration in research and development in the Caribbean and Latin American. This collaboration could identify and provide the much needed interventions to processors.

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Table 1: Distribution of establishments identified in the pre-census exercise and the interview process

Country	Total from pre-census exercise	Interview Status			Total No. of Questionnaires Analysed
		Completed	Partially completed	No longer processing	
Barbados	4	4	0	0	4
Dominica	14	12	1	1	13
Guyana	8	8	0	0	8
Jamaica	13	12	1	0	13
St. Kitts and Nevis	9	7	0	2	7
St. Vincent & Grenadines	11	11	0	0	11
Trinidad and Tobago	24	20	4	0	24
Total (nos)	**83**	**74**	**6**	**3**	**80**
T&T data separated					
Trinidad	6	5	1	0	6
Tobago	18	15	3	0	18

Table 2: Methods by which persons in charge of processing gained knowledge of processing techniques by country (percentage distribution of respondents)

Country	Method of processing knowledge transference (%)						Total
	Traditions	Formal training courses	Apprenticeship in an operating establishment	A mixture of tradition & formal courses	Other	Not Stated	
Barbados	0.0	25.0	0.0	25.0	50.0	0.0	100
Dominica	76.9	0.0	0.0	0.0	0.0	23.1	100
Guyana	75.0	0.0	12.5	12.5	0.0	0.0	100
Jamaica	38.5	23.1	15.4	15.4	7.7	0.0	100
St. Kitts and Nevis	42.9	28.6	0.0	28.6	0.0	0.0	100
St. Vincent	63.6	9.1	18.2	9.1	0.0	0.0	100
Trinidad & Tobago	79.2	4.2	8.3	4.2	4.2	0.0	100
Total (%)	**62.5**	**10.0**	**8.7**	**10.0**	**5.0**	**3.8**	**100**
Total No. Processors	**50.0**	**8.0**	**7.0**	**8.0**	**4.0**	**3.0**	**80**
T&T data separated							
Trinidad	50.0	16.7	33.3	0.0	0.0	0.0	100
Tobago	88.9	0.0	0.0	0.0	5.6	5.6	100

Table 3: Number of establishments by type of ownership with profitable operations for cassava and sweet potato products among all the countries

Type of ownership	Profitable cassava Operations			Profitable sweet potato operations		
	Yes	No	Total	Yes	No	Total
Sole owner	33	7	40	13	2	15
Partnership	7	0	7	3	0	3
State	1	2	3	0	2	2
Company	5	0	5	2	1	3
Co-operative	3	1	4	1	0	1
Family	7	1	8	4	0	4
Other	1	1	2	1	1	2
Total Amt	**57**	**12**	**69**	**24**	**6**	**30**
Percentage	**83%**	**17%**	**100%**	**80%**	**20%**	**100%**

Table 4: Preferred varieties of cassava and sweet potato used by processors

Cassava	Sweet Potato
1. MX cassava 2. Bitter cassava 3. Butter stick 4. Sweet cassava	1. Black vine 2. Chicken foot 3. Red skin 4. White skin

Table 5: Number of establishments by country indicating whether the demand for cassava and sweet potato products exceed their supply

Country	Demand for cassava product(s) greater than supply				Demand for sweet potato product(s) greater than supply			
	Yes	No	Sometimes	Total	Yes	No	Sometimes	Total
Barbados	2	2		**4**		2	1	**3**
Dominica	3	2	7	**12**			0	**0**
Guyana	4		4	**8**	1	1	0	**2**
Jamaica	3	1	6	**10**	2	2	2	**6**
SKN	1	3	3	**7**	2	1	1	**4**
SVG	5	2	1	**8**	0	2	2	**4**
T&T	17	2	5	**24**	11		0	**11**
Total (nos)	**35**	**12**	**26**	**73**	**16**	**8**	**6**	**30**
Total %	**48**	**16**	**36**	**100**	**54**	**27**	**20**	**100**
Trinidad	2	1	3	**6**	2			**2**
Tobago	15	1	2	**18**	9			**9**

Table 6: Number of establishments by type of ownership with requests for development of specific cassava and sweet potato products

Type of ownership	Request by Customers for the development of a specific cassava product			Request by customers for the development of a specific sweet potato product		
	Yes	No	Total	Yes	No	Total
Sole owner	17	26	43	3	12	12
Partnership	3	4	7	1	2	2
State	2	1	3	0	2	2
Company	1	3	4	1	2	2
Co-operative	2	2	4	0	1	1
Family	4	4	8	2	2	2
Other	2	0	2	2	0	0
Total (nos)	**31**	**40**	71	**9**	**21**	**21**
Total (%)	**44**	**56**	**100**	**30**	**70**	**100**

