Ajouter de la valeur aux aliments locaux pour assurer la sécurité alimentaire et nutritionnelle : mythe ou option stratégique ?

Feuille de route pour la fondation d'une industrie durable du manioc en Jamaïque

Rapport
de
l'atelier sur la chaîne de valeur du manioc
29 novembre, Kingston, Jamaïque

par

Chadwick Anderson PhD

Conseiller de projet

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Résumé

La Feuille de route sur la chaîne de valeur du manioc a été développée à partir des conclusions d'un atelier national organisé le 29 novembre 2012 à Kingston (Jamaïque) et auquel ont participé près de 60 représentants d'un large éventail de parties prenantes. L'atelier national a constitué le prolongement de l'atelier régional *Ajouter de la valeur aux aliments locaux pour assurer la sécurité alimentaire et nutritionnelle : mythe ou option stratégique ¡V Valoriser la recherche, l'innovation et l''entreprenariat*, du 26 au 29 novembre. Des experts industriels, des chercheurs et des professionnels ont fourni des présentations clés sur différents aspects de l'industrie, y compris ses lacunes, et ont proposé plusieurs solutions ou options à prendre en compte. Les principaux intervenants ont été M. Sean Black, coordinateur national, CARDI, Jamaïque ; Dr Ian Thompson, conférencier en sciences de l'alimentation, Université des Indes occidentales ; M. Shane Healy, responsable des opérations, Red Stripe ; Dr Derrick Deslandes, conférencier en Marketing, Université des Indes occidentales et consultant au Ministère de l'agriculture et de la pêche. Les quatre points principaux abordés par les intervenants sont les suivants :

- CARDI dispose actuellement d'un programme actif de recherche sur le manioc. M. Black a souligné que les producteurs de manioc en Jamaïque sont en concurrence avec les autres producteurs dans le monde. Il est nécessaire de développer des coopératives afin d'utiliser des approches basées sur des systèmes de haute technologie modernes.

- La Jamaïque pourrait produire annuellement 63 700 tonnes de manioc frais dans vingt grandes exploitations (d'une surface totale de 4862 ha) et utiliser une technologie mécanisée/semi-continue pour la production et la transformation. D'après le Dr Ian Thompson, elle pourrait ensuite remplacer, au même prix, la farine de blé par de la farine de manioc.

- Red Stripe, le principal producteur de bières, souhaiterait utiliser 40% de matières premières locales d'ici 2016. M. Healey a fait savoir que dans un système de production intégré, Red Stripe était prêt à donner à la région 35 USD/tonne de manioc et que ce prix pourrait être atteint avec des rendements de 60 tonnes par hectare. Il a fait part de son inquiétude quant à l'actuel niveau de toxicité et a observé que Red Stripe aurait idéalement besoin d'une variété de manioc sans cyanure.

- Un défi culturel persiste. Il doit être reconnu et relevé afin que l'industrie du manioc puisse prospérer et répondre aux demandes des consommateurs. Le Dr Deslandes a précisé que toute tentative à venir devrait être minutieusement programmée et mise en œuvre, et devrait se concentrer intensivement sur la R&D.

Tous les intervenants ont évoqué les faibles rendements actuels des racines fraîches de manioc. Toutefois, le Dr Thompson et M. Healy ont fait état de rendements actuels compris entre 10 et

13,1 tonnes par hectare. Ceux-ci représentent actuellement entre 25 et 35 % des rendements estimés figurant dans les publications de Bodles et du Département de planification économique du Ministère de l'agriculture et de la pêche. Par conséquent, le besoin de croissance de la production est important au sein de la chaîne de valeur du manioc.

M. Ian Ivey (Next Corporation) a ensuite invité les participants à analyser plus avant les problèmes soulevés lors des présentations des séances en groupe de travail et à soumettre les composantes d'une feuille de route qui permettra à l'industrie de progresser. Au cours d'un débat animé, l'UTech a révélé qu'à la suite de ses recherches, elle avait mis au point plusieurs recettes à base de manioc et cherchait encore d'autres moyens de développer les données.

Les principaux domaines nécessitant une action sont :
1. Le développement et l'application d'une politique encadrée par le gouvernement, promouvant le manioc comme féculent/aliment de base recommandé dans le programme de sécurité alimentaire et nutritionnelle de la Jamaïque ;
2. Le développement d'une ou de plusieurs bases de données pour : les variétés aptes à la transformation, pour soutenir l'ajout de valeur ; les zones de plantation de manioc privilégiées/recommandées en Jamaïque ; et les meilleures pratiques de production, pour obtenir les rendements les plus élevés ;
3. Un programme de recherche et de développement pour de nouvelles variétés à faible teneur en cyanure, l'optimisation des rendements et les produits à valeur ajoutée ;
4. La création d'une base de données accessible présentant des options pour les produits du manioc à valeur ajoutée à destination des marchés locaux et d'exportation ;
5. L'organisation d'une coopérative fonctionnelle des producteurs de manioc ;
6. La création d'une Association de transformateurs de manioc ;
7. Le développement d'un programme de communication et de marketing rentable pour promouvoir le changement culturel en faveur d'une plus grande consommation locale de manioc ;
8. Accès aux fonds.
Ces points ont été répartis sur une feuille de route de 18 mois, détaillant les échéances et les responsabilités pour la mise en œuvre.

Abbreviations

Abbreviation	Full Term
Bodles	Bodles Agricultural Research Station, MoAF, Jamaica
BSJ	Bureau of Standards, Jamaica
CARDI	Caribbean Agricultural Research & Development Institute
CCST	Caribbean Commission on Science & Technology
CIAT	International Center for Tropical Agriculture
CLAYUCA	Latin American and Caribbean Consortium to Support Cassava Research and Development
CPGA	Christiana Potato Growers Association
CTA	ACP-EU Technical Centre for Agricultural and Rural Cooperation
DCFS	Department of Cooperatives and Friendly Societies
FAO	United Nations Food and Agriculture Organization
GoJ MDA	Government of Jamaica Ministries/Departments/Agencies
ha	Hectares (2.47 acres)
HACCP	Hazard Analysis and Critical Control Point
HCN	Hydrogen Cyanide-Generic phrase representing cyanide found in cassava.
IITA	International Institute of Tropical Agriculture
JAPA	Jamaica Agro-processors Association
JAS	Jamaica Agricultural Society
JIS	Jamaica Information Society
MoAF	Ministry of Agriculture and Fisheries, Jamaica
NCU	Northern Caribbean University
NCST	National Commission on Science and Technology, Jamaica
RADA	Rural Agricultural Development Authority, MoAF, Jamaica
R&D	Research and development
SRC	Scientific Research Council
UTech	University of Technology, Jamaica

Introduction

The ACP-EU Technical Centre for Agricultural and Rural Cooperation (CTA), in collaboration with the Caribbean Council on Science & Technology (CCST), the National Commission on Science and Technology, Jamaica (NCST) and the Caribbean Agricultural and Research Development Institute (CARDI) hosted a workshop entitled *Adding value to Local Food for Food and Nutrition Security: Myth or Strategic Option – Leveraging the Research, Innovation and Entrepreneurship Network*. As part of its deliberations, on November 29, 2012, focus was given to the cassava value chain in Jamaica. The aim was to assess and provide recommendations in the various areas of the value chain, including: customers for cassava products; capabilities and enablers of the cassava industry; production and processing capacity; and locations and price points for an unsubsidised cassava production system. These recommendations would then be implemented over an 18 month period.

