THE CARICOM REGIONAL TRANSFORMATION PROGRAMME FOR AGRICULTURE

The Sweet Potato Industry in CARICOM

Competitiveness & Industry Development Strategies

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We wish to express our deep appreciation to the Ministries of Agriculture for their cooperation and assistance in the study. In particular, they were helpful in providing background data on the industry, as well as arranging and providing logistical support for our field visits. In this regard, we wish to highlight the willingness of staff in the industry, extension personnel, researchers, farmers, agro-processors and investors in sharing their experiences on the industry in their countries. Without their support we would not have been able to conclude the analysis. Our discussion with officials in the Ministries of Agriculture in the Region proved helpful in reconciling some of the deficiencies we encountered in the review.

Technical support was provided through the assistance of Brent Theophile, Rebecca Gookool, Jai Rampersad and David Hanson, to which the Core Team also express support. To Ms. Martha Jimenez-Spence and Indira Ousman-Buchoon, we express our sincere thanks for their logistical organizational and communication support.

Although we tried to ensure accuracy of the database used for the review, nonetheless we accept responsibility for any errors that may be discovered. This may be the result of the multiple databases from which we had to access the data.
DEDICATION

We dedicate this work to the Memory of our Colleague and member of the study team, Dr Lloyd B. Rankine. Dr Rankine passed away on October 25, 2006. He was a colleague with whom we shared many long hours in dialogue, in the field and in the class room. His life long endeavours and dedication reflect his passion for agriculture in the Caribbean.

Dr. Rankine was an integral part of the University of the West Indies having served the University (both Mona and St. Augustine campuses) from 2nd December 1968 to June 3, 2006 when he suffered a debilitating stroke. He served as Head of the Department of Agricultural Economics and Extension from 1977 to 1990 and taught in the capacity of Senior Lecturer up until 2003, when he retired. From 2003 to June 3, 2006, he lectured part-time in the Department

Dr. Rankine also served as Director and Chairman on many Boards in Trinidad and Tobago.

Ranjit H. Singh & Govind Seepersad
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The CARICOM Sweet Potato Industry

COMPETITIVENESS & INDUSTRY DEVELOPMENT

STRATEGIES

EXECUTIVE SUMMARY

This report examined the Sweet Potato industry throughout the value chain. In particular, we reviewed the production conditions/industry characteristics in each of the major producing countries; we reviewed the market situation, both extra-regional and regional; estimated the cost of producing Sweet Potato in each country, and finally undertook a competitiveness analysis, both in the extra-regional and CARICOM markets.

1. KEY ISSUES IMPACTING ON INDUSTRY DEVELOPMENT

From the analyses of the Sweet Potato industry presented in the Market Intelligence Report as well as this present (Competitiveness) Report, we have identified the main issues that are relevant to the transformation of this Industry. We summarize these as follows:

1. Extra-Regional Market Opportunities: The only significant extra-regional market for CARICOM Sweet Potato exports is the UK market. Although providing some window for CARICOM Sweet Potato, the UK market is a highly competitive market with a number of traditional suppliers from Africa and Asia having strong market presence.

2. Competitiveness of Sweet Potato Exports: Only Jamaica and Trinidad are price competitive in the UK market.

3. The CARICOM Market:
   (i) Intra-regional trade in Sweet Potato is rather limited with the largest volume taking place between St Vincent and Trinidad & Tobago. With the exception of
Jamaica and St Vincent most of the Sweet Potato produced in CARICOM is consumed in the producing country.

(ii) **Competitiveness of US Imports:** Sweet Potato imports from the US into CARICOM are not price competitive.

4. **Value-Added Products:** Regional production of value added products from Sweet Potato is negligible.

5. **Productivity of Sweet Potato:** Sweet Potato yields in CARICOM are well below potential, with significant losses due to diseases and pests.