Table 7: Priority improvements desired by cassava and sweet potato processors based on responses

Priority				
		▪ Labelling and packaging (67.5%) ▪ Food safety training (61.3%) ▪ More efficient peeling process (60%)	▪ Equipment/technological training (60%)	▪ More use of advanced equipment/technology (73.8%) ▪ Greater mechanisation of operations (60%)
		▪ Training in best practices and innovation (58.8%)	▪ Upgrading facilities to food safety standards (53.8%)	
		▪ More research into (new) product development (57.5%)		
				▪ Working capital and financial management (48.1%)
				▪ Expanding the existing structure (46.3%)
High				**Low**
Processor Ability to Respond in the Short to Medium Term				

Table 8: Preferred improvements in cassava and sweet potato – regional and country specific (ranked)

Cassava		**Sweet Potato**	
1. Ease of peeling (29%) 2. Improved uniformity of root size (21%) 3. Improved uniformity of root shape (19%)		1. Improved uniformity of tuber size (31%) 2. Improved uniformity of tuber shape (29%) 3. Ease of peeling (20%)	
Country	**Preferred Characteristic Improvements**	**Country**	**Preferred Characteristic Improvements**
Barbados	uniformity of root size, uniformity of shape and thickness of the skin	**Barbados**	uniformity of root size and uniformity of shape
Dominica	uniformity root shape and ease of peeling	**Dominica**	None (no sweet potato is processed in Dominica)
Guyana	uniformity of root size, uniformity of shape, ease of peeling, uniformity of flesh colour and stringiness of root flesh	**Guyana**	uniformity of root size, uniformity of shape, ease of peeling, uniformity of flesh colour
Jamaica	ease of peeling, uniformity of root size and stringiness of root flesh	**Jamaica**	uniformity of tuber size
St. Kitts & Nevis	uniformity of root size, uniformity of shape and ease of peeling	**St. Kitts & Nevis**	uniformity of root size, uniformity of shape, uniformity of flesh colour
St. Vincent & the Grenadines	uniformity of root size, uniformity of shape, ease of peeling and thickness of the skin	**St. Vincent & the Grenadines**	uniformity of root size
Trinidad & Tobago	uniformity of root size, ease of peeling and uniformity of shape	**Trinidad & Tobago**	uniformity of root size, uniformity of shape and ease of peeling

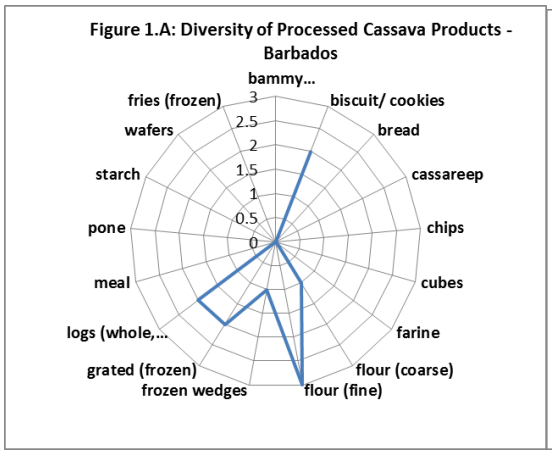


Figure 1.A: Diversity of Processed Cassava Products - Barbados
bammy...
biscuit/ cookies
bread
cassareep
chips
cubes
farine
flour (coarse)
flour (fine)
frozen wedges
grated (frozen)
logs (whole,...
meal
pone
starch
wafers
fries (frozen)
0
0.5
1
1.5
2
2.5
3

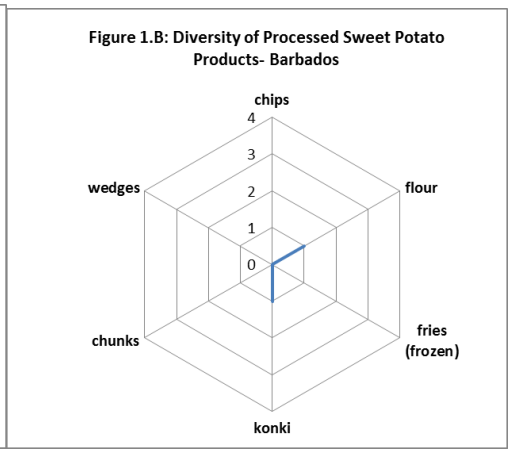


Figure 1.B: Diversity of Processed Sweet Potato Products- Barbados
chips
flour
fries (frozen)
konki
chunks
wedges
0
1
2
3
4