The workshop brought together stakeholders from academia, producers, retailers, processors, financiers and enablers, such as research and development entities and farmer support groups, totaling 55 people for the morning session, with 35 remaining for the working group sessions. The activities were facilitated by Ms Judith Francis (CTA), Dr Chadwick Anderson (Project Consultant) and Mr Ian Ivey (Consultant) and Ms Lovaan Superville and her team from the CCST.

Overview of cassava and the global cassava trade

Manihot esculenta, popularly called cassava, is a root crop of the Euphorbiaceae (spurge) family. It is known by a number of names across the regions of the world including manioc (Africa), pondu (Africa), mogo (Africa), mandioca (Brazil), mushu (China), bankye (Ghana), yucca (Latin America) and singkong (Indonesia).

[1] [2]

Cassava is reported to have its origins in South America. However, during the 16th and 17th centuries it was carried to various places as part of the global trade network. Cassava is currently listed among the top four sources of food energy in the diets of the tropical countries of the world along with maize (& wheat), rice and potatoes. Current major centres of cassava research are the International Institute of Tropical Agriculture (IITA, Nigeria), the International Center for Tropical Agriculture (CIAT, Columbia) and the Latin American and Caribbean Consortium to Support Cassava Research and Development (CLAYUCA).

Cassava is an excellent food crop currently consumed by over 600 million people. It grows very well on sandy or sandy loam soil of moderate fertility. However, it can grow on almost all soil types, therefore utilising marginal lands. It also has significant tolerance to weather changes and is thought to be quite climate resilient. It should therefore be able to better survive climate changes, particularly higher temperatures and lower rainfall. There are perhaps thousands of varieties of cassava; however the varieties which are selected for planting must satisfy the needs of the processors, farmers, industrial users and consumers. In a number of countries, cassava has been targeted to replace cereal imports and promote rural development.

[1] Picture downloaded from http://amber.gsc.riken.jp/cassava/
[2] Picture downloaded from http://www.nigeriaintel.com/2012/08/22/examining-nigerias-cassava-policy/

Nutritional profile:

According to a Cajanus[3] publication, cassava contains high levels of carbohydrates, calcium, vitamin C, iron and potassium. It is however a poor source of protein and dietary fibre. This is highlighted in Table 1.

Table 1 Nutritional profile of 100g of selected (cooked) Caribbean starches

	Cassava	**Rice (parboiled)**	**Rice (white)**	**Sweet potato**	**Irish potato**	**DV[4]**
Energy/Kcal	120	371	366	90	93	2000
Protein/g	3.1	6.8	6.0	2.01	1.96	50
Fat/g	0.4	0.6	1.4	0.15	0.10	65
Carbohydrate/g	27	81.7	80.1	20.71	21.55	300
Dietary fibre/g	0.1	1.8	-	3.3	1.50	25
Calcium/mg	87	NI	NI	38.0	5	1000
Iron/mg	3.4	3.6	0.4	0.69	0.35	18
Potassium/mg	690	120	76	475	391	3500
Vitamin C/mg	31	NI	NI	19.60	12.80	60
Niacin/mg	NI	3.6	2.6	1.49	1.40	20
Folate/mcg	NI	NI	NI	6.00	9.00	400
Vitamin A/IU	NI	NI	NI	19218	0.00	5000
Vitamin E/mg	NI	NI	NI	0.71	0.04	30

NI: No information provided in reference.
DV: Daily Values based on a caloric intake of 2,000 calories, for adults and children of four or more years of age.

[3] Holdip, J., Common Caribbean Foods and Your Health. *Cajanus* **2006**, *39* (1), 1-57.
[4] **http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/FoodLabelingNutrition/FoodLabelingGuide/ucm064928.htm,** accessed December 13, 2012

The general trend is based on nutritional facts: cassava has significantly more energy (Kcal/100g) than either sweet or Irish potato. In theory, it can play a pivotal role in food and nutrition security of regions of the Caribbean.

Uses of cassava

Cassava is produced for three broad applications: human consumption, (both fresh and processed); animal consumption; and for industry. For human consumption, cassava can be prepared by peeling, slicing, soaking, retting, fermenting, boiling, drying, roasting and pounding to make a number of value-added products.

Cassava pellets mixed with soy meal can be an effective substitute for wheat in animal feed.

Cassava has industrial applications, including fermentation to produce ethanol in East and South East Asia. The starch from cassava has significant food and non-food, industrial applications.

The FAO food prices outlook published in November 2012 (Figures 1 & 2[5]), shows that during the period 2009 to 2012, cassava prices fluctuated but generally had an upward trend. Figure 2 shows that cassava and maize prices, while fluctuating, can be competitive, with cassava becoming a cheaper alternative.

Figure 24. International cassava prices (October 2009-October 2012)