6. **Cost of Production**

Unit cost ranged from a high of USD 0.75/kg of Sweet Potato for St Lucia to a low of USD 0.11/kg for Jamaica. The estimated cost of production were as follows (Figure below):

- Jamaica - from a high of USD 0.23/kg to a low of USD 0.11/kg Sweet Potato
- Trinidad and Tobago - from a high of USD 0.34/kg to a low of USD 0.17/kg of Sweet Potato
- St Vincent - cost was USD 0.44/kg Sweet Potato
- Guyana - cost was USD 0.28/kg Sweet Potato

In general, the results suggest a larger percentage of the farms achieved unit cost of production in the higher ranges, from USD 0.23 to USD 0.44/kg. Costs were much higher in the case of St Lucia, partly due to very low yields. Further details of yields and costs in the various countries of the study are presented in the Country Reports below.
2. PLATFORM FOR INDUSTRY DEVELOPMENT

Our proposal for the transformation of the CARICOM Sweet Potato industry is grounded on the following three platforms:

(i) Improving Productivity and Cost Efficiency

(ii) Expansion / Growth of the Domestic / CARICOM Market through the promotion of consumption and development of convenience ready to cook / ready to eat products

(iii) Product development for application into end uses, including application of S&T/R&D aimed at the development of high-valued products that exploit the health benefits of Sweet Potato.

Additionally, a number of other factors suggest a good potential for the development of a viable Sweet Potato industry in CARICOM, including the fact that Sweet Potato has good shelf life, the crop exhibits high versatility with respect to growing conditions and low susceptibility to natural disasters such as hurricanes. It is also amenable to the typical small scale farming systems that characterize the Region.
3. THE Way Forward: Industry Development Strategies / Plans

The development of the Sweet Potato industry in CARICOM calls for intervention in the THREE PLATFORM AREAS identified above. We now present strategies for addressing the development challenges in each of these areas. Specifically, we recommend the following strategies:

A. Strategies to Improve Productivity & Cost Efficiency

Sweet Potato productivity in the Region is well below the plant’s agronomic potential. Problems of heavy and persistent attacks from the Sweet Potato weevil and the Sweet Potato stem borer together have resulted in significant losses of marketable yield, ranging as high as 40% in some countries. To the above, we may add losses due to nematodes, viruses and other non detecting yield reducing factors.

Source of the Problem: Two factors that contribute to the high losses in the production of Sweet Potato are:

   (i) The failure of growers to use CLEAN planting material (carryover of disease from previous crops)

   (ii) The high incidence of pest & disease and the high cost of control

Strategies:
To address the two main problems impacting on low productivity and high cost in the production of Sweet Potato we propose the following measures:

- Development of a Regional action plan for R&D to develop technology for controlling the common pests and diseases in a sustainable manner.

- Implementation of a system of quality assurance/regulations to ensure the use of disease free planting material. Towards this end, we recommend the adoption of protocols to enhance quality assurance in the industry, in particular focusing on the quality of planting material, the use of agro-chemicals and the quality of the final product with respect to food safety.
STRATEGY A1: A REGIONAL SWEET POTATO R&D PROGRAMME (AGRONOMIC)

Given the commonality of the Pest and Disease problem facing the Sweet Potato Industry throughout the Region we propose a REGIONAL R&D PROGRAMME. This initiative should involve the participation of the key stakeholders – Caribbean governments, the private sector involved in the Industry (whether production, processing or marketing) and R&D institutions. The aim of the Programme is to:

• find a sustainable cost effective solution to the Industry’s pest and disease problems
• develop systems / protocols to ensure that growers have access to clean planting material
• conduct genetic R&D evaluation and selection of Sweet Potato planting material for the industry.

Specifically, we propose the following action:

(i) The establishment of an R&D fund for a Sweet Potato Industry Research Programme (SPIRP) with contribution from stakeholders and the donor community. We suggest the wider Caribbean rather than only CARICOM given the fact that the problem extends to other Caribbean countries.

(ii) The SPIRP should be established as a CONTESTABLE R&D FUND for R&D in the following areas: AGRONOMY, ENTOMOLOGY / PLANT PROTECTION, GENETIC. R&D Institutions would be invited to bid for resources from the fund to undertake specific research relating to the problems / issues impacting on productivity and cost efficiency. We suggest that participation in the bids should not be limited to Regional R&D institutions but should be open to institutions outside of the Region.

(iii) The SPIRD should be managed by a Committee comprising key stakeholders

(iv) Bids for R&D should emphasize sustainable and cost effective solutions, including genetic and biological technology options.