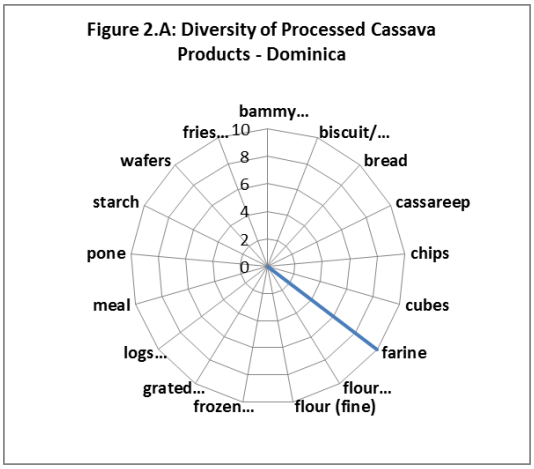


Figure 2.A: Diversity of Processed Cassava Products - Dominica
bammy...
biscuit/...
bread
cassareep
chips
cubes
farine
flour...
flour (fine)
frozen...
grated...
logs...
meal
pone
starch
wafers
fries...
0
2
4
6
8
10

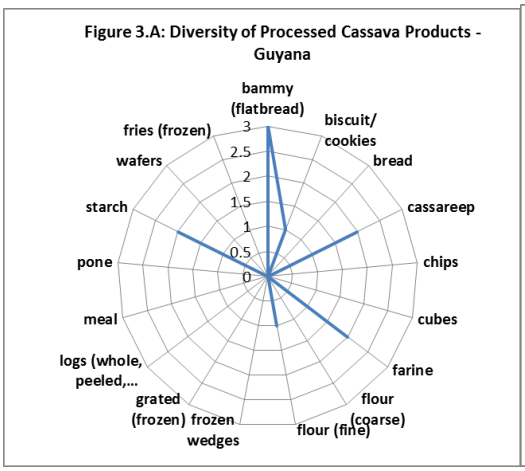


Figure 3.A: Diversity of Processed Cassava Products - Guyana
bammy (flatbread)
biscuit/ cookies
bread
cassareep
chips
cubes
farine
flour (coarse)
flour (fine)
frozen wedges
grated (frozen)
logs (whole, peeled,...
meal
pone
starch
wafers
fries (frozen)
0
0.5
1
1.5
2
2.5
3

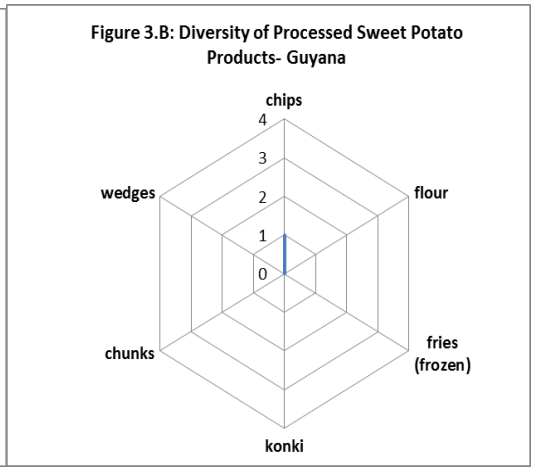


Figure 3.B: Diversity of Processed Sweet Potato Products- Guyana
chips
flour
fries (frozen)
konki
chunks
wedges
0
1
2
3
4

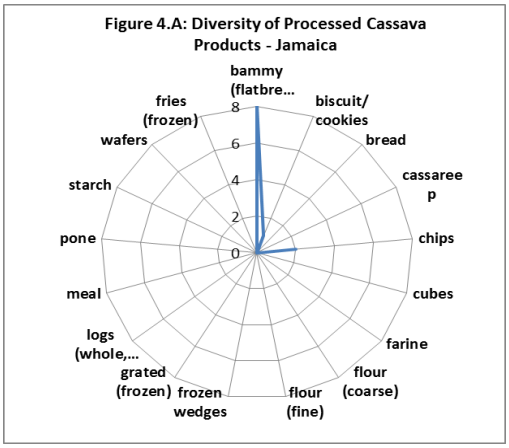


Figure 4.A: Diversity of Processed Cassava Products - Jamaica
bammy (flatbre...
biscuit/ cookies
bread
cassaree p
chips
cubes
farine
flour (coarse)
flour (fine)
frozen wedges
grated (frozen)
logs (whole,...
meal
pone
starch
wafers
fries (frozen)
0
2
4
6
8