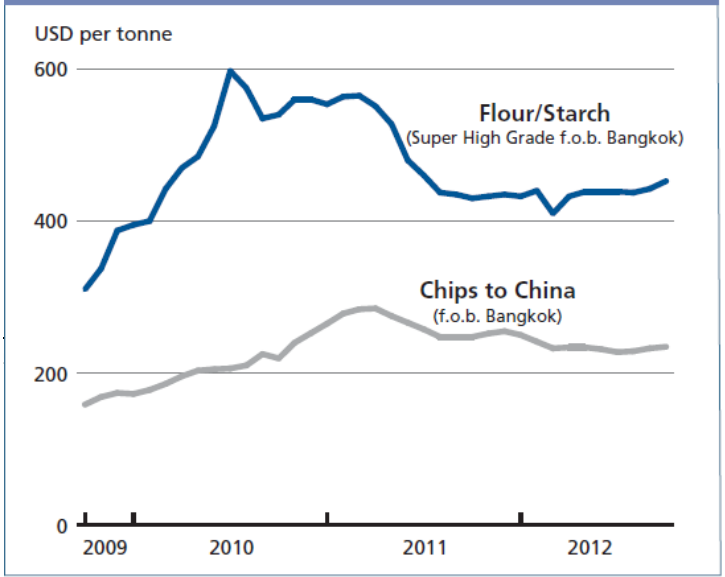

Figure I International cassava prices

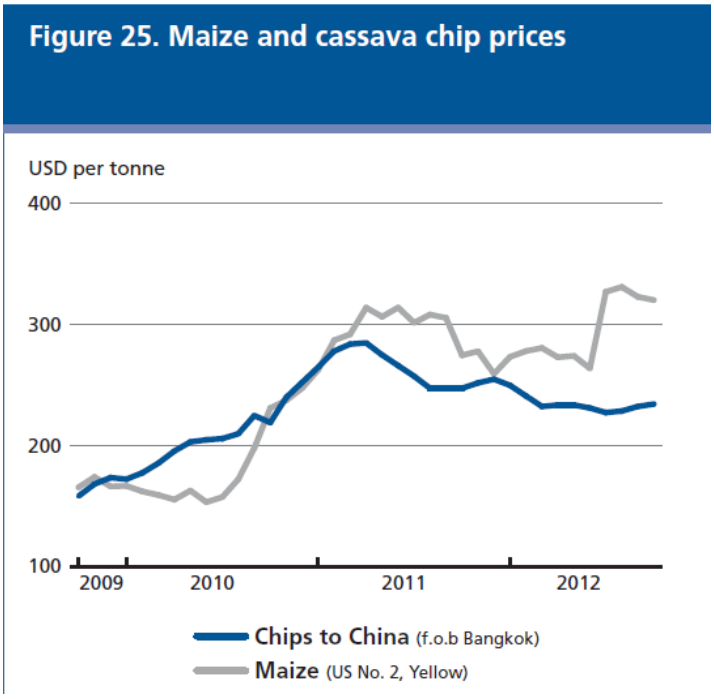

Figure II International maize and cassava chip prices

Overview of the cassava industry in Jamaica

Cassava production

Cassava is produced in a number of parishes in Jamaica. A 2011 survey[6] published by the Ministry of Agriculture and Fisheries (MoAF) highlights the cost of production. The communities with the lowest production costs and highest yields are Mocho in Clarendon and Annotto Bay in St. Mary.

Table 2 Cassava production statistics from MoAF

Parish	Area	Production cost	Yield (tonnes/ha)	Production type	Production time/months
		US $/kg			
Clarendon	May Pen	0.21	35.6	Mechanical	9
Clarendon	Mocho	0.17	37.7	Mechanical	8
St Catherine	Lluidas Vale	0.22	37.1	Manual	9-12
St Elizabeth	Santa Cruz	0.21	22.5	Manual	12
St James	Anchovy	0.27	22.5	Manual	9
St James	Montego Bay	0.28	18.0	Manual	6-8
St Mary	Annotto Bay	0.17	37.1	Mechanical	6
St Thomas	Cedar Valley	0.38	25.1	Manual	9

Table 2 shows that production cost of cassava/kg varies from US $0.17-0.38 and the yield per acre ranges from a low of 18.0 tonnes to a high of 37.7 tonnes.

[6] *Cost of Production Estimates, 2011*; A Publication of the Economic Planning Division, MoAF.

Cassava gene bank[7]

Seven cassava accessions are being held at the Bodles Research Station while the Bauxite Institute has introduced three to four accessions from the Dominican Republic. Some nine germplasm types are held at the Scientific Research Council (SRC). Information[8] on select commercial varieties obtained from Bodles Research Station is found in Table 3. With the exception of the Rockwood variety, accessions of all the varieties are kept and maintained.

Table 3 Features of select, commercially important cassava varieties

Varieties	Maturation Period	Cyanide content %	Starch /100g	Pulp colour	Estimated yield (tonnes /ha)	Moisture %	Some preferred commercial uses			
							Bammy	Starch	Animal feed	Fresh food
CM 849	9-12mo	0.05	23	white/cream	36.4	68	*	*	*	*
CM 516	9-12 mo	0.06	23	white	44.8	67	*	*	*	*
Prison Farm	9-12 mo	0.03	30	white	28.0	66	* * *	*	*	*
MColl 22	9-12mo	0.08	35	white	44.8	57	* * *	*	*	*
Real Sweet	9-12 mo	-	-	white/cream	30.8	-	*	*	*	*
Blue Bud	9-12 mo	-	28	cream	28.0	61	*	* * *	*	*
Cuba Sweet	9-12mo	-	-	white/cream	30.8	-	*	*	*	*
Rockwood *	9-12mo	-	-	white			*	*	*	

Notes:
Blue Bud & Rockwood can be used for chips

[7]McGlashan D.; et al. *JAMAICA: Country Report to the FAO International Technical Conference on Plant Genetic Resources for Food and Agriculture*, **2008.**

[8] Features of cassava varieties, *Bodles Research Station, Ministry of Agriculture*, **2009**.

Cassava products and processes

The products currently on the market include bammies (small and large round; and square), pancake mix, gari, farina, flour and spray starch. The processing systems followed by most processors for the above listed products (except spray starch) are shown in the schematic diagrams in Appendix 1.

There are at least 10 processors in the market currently and at least 70% of them produce bammy. RADA Twickenham produces the widest variety of cassava products for human consumption while JP Tropical Foods is the sole producer of cassava chips. Some of the processors in the market are shown in Table 4. For several of the processors listed, e.g. JP Tropical Foods Ltd, Tijule Company Ltd., Central Food Packers and Rainforest Seafood, cassava represents only one of their product lines.

Table 4 **A** selection of Jamaica's cassava processors

Processor	**Cassava Products**
Mello Bammies	Bammy
RADA Twickenham Bammies	Flour, Bammy, Farina, Gari, Pancake mix
Rainforest Seafood	Bammy
St. Bess Bammies	Bammy
Cousins Distributors	Bammy
JP Tropical Foods Ltd	Cassava chips
A-B Cassava Processors Ltd	Spray starch
Carleston Products	Festival mix
Tijule Company Ltd.	Bammy and pancake mix
Central food packers	Bammy

Import/export data on the cassava trade

Information provided by Statistical Institute of Jamaica, STATIN, shows the exports and imports of cassava and its derivatives over the period 2007-2010 (see Table 5). The value of cassava imports declined over the period, while exports increased.

Table 5 Figures for Jamaica's cassava exports and imports in US $

Trade Type	2007	2008	2009	2010
Value of Cassava Imports (US $)	25147	13,377	27,874	465
Value of Cassava Exports (US $)	163318	293,307	No data	342,040

Over the period, Jamaica has imported fresh cassava and cassava starch from the USA and Hong Kong, and has exported bammies, fresh cassava and cassava flour to Canada, United Kingdom, USA, Aruba, Bermuda, Cameroon, The Netherlands, China and Cayman Islands.

The above information shows that Jamaica has the framework for growth in the cassava value chain; however the volumes being planted and traded are very low. It is likely that under current conditions, it is not significantly profitable. One must ask whether the existing platform can be further exploited to provide greater returns and expand the cassava industry.

Towards a cassava value chain roadmap – Lessons from the workshop

The workshop was divided into four sessions. The first session had four presentations followed by questions and answers. The participants were asked to note the issues and priorities which they identified from each presenter. The participants were then divided into groups and asked to assess the positive and negative features of the cassava value chain, followed by a gap and solutions analysis, with proposed action items over an 18 month period.

Summary of presentations

The main presenters were: Mr Sean Black, National Coordinator, CARDI, Jamaica; Dr Ian Thompson, Lecturer in Food Sciences, University of the West Indies; Mr Shane Healy, Operations Manager, Red Stripe; Dr Derrick Deslandes, Lecturer in Marketing, University of the West Indies and consultant to the Ministry of Agriculture and Fisheries.