STRATEGY A2: PRODUCTION & SUPPLY OF CLEAN PLANTING MATERIAL

The common practice of using planting material from previous crops is considered by industry experts to be a major source of crop losses. The industry in Jamaica, with the assistance of
USAID has initiated a project to supply growers with disease free material. Based on the experience of other countries, for example China, clean planting material could boost average yields by as much as 40%. Clearly, this has significant implications for improvement in cost efficiency.

The specific action being proposed here is for Ministries of Agriculture to develop Protocols for the production of Clean Sweet Potato planting material and to make these available to growers.

**B. EXPANSION / GROWTH OF THE DOMESTIC / CARICOM MARKET**

The domestic market in CARICOM is characterized by very low per capita consumption of Sweet Potato. We propose the following strategies to expand the consumption / utilization of Sweet Potato in the Region:

**STRATEGY B1: THE PROMOTION OF READY TO COOK AND READY TO EAT SWEET POTATO PRODUCTS**

Given the consumption trends in the Region to more convenience foods, we are of the view that the availability of more convenient Sweet Potato products and prepared foods could encourage higher levels of consumption. Many such products are well known at the household level or in the food service industry but not commercially available. We suggest the development of ready to cook and ready to eat products by the Industry and the promotion of entrepreneurial activities in the supply/marketing of such products.

**C. HIGH END PRODUCT DEVELOPMENT**

Beyond the traditional uses of Sweet Potato, recent research has highlighted significant health benefits from consumption of Sweet Potato and Sweet Potato based products. We therefore propose that the Industry’s stakeholders support an R&D programme of work to investigate and develop such products.

**STRATEGY C1: R&D TO DEVELOP HIGH END PRODUCTS**

We therefore recommend the commissioning of R&D work in product development by relevant institutions in the Region with a focus on high end products, including exploiting the health benefits of the Sweet Potato.
Section 1

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

This study is part of a larger study commissioned by the CARICOM Regional Transformation Programme for Agriculture to evaluate the international competitiveness of selected agricultural commodities. These include Sweet Potato, papaya, sweet potato, coconuts and small ruminants.

This Report on the competitiveness of Sweet Potato is the final component of the overall study on the competitiveness of the industry in CARICOM. It was preceded by a Review of the Policies in the CARICOM countries included in the study and a Market Intelligence Report on Sweet Potato. Five countries were included in the Competitiveness Study of Sweet Potato, namely: Guyana, Jamaica, St Lucia, St Vincent and the Grenadines and Trinidad and Tobago.

The Policy Review critically examined the general agricultural sector policies as well as those specific to the selected commodities in the five CARICOM countries chosen. The market intelligence study covered a review of the global as well as the regional situation – production, trade flows, competition, opportunities and challenges for the CARICOM industry.

1.2 STRUCTURE OF THE REPORT

This report on the international competitiveness of Sweet Potato is comprised of six sections. In the next two sections which follow, we provide background information to the main analyses reported here. Firstly in the next section we highlight key issues from the Market Intelligence Report and then in Section 3 we provide a profile of the Industry in CARICOM. Section 4 presents the results of the Cost of Production study for Sweet Potato in each of the main growing countries and in Section 5 the analysis of the international competitiveness of Sweet Potato is presented. We conclude the report in Section 6 with proposals on Strategies for the development of the Industry.

The CARICOM Regional Transformation Programme for Agriculture: Sweet Potato Industry in CARICOM Competitiveness and Industry Development Strategies
Section 2
MARKET ASSESSMENT: KEY ISSUES, OPPORTUNITIES AND COMPETITION

2.1 INTRODUCTION

We highlight in this Section of the Report those aspects of the various markets that are relevant to the competitiveness analysis for Sweet Potato. We also consider opportunities and challenges in the context of identifying Strategies for the development of the Sweet Potato Industry.

Development of the Sweet Potato industry may require exploiting all available market opportunities. In this regard, we are of the view that the markets of potential interest to CARICOM include both the domestic and the extra-regional markets. Given transportation logistics and shipping costs, extra-regional markets are restricted to Eastern USA, the Eastern Provinces of Canada and Western Europe, mainly the UK and The Netherlands. Additionally, both the market for the primary commodity as well as value added is of interest.

2.2 MARKET FEATURES

Domestic consumption of Sweet Potato is widespread among countries with per capita consumption being higher in the major producing countries. As a result, the volume of exports as a percent of total production is generally small; a feature that is common for many commonly produced commodities.