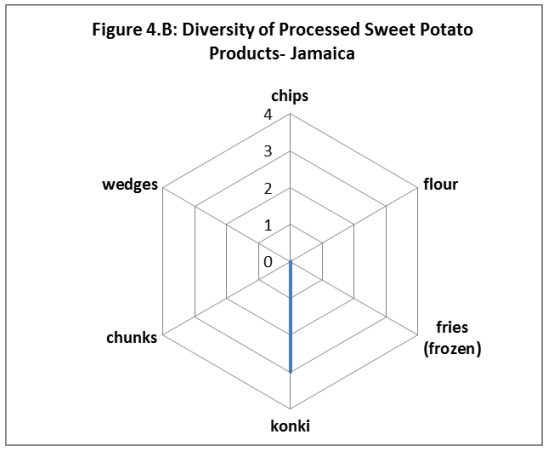


Figure 4.B: Diversity of Processed Sweet Potato Products- Jamaica
chips
flour
fries (frozen)
konki
chunks
wedges
0
1
2
3
4

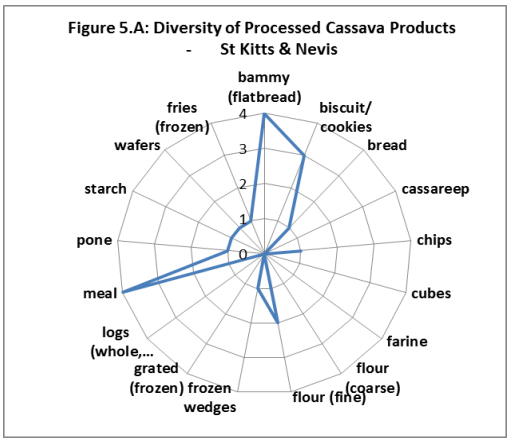


Figure 5.A: Diversity of Processed Cassava Products - St Kitts & Nevis
bammy (flatbread)
biscuit/ cookies
bread
cassareep
chips
cubes
farine
flour (coarse)
flour (fine)
frozen wedges
grated (frozen)
logs (whole,...
meal
pone
starch
wafers
fries (frozen)
0
1
2
3
4

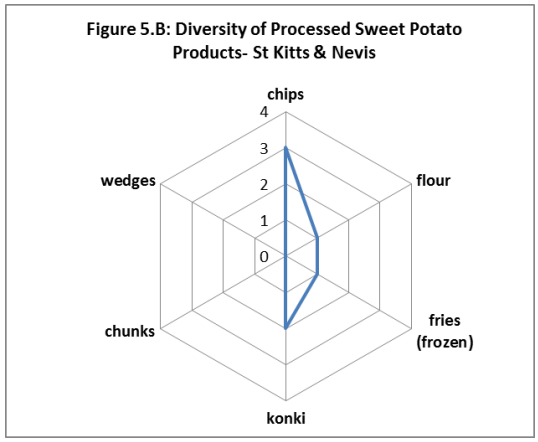


Figure 5.B: Diversity of Processed Sweet Potato Products- St Kitts & Nevis
chips
flour
fries (frozen)
konki
chunks
wedges
0
1
2
3
4

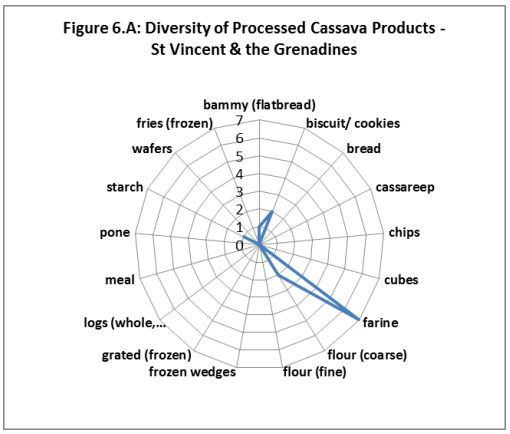


Figure 6.A: Diversity of Processed Cassava Products - St Vincent & the Grenadines
bammy (flatbread)
biscuit/ cookies
bread
cassareep
chips
cubes
farine
flour (coarse)
flour (fine)
frozen wedges
grated (frozen)
logs (whole,...
meal
pone
starch
wafers
fries (frozen)
0
1
2
3
4
5
6
7