Mr Sean Black

Mr Black presented on the topic *Empowering the farmers to use best practices for profitable cassava production*. He highlighted that Jamaica, like other islands in the region, is very vulnerable and needs to focus on its food security. As part of a regional response, CARDI is implementing a roots and tubers sub-sector project, in which cassava is one of the priority crops. The project has five components, two of which are to increase fresh and value-added products and to enable the creation of value chain clusters. CARDI is currently involved in the formation of two cassava farmers' cooperatives in St. Catherine and St. Thomas, and is currently doing field trials on cassava varieties at selected locations across the island. Some of the successes of the project to date include training in: HACCP, for some 45 producers and processors; market and business planning; land preparation, crop and pest management; and harvesting and post-harvest management. In addition, CARDI has installed additional capacity at the RADA Twickenham facility and increased the capacity of the Tissue Culture Lab at the Christiana Potato Growers Association (CPGA) to supply needed planting materials.

Mr Black underscored that cassava farmers in Jamaica are competing with farmers across the globe, and there is need to develop best practices in all areas of production while also operating in clusters. He also noted that significant benefits can be derived by moving to value addition and targeting specific markets. The main priorities identified were: the need for cooperation; identification and sourcing of high yielding varieties; improving harvesting and post-harvest techniques; and the need to focus on increasing yield and product quality. These would form part of a modern, large-scale, high-tech, systems-based approach to production, to create a highly profitable and viable industry.

A summary of the participants' views on the major issues and priorities are found in Table 6.

Table 6 Issues and priorities identified from Mr Black's presentation

Issues	**Priorities**
Farmers largely have smallholdings	Need for cooperation
Improved varieties are needed	Source and expand high yielding varieties
Training of farmers	Harvesting and post-harvest techniques
Cereal production has decreased	Need to focus on volume and quality
Information and technology dissemination	Good agricultural practices
Stakeholders need unity, consensus and support with facilitation	
Lack of capacity throughout the value chain	
We are competing with farmers across the globe	
High levels of imports	
Established a tissue culture capacity at CPGA	
Sustainability	
Lack of knowledge among producers	

Dr Ian Thompson

Dr Thompson's presentation was entitled, *An Alternative Model for a Successful Cassava Industry.* Dr Thompson noted that the current production model will not work. In illustrating this point, he showed a video of current techniques and technologies being used in Thailand and Colombia and contrasted these practices with the systems being used in Jamaica e.g. at the Twickenham Industries, a RADA-operated facility. Moving forward, if cassava is to be a national staple for achieving food security, then there is need to focus on R&D, including looking at global options in the areas of production and processing which can be implemented locally. Jamaica must look at 'cassava economics' to determine production volumes, types and profitability. It must ultimately build an integrated approach which looks at the 'farm-processing nexus', and includes a market-driven production strategy and the building of a team of stakeholders.

Dr Thompson presented his ‘cassava economics’: a framework to produce cassava flour at the same price as wheat flour (US$0.87, April 2012). His calculations showed that under the current production system, cassava flour costs US$1.16. However, in an integrated model the price point can be met. His specific recommendations were:

- Produce a targeted 63,700,000 kg of cassava root
- Select an appropriate variety to produce 30 tonnes per hectare
- A minimum of 4,862 ha under cultivation, with an average farm size of 200 ha
- Plant density of 10,000 plants/ha
- Use mechanised/semi-continuous technology for production and processing
- Establish four processing centres at strategic locations

In addition, there is a need to focus on R&D.

The participants noted a number of issues which were raised during Dr Thompson’s presentation and the corresponding priorities which should be focused on. The participants indicated that the main priorities should be: use of more technology; building a more integrated system; expanding market research; and developing proper R&D infrastructure. These are further detailed in Table 7.

Table 7 Issues and priorities determined from Dr Thompson's presentation

Issues	**Priorities**
Uncompetitive products	Use more technology in processing and production
Establishing economies of scale	Building a more integrated system
Consumer acceptance/Cultural roadblocks	Expand research in marketing
Access to good information	Proper product research and development
Manual processes being used to make cassava	
Government policies	
What size should the economies of scale be, especially with high inputs such as JPS?	
Marketing	
Integrated approach is needed	
Information is not accessible to the farmers	
Technology in processing and production	

Dr Thompson's presentation can be found on the CTA website at http://knowledge.cta.int/ keyword: Ian Thompson.

Mr Shane Healy

Mr Healy gave a spirited presentation from the perspective of the buyer. In his presentation, *Cassava Product Opportunities: The Red Stripe Experience*, He outlined that Red Stripe imported all of its raw materials including hops, malted barley and high maltose sugar and used nearly zero locally sourced raw materials. He noted that the vision of Red Stripe is to use 20% locally sourced raw material by 2014, doubling that figure to 40% by 2016. This would effectively replace some of his imported inputs with locally sourced cassava. The R&D work has been done and they have developed a beer with the same great taste and profile as the current products on the market. They are now looking at sourcing the cassava locally. He indicated that in an integrated system, Red Stripe is prepared to pay in the region of US$35/tonne for cassava

and that price point could be accomplished if the yields (based on their calculations), were 60 tonnes per hectare (Table 8).

Table 8 Estimated break-even prices per tonne of cassava.

Yield (tonnes/ha)	**Break-even price (US $/tonne)**
5	420
10	210
20	105
30	70
60	35

The maximum estimated yields, as reported by Bodles (Table 3), is 44 tonnes per hectare. However, Mr Healy reported that actual average yields reported by farmers are much lower, at 10 tonnes per hectare.

He also raised the issue of the current toxicity level of the cassava being used. The tests done by an independent overseas lab on a number of samples showed very high cyanide levels and while the cyanide decomposes during production, for marketing and perception issues, he needs a cyanide-free variety of cassava.

The participants noted a number of issues which were raised during Mr Healy's presentation and the corresponding priorities which should be focused on. The participants indicated that the main priorities should be: finding sustainable, high-yielding, cyanide-free varieties; assisting farmers with variety selection and production; and establishing economies of scale. These are further detailed in the Table 9.

Table 9 Issues and priorities determined from Mr Healy's presentation

Issues	Priorities
Operation will require a certain acreage	Find sustainable supply of low priced cassava
Cost of cassava production	Assist farmers with production and variety selection
It will take three years to roll out its cassava project	Increase local inputs to 40%
0% of the inputs are currently locally sourced	Secure market available
High cyanide content	Cyanide-free variety is needed
Yield	
Cassava can be used in beer production	
Need low prices for cassava	

Dr Derrick Deslandes

Dr Deslandes presented *A review of the MoAF Cassava Initiative*. He highlighted a cultural challenge which must be recognised and addressed in order to create a successful cassava industry that responds to consumer demands. He indicated that although there were two major attempts to create a cassava industry, in the 1970s and again in 2008, a cassava marketing programme had never been planned and implemented. While the farmers had responded and planted the cassava, the processors had never responded, except for the Jamaica Producers Group. He pointed out that there needed to be more coherence in government policies. With regards to large-scale cassava production, Dr Deslandes noted that the bauxite companies could use the reclaimed land and grow cassava as part of their portfolio. He highlighted the fact that Jamaica tends to operate as a spot market, with no-contract production, and that in a number of cases, the farms are not operated as a business. He commented that agriculture in Jamaica has not changed in the last 50 years and major issues with production and productivity remain. This must be solved through R&D and changing of cultural practices, in order to operate as a world class industry.

The participants noted a number of issues which were raised during Dr Deslandes' presentation and the corresponding priorities which should be focused on. They indicated that the main priorities should be: the implementation of mechanisation; increased use of research and development; and marketing research to determine consumer demands for both fresh and processed products. These are further detailed in Table 10.