With respect to the CARICOM market, only a limited volume of sweet potato is currently traded regionally. We are of the view that this market is grossly underexploited since per capita consumption of the fresh tuber in a number of countries is low to very low and also the production of value-added is almost non-existent.
For each of the markets of interest, it is important to fully understand the structure and functioning as well as to identify the key drivers of competition including consumer preference patterns, trends in consumer demand, who (which countries/suppliers) are the main participants in these markets, what are the sources of competition for the main players in the market, the roles of produce quality and price, and finally, the regulatory requirements for market entry. Such an analysis assists in developing market entry strategies.

2.3 VARIETIES

Generally, there are two basic types of sweet potato on the market: firstly, the ‘moist-flesh’ type which is sweet, orange, soft with a moist flesh when cooked; and secondly, the ‘dry-flesh’ type which is dry and starchy with a firm flesh when cooked. The moist-flesh types are also known as dessert-types and account for most of the output in the USA. Varieties produced in the Caribbean are the ‘dry-flesh’ types which may be yellow or white in flesh colour and are most often used as a source of carbohydrate. The commodity in the retail market includes USA Sweet Yam (red flesh colour), Red China Yam (white flesh colour) and the Caribbean Sweet Potato (yellow flesh colour). These are illustrated in Pictures 1 and 2.
2.4. THE GLOBAL SITUATION

Sweet potato as a commodity is widely grown throughout the world. However, only about one percent of production enters world trade with Canada, the United Kingdom, France and the Netherlands being the major importing countries. The USA is the largest exporter of Sweet Potato accounting for 35% of world trade. Other exporters are China (12%), Israel (9%), France (7%), Indonesia (6%) and Netherlands France (5%). The latter two are also involved in re-exporting. Most of the product is used for table consumption with a small percentage going into industry uses and animal feed.

2.5. THE CARIBBEAN - REGIONAL SITUATION

2.5.1 Industry Profile

Key features of the Caribbean Sweet Potato industry are as follows:

- The largest Caribbean producers of Sweet Potato (Cuba, Haiti, the Dominican Republic) together account for 93% of total production in 2004 (Figure 2.1 and Table 2.1).
- Amongst CARICOM countries, Jamaica is the largest producer accounting for 68% of the Region’s production.
- Other significant CARICOM producers are Guyana, Barbados, St Vincent and the Grenadines and St Lucia, together accounting for 27% of CARICOM’s production.
- The remaining CARICOM countries produce only negligible quantities of Sweet Potato, together accounting for 5% of the Region’s output.
- Only 6.7% of CARICOM’s production are exported – Jamaica and St Vincent and the Grenadines being the major exporters.
- Jamaica exported 1,442 tonnes or 6.3% of production (2000–‘03): 55% to the UK accounting for 8% of that country’s imports; and 45% to Canada.
- St Vincent & the Grenadines exports 734 tonnes (2000–‘03): intra-Caribbean destinations with Trinidad and Tobago being the major market.
- Only small quantities of Sweet Potato are imported – Trinidad and Tobago and The Bahamas being the major importers with the former importing 477 tonnes from St Vincent & the Grenadines and the latter 252 tonnes from the USA (2000-03).
There is no evidence of significant commercial value added production of food or non food products.

![Figure 2.1: Major Sweet Potato Producers in the Caribbean Region - 000 Tonnes (2000/03 av) (Data Source: FAOStat Database)](image)

Table 2.1: Sweet Potato Production and Trade for CARICOM Countries (2000-2003 Average) Tonnes

<table>
<thead>
<tr>
<th>Countries</th>
<th>Production</th>
<th>Imports</th>
<th>Exports</th>
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<tr>
<td>Antigua</td>
<td>156</td>
<td>37</td>
<td>-</td>
</tr>
<tr>
<td>Bahamas</td>
<td>762</td>
<td>252</td>
<td>-</td>
</tr>
<tr>
<td>Barbados</td>
<td>2,345</td>
<td>27</td>
<td>1.7</td>
</tr>
<tr>
<td>Belize</td>
<td>223</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dominica</td>
<td>1,850</td>
<td>-</td>
<td>60</td>
</tr>
<tr>
<td>Grenada</td>
<td>284</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Guyana</td>
<td>2,265</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Jamaica</td>
<td>22,727</td>
<td>-</td>
<td>1442</td>
</tr>
<tr>
<td>Montserrat</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>St Kitts Nevis</td>
<td>150</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>St Lucia</td>
<td>804</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>St Vincent</td>
<td>1,525</td>
<td>-</td>
<td>734</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>220</td>
<td>477</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33,331</strong></td>
<td><strong>818</strong></td>
<td><strong>2237.7</strong></td>
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Data Source: FAOSstat Database
2.5.2 Consumption