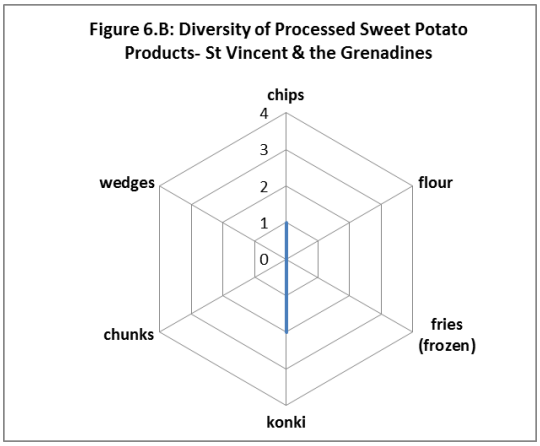
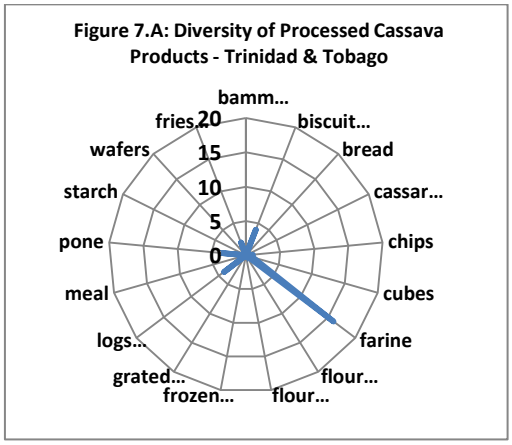
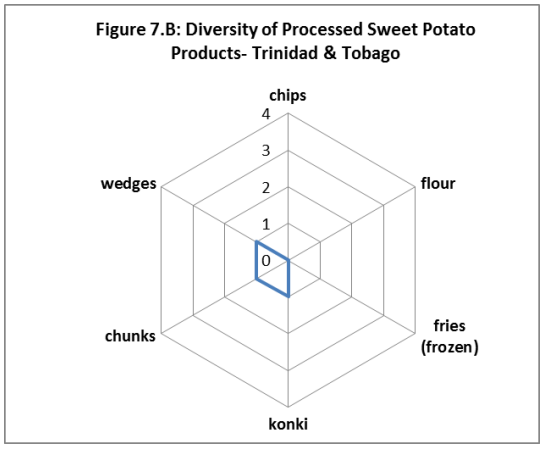


Figure 6.B: Diversity of Processed Sweet Potato Products- St Vincent & the Grenadines
chips
flour
fries (frozen)
konki
chunks
wedges
0
1
2
3
4





Figures 1.A – 7.B: Diversity of Cassava and Sweet Potato Value-Added Products in Individual Countries[7]