Table 10 Issues and priorities determined from Dr Deslandes' presentation

Issues	**Priorities**
Farmers need to use more technology	Implementation of mechanisation
Link between the University and farmers is weak to non-existent	Better communication and increased R&D inputs
Labour productivity is low	Improve labour productivity
Access to markets seems to be limited	Facilitate marketing and distribution
The size of the local market is small	Research to better determine consumer demand in both local and international markets
The focus is on local consumption	Better policies are required
Lack of resources	Review past projects
Production yields are low	
Selection of best practices is needed	
CARDI should be seen as facilitators, not implementers	
System is built on a buy/sell economic strategy without formal contracts	
Praedial larceny (theft of crops)	

Cassava value chain

The value chain approach was used to ensure an integrated approach to describing the state of the cassava industry in Jamaica. The diagram in Figure 4, (courtesy of Ian Ivey/Next Corporation) shows the major components of the value chain.

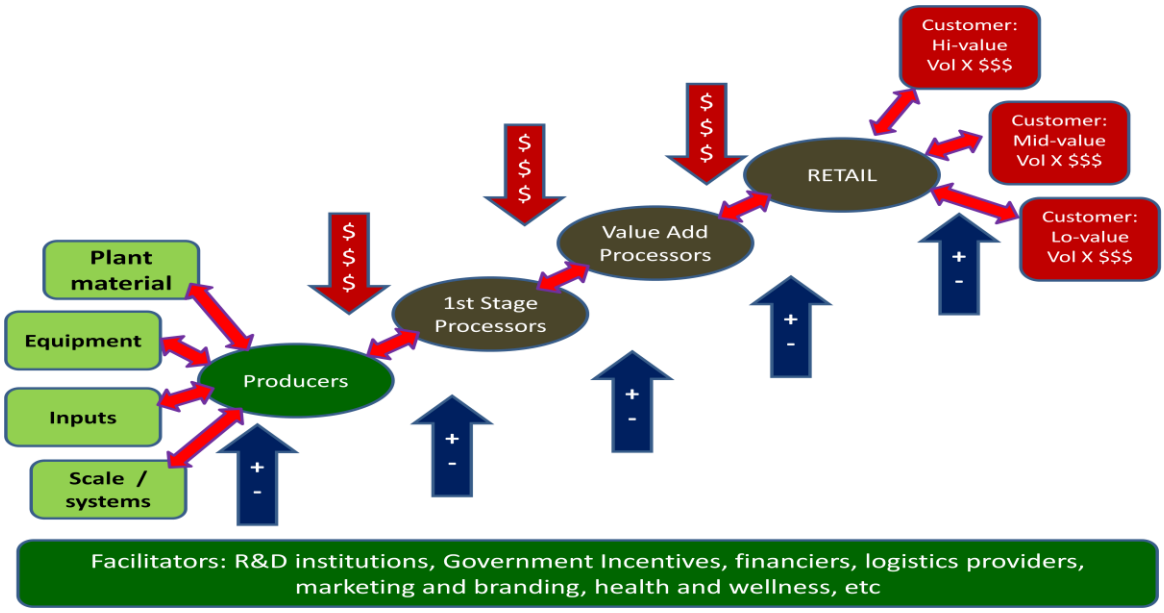

Figure 4 Generic value chain flow chart

The following section provides an overview of each segment of the value chain, followed by the positive and negative perspectives as identified by the stakeholders at the workshop. The discussions were robust and a number of suggestions emerged, some of which have been tabulated in Appendix 2. The discussion begins with the market.

Consumers/market

The Jamaican market is largely a low-middle income market dominated by major global starches, including flour and rice. Jamaicans also consume significant local produce; however, fresh cassava is not frequently consumed. Consumers have wide and extensive access to retailers and just about any product, particularly shelf-stable ones, are made accessible to all communities. Over 2.5 million tourists visit Jamaica each year, boosting the total local market to more than 5 million people. Current opportunities therefore exist in the human consumption and animal feeds markets. There is no facility in Jamaica currently utilising cassava for industrial

applications. The major positive factors identified for the consumer include: cassava gives a filling meal; it is reported to have a slow release of sugar content; it is gluten free; and it can make a wide variety of products. The major negative factors include: not enough information on nutritional and health benefits; concern about the cyanide content; packaging is not attractive and cassava products are stored under harsh, 'freezing' conditions. During the discussion, it was noted that UTech has been developing a number of products derived from cassava and is currently seeking to organise and print a cassava recipe book. It was also noted that there is no coordinated attempt at the level of government policy to promote cassava as a main staple.

Retailers

The retail space is quite expansive and a complete list can be found from a compilation of Jamaica Yellow Pages and Redbook. Some of the major retailers in the area of 'health and wellness' would include supermarkets (and corner shops), pharmacies, restaurants (and cook shops), beauty care retailers and haberdasheries and sundries. These are the major access points from which cassava products and derivatives would be made available to the consumer. Retailers exist to make a profit and therefore will sell items which have appeal, sufficient selling volumes and profit markup. Retailers also seek long term relationships, where a relationship is seen as a mutually beneficial partnership. Retailers are a significant source of market intelligence and can provide guidance in product development, packaging and price points.

The major positive factors identified for retailers include: the potential wide range of cassava products; these products would be locally made; and international markets love 'brand Jamaica'. The major negatives include: insufficient demand from consumers for cassava products; insufficient information to promote cassava products; and the risk of interrupted supply at the right price and quality.

Processors

In theory, processors have been divided into first stage and value addition processors. However in the actual case of the local cassava industry, there is no separation between either of the groups. The typical processor starts with cassava tubers, to produce a myriad of products. The participants were, however, asked to explore the possibility of a second stage processor who focuses on higher-end value addition.

The deliberations of the producer group led to the following positive and negative factors. The processors believed that there were many benefits to be derived for the consumer and that if properly marketed, cassava products could be a big seller. The negative factors were seen on the supply side, including the high cost of cassava tuber because of high farmer input costs. The consumer also must be educated regarding the value of the products. The group saw several positive factors regarding the second stage processor. These include: a unique portfolio of niche products; opportunity to sell highly profitable products; and selling products which are not consumed, so the cyanide content may be less of an issue. The major negatives were: identifying the unique products; availability, adherence and enforcement of regulations and standards; and the cost of the R&D to create the new products.

Producers

According to the most recent Census of Agriculture (Statistical Institute of Jamaica, 2007), the average land holding is 1.42 ha, down from 2.17 ha (1996). It also reports that the area under cultivation of cassava is 2,750 ha, shared among some 18,100 farms. This model is not profitable as both Healy and Thompson indicate that only large hectarages will be profitable. The Census (see Tables 11 & 12) also showed that large land holdings still exist, some of which presumably could be used for cassava production.