Based on the FAO Statistics, the total consumption of sweet potato in CARICOM was estimated at about 31,000 tonnes, estimated from production values less extra-regional exports. The major consuming countries were Jamaica (20,379 tonnes) and Barbados (2,369 tonnes).

In the non-CARICOM countries, an estimated 599,379 tonnes were consumed annually. Cuba and Haiti represented the largest market in the Caribbean at a consumption of 389,613 tonnes and 176,000 tonnes respectively.

The per capita consumption estimates suggest five levels of consumption for the Caribbean as indicated in Figure 2.2 below:

- Level I - Very High Consumption (greater than 20 kg per capita): Includes Cuba, Haiti and Dominica. This group also comprises countries with relatively low per capita income.
- Level II: High Consumption (10 – 20 kg per capita): There were no countries falling in this consumption range.
- Level III – Medium Consumption (5-10 kg./capita): Consumption in this group of countries was significantly lower than the first and included Guadeloupe, Barbados, Jamaica, St Vincent and the Grenadines, St Lucia and Montserrat.
- Level IV – Low Consumption (2-5 kg./capita): There were seven countries in this group which included St Kitts, Grenada, Bahamas, Guyana, Martinique, the Dominican Republic and Antigua.
- Level V – Very Low Consumption level (less than 2 kg./capita): Trinidad and Tobago, Puerto Rico and Belize.
2.6. OVERVIEW OF EXTRA-REGIONAL MARKETS

2.6.1 The USA Market

We note that the USA has an embargo against all imports of Sweet Potato to the mainland from CARICOM countries on account of SPS concerns. Nonetheless we ed the USA situation to get an insight into that market given that it is an exporter of Sweet Potato and therefore could potentially enter the CARICOM market as a competitor.

Sweet potato is commonly referred to as yams in the USA\(^1\). The USA produces an estimated 687,273 tonnes of Sweet Potato annually (1999/2001) of which about 97% are utilized within the country. Export in 2002 was USD 15.0 million whereas imports were negligible and primarily

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\(^{1}\) \(\ldots\)
restricted to Puerto Rico and the US Virgin Islands. Canada remains the major export market for U.S. sweet potatoes, but substantial inroads have been made in the United Kingdom.

**Consumption Patterns & Preferences:** Sweet potato consumption in the USA appears to be concentrated during the fall months (October – December) where about 39% of production in consumed. Holiday occasions are also noted for increased demand. However, sweet potatoes have had limited success in the food-service industry.

Market research on Sweet Potato consumption patterns in the USA indicates as follows:
- Per capita consumption is highest among many ethnic groups, particularly those with a Caribbean or Latin American background.
- Within the above market segments, the “dry-flesh” varieties of sweet potato from the Caribbean are strongly preferred over the moist/sweet variety.
- A trend of increasing consumption.

### 2.6.2 The Canadian Market

Canada’s production of sweet potato is relatively insignificant. Consumption level in 2001 was entirely from imports, valued at USD 11.6 mn. The major suppliers to the Canadian market were the USA, supplying 85% of total imports and Jamaica, supplying 7% (2001).

### 2.6.3 The EU Market

The EU imports of sweet potato average about USD 20 mn annually over the period 2002-2004 (Eurostat Comext). The major sources of imports are the USA (36%), Israel (32%), South Africa (12%), Egypt (8%) and Jamaica (5%). The largest importers were the UK (39%), France (20%), Italy (16%), Netherlands (13%) and Portugal (4%).