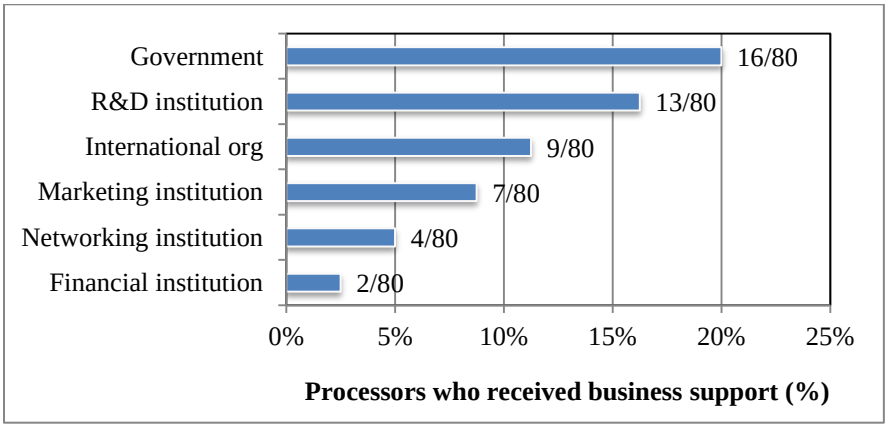


Figure 8: Rate of access to business support services from various providers

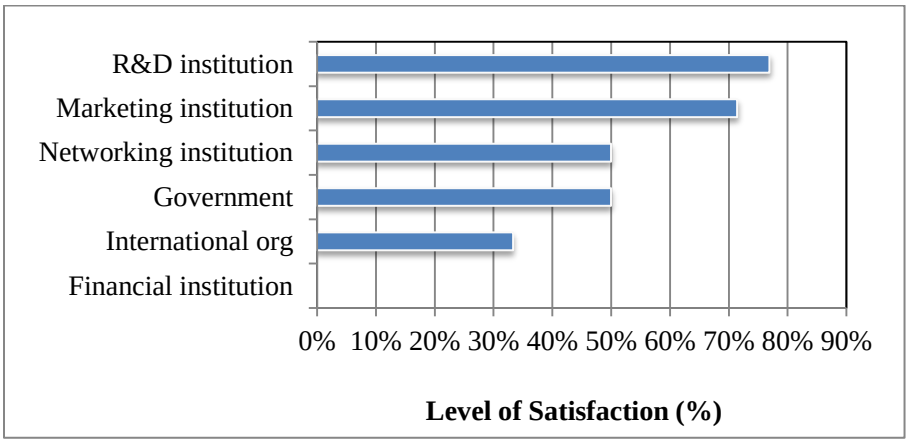


Figure 9: Level of satisfaction (%) with various suppliers of business support services

[7] Note that for Dominica, no sweet potato processing was observed.

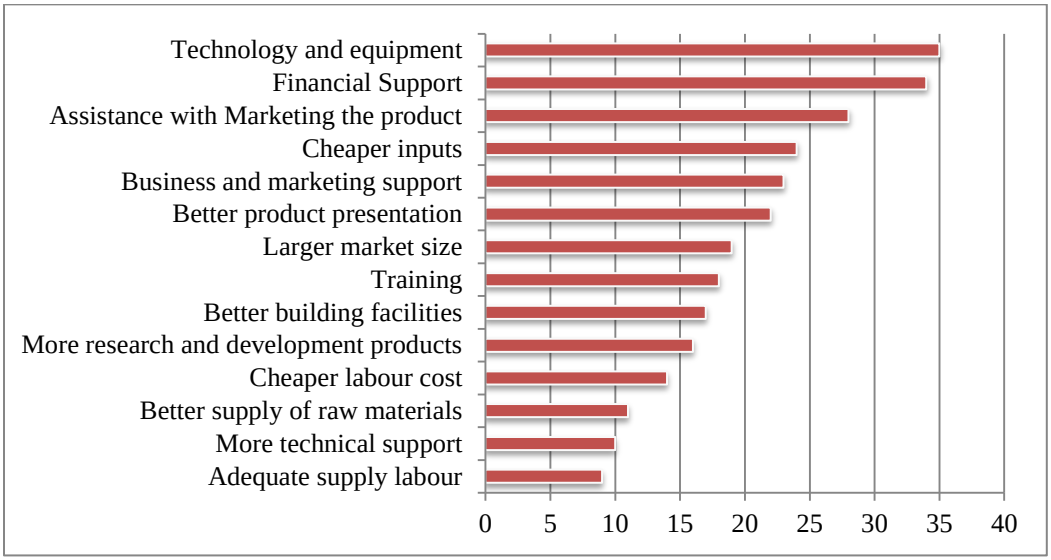


Figure 10: Priority solutions proposed by processors for improving competitiveness

Appendices

Appendix 1: Percentage distribution of responses on training courses that respondents are "interested and willing" to take

Country	Respondents on Need for Training Courses (%)								
	Product processing	Product quality	Better positioning business within food industry	Good agricultural practices	Good manufacturing practices	Food safety	Agro-processing machinery & equipment	Exporting to EU,US regional markets	Packaging & labeling
Barbados	80.0	60.0	100.0	60.0	100.0	80.0	80.0	100.0	100.0
Dominica	71.4	78.6	71.4	85.7	85.7	85.7	42.9	50.0	85.7
Guyana	95.0	95.0	95.0	75.0	95.0	95.0	95.0	70.0	95.0
Jamaica	14.0	18.6	18.6	7.0	14.0	16.3	14.0	11.6	11.6
SKN	80.0	80.0	80.0	50.0	80.0	80.0	80.0	80.0	80.0
SVG	80.0	80.0	86.7	86.7	80.0	86.7	80.0	86.7	86.7
T&T	51.9	44.4	55.6	37.0	48.1	63.0	66.7	55.6	55.6
Trinidad	41.2	41.2	47.1	29.4	41.2	41.2	52.9	41.2	41.2
Tobago	70.0	50.0	70.0	60.0	60.0	100.0	90.0	80.0	80.0
Avg (%)	**64.8**	**60.9**	**69.4**	**54.5**	**67.1**	**72.0**	**66.8**	**63.9**	**70.6**