Table 11 Area of farms (in hectares) by size group and parish of location

*2007 Census of Agriculture – **Jamaica***

Parish of Location	Total Hectares	SIZE GROUP IN HECTARES							
		Under 1 ha	1 to under 5 ha	5 to under 10 ha	10 to under 25 ha	25 to under 50 ha	50 to under 100 ha	**100 to under 200 ha**	**200+ ha**
All Jamaica	325,810	47,712	86,011	19,721	19,166	11,896	11,742	**13,707**	**115,854**
St Andrew	8,354	2,629	4,000	598	460	175	218	**274**	**0**
St Thomas	22,257	2,301	6,673	1,721	1,400	825	429	**420**	**8,488**
Portland	16,201	1,802	6,132	1,733	1,909	1,302	888	**1,017**	**1,418**
St Mary	20,890	2,586	7,422	2,183	2,072	1,226	998	**1,333**	**3,070**
St Ann	37,099	4,972	7,678	1,462	1,620	941	990	**2,388**	**17,048**
Trelawny	24,803	2,656	3,428	440	619	562	539	**295**	**16,263**
St James	13,893	1,670	3,121	617	851	878	1,335	**837**	**4,583**
Hanover	9,751	1,634	2,896	627	754	261	732	**724**	**2,123**
Westmoreland	35,241	3,652	5,165	1,789	2,212	1,600	1,768	**2,573**	**16,483**
St Elizabeth	30,022	6,995	6,251	1,212	1,865	1,116	1,104	**1,393**	**10,087**
Manchester	24,521	5,800	8,654	1,746	1,420	931	462	**438**	**5,069**
Clarendon	44,856	6,462	15,284	3,607	2,642	1,311	1,668	**1,182**	**12,699**
St Catherine	37,922	4,553	9,307	1,986	1,342	768	611	**833**	**18,523**

Table 12 Number of farms by size group and parish of location

*2007 Census of Agriculture – **Jamaica***

Parish of Location	Total Farms	SIZE GROUP IN HECTARES								
		Land-less	Under 1 ha	1 to under 5 ha	5 to under 10 ha	10 to under 25 ha	25 to under 50 ha	50 to under 100 ha	**100 to under 200 ha**	**200+ ha**
All Jamaica	228,683	28,070	151,929	43,731	2,922	1,283	338	170	**100**	**140**
St Andrew	10,772	538	7,866	2,238	89	31	5	3	**2**	**0**
St Thomas	12,033	1,221	7,155	3,258	253	101	24	7	**3**	**11**
Portland	8,966	831	4,710	2,981	259	124	36	13	**7**	**5**
St Mary	13,421	990	8,360	3,538	321	146	32	15	**11**	**8**
St Ann	20,240	1,113	14,748	3,972	216	111	26	15	**17**	**22**
Trelawny	10,963	1,123	7,823	1,880	63	40	16	7	**2**	**9**
St James	8,514	789	5,921	1,595	94	55	25	19	**6**	**10**
Hanover	9,085	1,820	5,727	1,360	93	54	8	11	**5**	**7**
Westmoreland	21,031	3,611	14,357	2,546	267	137	45	25	**19**	**24**
St Elizabeth	34,440	6,054	24,628	3,395	175	114	34	16	**10**	**14**
Manchester	24,190	2,518	16,657	4,623	260	93	28	6	**3**	**2**
Clarendon	32,003	4,615	18,996	7,583	541	186	37	24	**9**	**12**
St Catherine	23,025	2,847	14,981	4,762	291	91	22	9	**6**	**16**

These farms largely employ manual labour; however some areas may have access to tractor services, through RADA, for land preparation. CARDI and the Ministry of Agriculture are implementing a roots and tubers sector plan, and are able to provide further information on the planting of cassava.

The assessment by the producer group at the workshop highlighted several positive and negative features of the cassava industry. The positives include: hectarage of land capable of mechanisation; agronomical testing of soil; and some amount of know-how. The group also believes that incorporation of cassava into themed nights could lead to greater consumption at hotels. They also noted several negatives and concerns which should be addressed. These include: non-commitment of various stakeholders; absence of technical support; difficulties (costs) in reaping; and lack of knowledge about the best varieties for specific purposes. They are also concerned about the cyanide content of the cassava.

Trends identified from the value chain analysis.

Several trends were identified in the positives and negatives. These trends were consolidated into four areas, to conduct gap analysis and the strategies to fix them over an 18 month period.

1. Consumer research to determine demand
2. Organising farmer and processor groups
3. Technical information – production and related areas
4. Technical assistance – processing and related areas

The analyses are shown in Tables 13 to 17.

Table 13 Gaps and solutions analysis to determine market needs

Gaps	**Proposed solutions**	**Who should be responsible?**	**What should they do?**
Lack of consumer research on cassava	Find companies who are interested and bring them into the dialogue.	CTA, MoAF, CARDI, FAO	Identify funds and company to conduct research
Knowledge of the actual uses or products derived from cassava	Interviews, focus groups, continuous R&D	Processors, farmers' associations, GOJ MDAs, e.g. MoAF, RADA, SRC	Develop new products, packaging and ongoing sampling.
Innovative marketing strategies	Farm to table dinner	Hotels and tourism industry	Hotels can host Jamaica nights and introduce local cassava dishes.
Cultural barriers of consumers need to change	Education programmes and campaigns	RADA, JAS, JIS	Change the mindset of consumers towards cassava products
Which variety will capture the market; what is the right fit? (e.g health benefits)	Constant interaction among all players	Manufacturers, Grace Kennedy, Mello, LASCO	Producers require direct instruction as to what to plant

Table 14 Gaps and solutions analysis to address issues in organising farming groups

Gaps (producers)	**Proposed solutions**	**Who should be responsible?**	**What should they do?**
No coordinating person, group or organisation	Form a cassava growers' association (cooperative) with management team.	Farmers, CARDI, Department of Cooperatives and Friendly Societies	Identify, develop and market cassava products; organise research and development; facilitate bulk purchasing of equipment; liaise with government
Best practices in succession and planning	Good cultivation and sites	Farmers, RADA	Early education, perhaps part of curriculum
Developing mechanisms to change existing culture	Mechanise and relearn traditional practices	Food Production and Development Officers	Fund/Finance entrepreneurship programmes; grant funding to attend seminars etc

Table 15 Gaps and solutions analysis to address issues relating to production

Technical information –Production			
Gaps	**Proposed solutions**	**Who should be responsible?**	**What should they do?**
High cost of production relative to the farm gate price.	Using mechanisation to reduce cost of reaping the cassava	Individual farmers	Engage RADA and private contractors to supply mechanisation services
	Bulk purchasing	Processors	Organise and help their suppliers (farmers) to purchase in bulk and transport to farms.
	Forming and working through the cooperatives.	Farmers and relevant groups, for example DCFS or CARDI	Organise farmers into cooperatives
Production of large hectarages may be difficult	Switch to focusing on value addition to retain more wealth	Government and research organisations	Start research and development initiatives

Table 16 Gaps and solutions analysis to address issues related to processing, and local and export market opportunities