### 2.7. MARKET OPPORTUNITIES

#### 2.7.1 Extra-regional Markets

The above reviews suggest a niche for Caribbean exports of quality sweet potato to both the Canadian and the UK markets. We have added The Netherlands as a market to be investigated.
and exploited given its location (close to the UK) and the fact that it is not only a major importer, but also an important re-exporter within the EU. **However, we are of the view that the absorptive capacity of the extra-regional markets is likely to remain relatively small for some time.**

We now provide further elucidation to the above. Firstly, with respect to the Canadian market, although the USA currently supplies over 90% of the requirements for this market, the current presence of Jamaican sweet potato in this market and the strong preference and growth in consumption among the ethnic West Indian population suggest an edge for Caribbean exporters. With respect to the UK market, Jamaica currently supplies 8% of this market, and Barbados a relatively small amount. Again, the USA is dominant in this market with a market-share of 52%. However, given an annual growth in consumption of about 22%, the opportunity exists for Caribbean exporters to capture a significant share of this by exploiting the segments of the market characterized by the ethnic immigrant population and with re-exporting nations – France and The Netherlands.

**2.7.2 The Caribbean Market**

Given the current low levels of per capita consumption in some countries of the Region, we are of the view that opportunities also exist to expand the Caribbean market. However, we expect that growth in consumption is likely to be slow given the need to first influence consumer preference. The latter we think would depend to a large extent on effective promotion as well as the development of various Sweet Potato based food products to meet the peculiar needs of the Caribbean consumer and the food service industry.
Section 3

PROFILE OF THE SWEET POTATO INDUSTRY IN THE
SELECTED CARICOM COUNTRIES

We provide a profile of the Sweet Potato Industry in the selected CARICOM countries – Jamaica, Guyana, St Lucia, St Vincent & the Grenadines and Trinidad & Tobago. The profile examines the key features of the Industry in each country focusing on technology, productivity and issues impacting on production and performance.

3.1 JAMAICA

Sweet Potato is an important food crop for Jamaica. The crop provides food, nutrition and livelihood security and also generates a significant amount of foreign exchange from exports. Jamaica farmers grow a range of different strains / varieties of sweet potato. The most common variety grown is the “Quarter Million”. Most of the sweet potato produced in Jamaica is concentrated in three districts, which accounts for an estimated 68% of total production. The respective acreages according to districts are as follows:

- Manchester (33.6% of national output or 419 ha)
- St. Elizabeth (23.4% of national output or 332 ha)
- Westmoreland (11.9% of national output or 170 ha)

The production units range from marginal to steep lands as in the Cockpit Country. Cultivation is generally done using staggered plantings in an effort to schedule output to suit market conditions. Producers rely heavily on manual tilling given the friability of the soil and the pockets of red soil between the karst topography. The crop is planted in small mounds in this area, while in other areas the soil is banked across the slopes.

Stem cuttings are normally used for planting material. These cuttings, usually 12 inches in length, are retained from a previous crop. Planting is normally done manually by burying the stem
cuttings by hand or with simple hand implements. Planting is generally done during the wet season, during the months of June/July and November (after harvesting the Irish Potato crop in some areas). In continuous areas, sweet potato slips are planted about 1 foot apart within the row and 3 feet between the rows. However, the range of production systems is broad and includes small holdings ranging from less than one acre in some areas, to larger acreages with a high degree of mechanization. The crop is generally produced under rainfed conditions, with producers at higher altitudes taking advantage of favourable moisture and environmental factors that allow for year-round cultivation. Both pure stand, continuous and mixed / intercropped systems are common.

The major insect pests are the Sweet Potato Weevil (*Cylas formicarius elegantulus*) and the Leaf Beetle. A common disease is Alternaria Leaf Spot. Estimated loss by pest and diseases are as high as 50% in some areas. Various viruses may be present but this would need confirmation. Chemical treatments are applied using knapsack sprayers.

Harvesting begins four months after planting, and is commonly done by hand or with the use of simple hand implements. Harvested tubers are placed in bags for field transportation and marketing. Tubers are generally sent to the market unwashed and without curing. Marketable yields average between 3,000 – 4,000 lbs / acre (3,368 – 4,491 kg/ha), although higher yields of 6,000 lbs / acre (6,736 kg/ha) have been achieved by some farmers. A performance target of 8,000 – 10,000 lbs / acre (8,982 – 11,227 kg/ha) has been set for rain fed systems, and 12000 lbs / acre (13,472 kg/ha) for irrigated holdings using “virus free” cuttings. Field losses average about 33% under the low pesticide production system used in Jamaica.