Gaps	**Proposed solutions**	**Who should be responsible?**	**What should they do?**
Affordable financing	Cheaper and accessible sources of financing	JMA, financial institutions, MoAF	Provide stimulus package including lower interest rates for production purposes
Reliability of supplies	Contracts with farmers, processors	Farmers and processors	Abide by all contractual agreements
Lack of support from agencies	One stop export centre	Ministry of Finance and Planning	Facilitate processing systems
Lack of appropriate processing standards	Mandatory training, transfer of technology and information, as necessary	Farmers' organisations and processors	Acquire the relevant technology - be trainers
Value-adding opportunities	Research	SRC, UWI, UTech, NCU, CARDI, RADA, BSJ	Proper dissemination of information
Local and export market	Form cooperatives and groups or develop partnerships between processors and growers	RADA, MOA Bodles, JAMPRO	Facilitate meetings and develop clusters

It can be concluded from the discussions at the workshop that there is a need for a functional and highly profitable cassava industry. To achieve this, a three year work plan may be required. However, over the next 18 months the following outcomes are desired:

1. The development and execution of a government-supported policy which supports cassava as a recommended starch/staple food in Jamaica's food and nutrition security programme;
2. The development of database(s) for: varieties suitable for processing, to support the value-added thrust; the preferred/recommended cassava planting areas in Jamaica; and the best production practices, to obtain the highest yields;
3. Research and development programme for new varieties with low cyanide content, yield optimisation and value-added products;
4. The creation of an accessible database showing options for value-added cassava products for local and export markets;
5. The organisation of a functional cooperative of cassava farmers;
6. The creation of an Association of Cassava Processors;
7. The development of a cost-effective communication and marketing programme to support the cultural change towards greater local consumption of cassava;
8. Access to funding.

The roadmap is detailed in Table 17.

Cassava value chain roadmap

Table 17 Cassava value chain roadmap to be implemented over 18 months

Target	Action item	By whom	By when	Accountability
The development and execution of a government-supported policy which supports cassava as a recommended starch/staple food in Jamaica's food and nutrition security programme	Select a policy committee	MoAF	Month 1-3	Permanent Secretary
	Conduct deliberations	Committee	Month 5	Committee Chairperson
	Complete policy	Committee	Month 7	Committee Chairperson
	Policy endorsed by cabinet	MoAF	Month 9	Minister
The organisation of a functional cooperative of cassava farmers	Arrange a meeting with cassava growers	CARDI RADA DCTFS	Month 1-3	CARDI DCTFS
	Select executive	Participants	Month 1	CARDI
	Establish constitution including fee structure	Executive	Month 5	Executive chairperson
	Develop business plan	Competent firm	Month 8	Executive chairperson
	Organise chapters	Executive	Month 10	Executive chairperson
The creation of an accessible database showing options for value added cassava products for local and export markets	Conduct global market research	Marketing organisation/ Marketech (SRC)	Ongoing	Joint Working Group
	Develop database access platform	IT Department MoAF/ RADA	Month 6	Permanent Secretary
	Quarterly updates to processors and	Marketing organisation	Quarterly, beginning	Joint Working Group

	producers		month 3	
The development of database(s) for: suitable processing varieties to support the value added thrust; the preferred/recommended cassava planting areas in Jamaica; and the best production practices to obtain the highest yields.	Determine the best planting areas	RADA/ UWI/ Mona GeoInformatics Institute	Month 4	RADA HEAD
	Develop GPS-supported agronomical map	RADA	Month 7	RADA HEAD
	Determine varieties to support targeted value-added products	CARDI/SRC/ Bodles	Month 1 - Month 18	CARDI
	Correlate variety to planting location	CARDI/MoAF	Month 2- Month 18	RADA
	Conduct field trials to validate yield and planting locations	CARDI/MoAF	Month 2 - Month 18	CARDI
The creation of an Association of Cassava Processors	Arrange a meeting with cassava processors	UWI/JAPA/SRC /Consultant	Month 2	Independent consultant
	Select working group	Participants	Month 2	Independent consultant
	Deliberate on ideal processing network and requirements	Participants	Month 7	Independent consultant
	Execute findings	Members	Month 2 - Month 18	Independent consultant
The development of a cost-effective communication and marketing programme to support the cultural change towards greater local	Develop sensitisation programme	MoAF	Month 7	Permanent secretary
	Execute programme	MoAF	Month 2 – Month 18	Permanent secretary

consumption of cassava				
Access to funding	Meet with various funding entities to identify funding for the roadmap	CTA/MoAF/ CARDI	Month 2	CTA
	Meet with financial institutions to promote funding of cassava production and value addition	MoAF	Month 2 - Month 18	MoAF
Research and development programme for new varieties with low cyanide content, yield optimisation and value added products	Develop framework agreement for R&D	SRC/UWI/ UTech/NCU/ private labs	Month 7	Independent consultant

n.b. For the purpose of this report, unless otherwise stated, values are quoted in JMD. The exchange rate of Jamaican dollars to US dollars was at 93:1 at the time of publication.

Reviewed by: Judith Francis, CTA

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Appendix 1.

Figure 1 Initial processing of cassava tubers into cassava meal and chips

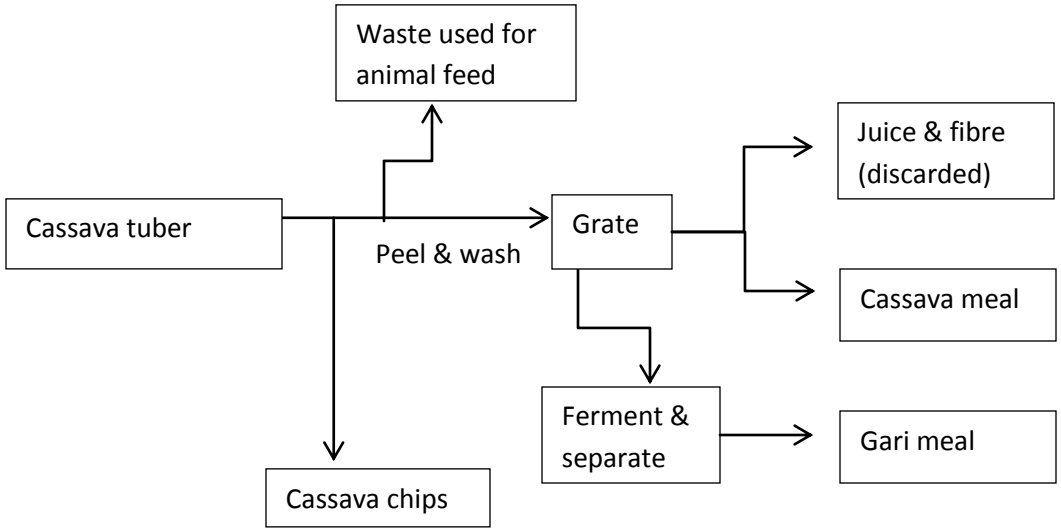
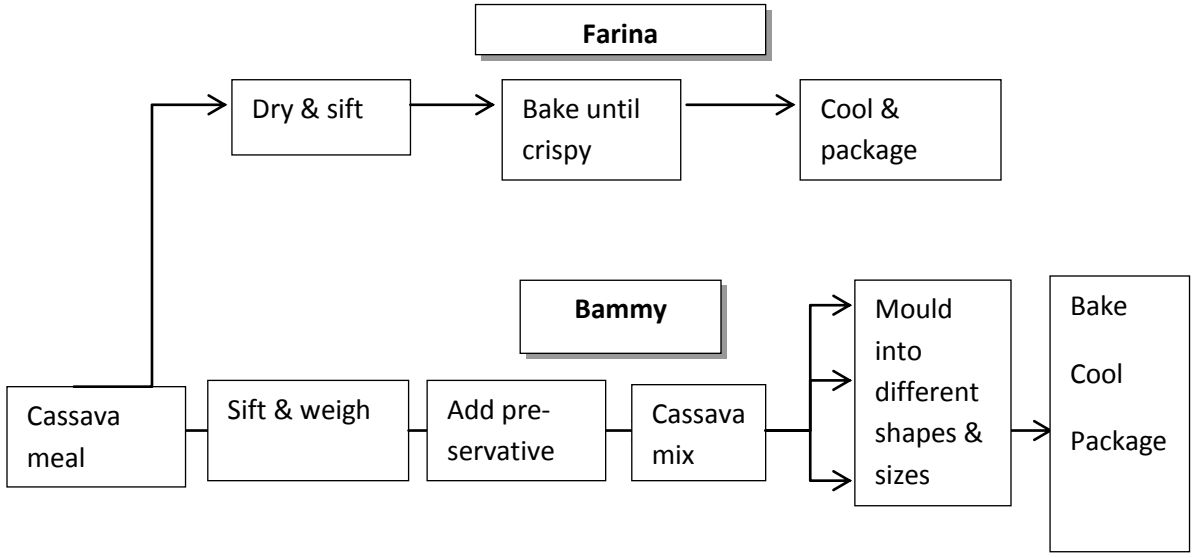


Figure 2 Secondary processing into farina and bammy



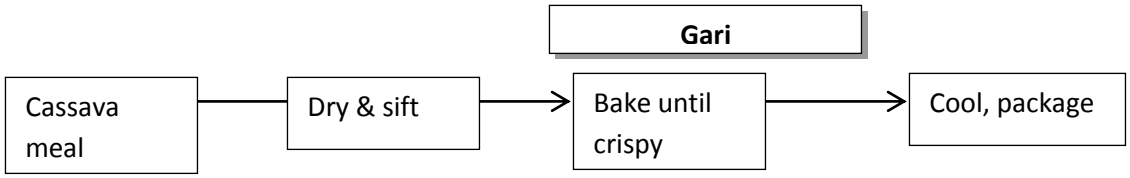


Figure 3 Secondary processing into Gari

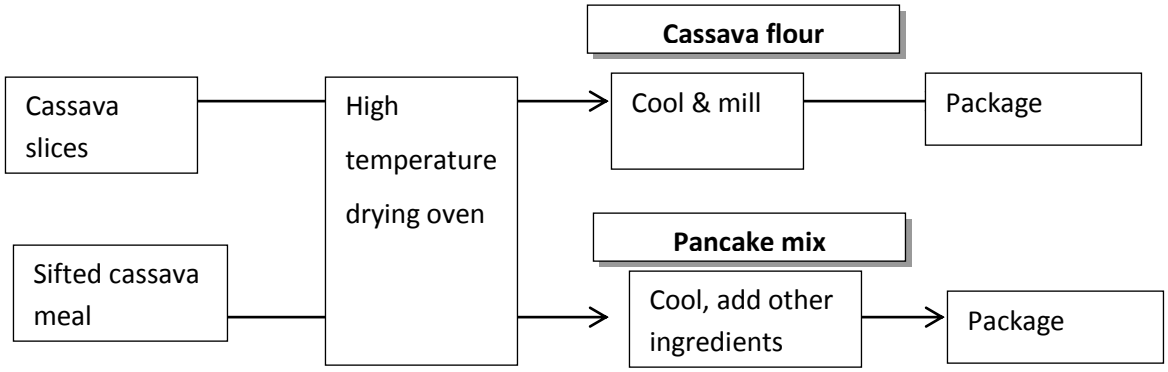


Figure 4 Secondary processing into flour and pancake mix

Appendix 2

Table 1 Positive and negative factors for the consumer

Consumer	
Positive factors	**Negative factors**
A serving of cassava gives a filling meal	There is not enough nutritional information available on cassava and cassava products.
Organic cassava is produced in Jamaica	Insufficient information on health benefits
Cassava is reported to have a slow release of sugar content	Widespread concerns about the safety of cassava products including the levels of hydrogen cyanide
Cassava is gluten-free and can provide a health benefit	Concerns about the safety of production facilities and processing techniques
Cassava is easily and readily available year round.	Packaging is not necessarily attractive
Cassava can make very versatile meals and value-added products.	Cassava products have a short shelf life and face harsh storage conditions

Table 2 Positive and negative factors for the retailer

Retailers	
Positive factors	**Negative factors**
There is a wide range of cassava products, both actual and possible.	Not enough consumer research on what they want and how they feel about the products.
International market will buy items, especially those labeled with "Brand Jamaica".	Many consumers do not know of cassava products, while some may have negative cultural perceptions of cassava.
A variety of new products that can be introduced to local and international markets.	Retailers do not know enough about the products to pass on information to consumers – e.g. what are the products, advantages, retailers?
	Jamaicans do not tend to favour locally produced goods.
	Problems with continuous supply of the product at

	the right price and quality.
	Need to open up the local market by doing some research and education.
	Uncertain whether there is a viable market for cassava in Jamaica.
	Who will provide finance to do the marketing?

Table 3 Positive and negative factors for the 1st stage processor

1st stage processors	
Positive factors	**Negative factors**
Increasing know-how available	Reaping is highly costly, increasing the cost of the raw material.
Lower risk due to lack of interest by praedial thieves	Lack of technical support for farmers from government
Cottage industry at community level	Big gap between current land preparation and mechanical preparation
Cheap source of carbohydrate	Insufficient public education of the consumer
Possible value-added products	Unreliable markets/storage, lack of certified germplasm

Table 4 Positive and negative factors for the 2nd stage processor

2nd stage processor	
Positive factors	**Negative factors**
They would have unique products for niche markets, thereby having high value/income	Challenges in identifying the unique products
There are opportunities in the budding nutraceutical market/industry that exists globally	The rigour needed in getting the final product; also the regulations and standards which must be adhered to
The producer/manufacturer can set the price of his products	Some products maybe too expensive for the consumer; also marketing will be expensive as they may be trying to create a new market
They can create products which set them above the average market	New products will require extensive product research and development, which is very expensive and time consuming
They can create products which are not consumed, so the perception of cassava may not be a factor	Negative perceptions of cassava

Table 5 Positive and negative factors for the producer

Producer	
Positive factors	**Negative factors**
Cassava leaves can be used as Calaloo	The best varieties for specific purposes are not known
Cassava starch can be used for ironing; cassava crumbs can be used for cooking	There is a disconnect between farmers and government agencies
Need to market the versatility of cassava	Limited access to financing
Focus on people with gluten allergies	Lack of research funding Limited knowledge on HCN values/nutritional aspects Need to standardise processing
Versatility of the cassava leaves	The matter of HCN is not settled
Cassava has high caloric food content; perhaps can be used as an energy food	Planting and reaping - terrain is difficult
All inclusive hotels can have a Jamaica cassava night	Cassava not moving effectively from farm to table.
UTech is trying to break barriers in the consumption of cassava	RADA does not provide marketing assistance