Most of the sweet potato produced in Jamaica is consumed locally, with small amounts exported to Canada and the UK. A relatively small range of value-added products are supplied to the domestic market. One such product is Sweet Potato Pudding Mix. Some of the unmarketable sweet potato goes into animal feed.

Market information on sweet potato is obtained primarily from the Jamaica Produce Marketing Corporation (JAMPRO). Also, the Statistical Unit of the Ministry of Agriculture is responsible for collecting, analyzing and disseminating information on production and export. Hucksters
purchase from farmers at the farm gate for both wholesale and retail sales at the municipal markets. Farmers may not be fully aware of prevailing prices in the regional market. Officers of the Ministry of Agriculture Plant Quarantine, as well as USDA officials, undertake quality assurance on exports.

R&D support is currently being addressed by CARDI and the Ministry of Agriculture. At the time of visit, the Ministry and CARDI were undertaking tissue culture grow-out field trials in an effort to reduce the possible incidence of viruses in the planting material. The major areas for R&D and Technology Support identified include:

- Evaluation and characterization of existing cultivars.
- Introduction / development of new cultivars / varieties.
- R&D on product development and commodity utilization.
- Improved quality through better crop agronomy, harvest and post harvest systems.
- Control of major pests: Sweet Potato Weevil and the Leaf Beetle.
- Screening and selection of planting material. Current system carries the risk of movement of contaminated planting material.

3.2 GUYANA

**Production Characteristics**: Sweet Potato has been receiving increasing focus in Guyana. The crop provides food, nutrition and livelihood security and has been an important source of income for small holder farmers. Over the years, production was done on holdings ranging from less than one acre up to a maximum of about three acres. The production units can be found on the river levees and cultivation is generally done using staggered plantings in an effort to schedule output to suit market conditions. Most of the sweet potato produced in Guyana is concentrated in Region 5 – East Berbice, in the village of Mara, and Region 2 in East Essequibo in the Parika area.

The pegasse-clay soils as well as the flat topography facilitate both manual and mechanized land preparation. On smaller holdings, the land is tilled manually or with the use of hand held mechanized tillers and the soil is then ridged or formed into narrow cambered beds up to 3 feet
wide. On the larger holdings, land preparation is manual. Planting is done manually by burying the stem cuttings by hand or with simple hand implements. Sweet potato slips are planted about 1 foot apart on the beds. The crop is produced under both rainfed and irrigated conditions in pure stand cultivation systems. Crop rotation is common.

**Varieties:** The most common variety of sweet potato grown in Guyana is the “Black Rock” variety. Planting material is retained from the previous crop for cultivation. Stem cuttings, about 12 inches in length are used for cultivation. Chemical application is done using knapsack sprayers. Fertilizer and pesticide is applied as required and vine turning is commonly practiced. No screening of planting material is done on farmers’ holdings.

Harvesting is done manually by hand or with the use of simple hand implements. The tubers are then placed in bags for field transportation and marketing. Sometimes tubers are washed before marketing; however, it is commonly believed that washing increases the rate of spoilage. No curing of tubers is done.

**Pest & Disease:** The major insect pest is sweet potato moth (*Megastes grandalis*) and the sweet potato weevil (*Cylas formicarius elegantulus*) and “Scrabie”. Various viruses may be present but this would need confirmation. Monitor and Monocrotophos are used by some farmers for pest control. In some cases, sweet potato slips are found to turn yellow, wilt and eventually die 3 – 4 weeks after planting, however this problem needs further investigation.

Yields average about 10,000 lbs of marketable produce per acre. However, some farmers report as much as 22,000 lbs. Most planting is done between August to April as the crop is found to do better during the drier months of the year.

All the sweet potato produced in Guyana is consumed fresh; some of the unmarketable sweet potato may be used as animal feed. Export volumes are very low. While production capacity exists in Guyana this is in fact limited by market availability, both on the domestic and export markets.
Institutional & Policy Support: R&D support is currently being addressed by NARI and the Ministry of Agriculture. Currently, R&D / evaluation are being done on 65 varieties of sweet potato. NARI, NGMC and the Ministry of Agriculture provide technology transfer support on primary production and management. Technology support for value added activities limited. The NGMC is playing a major role in the export of non-traditionals’ and can facilitate consolidation and grading of produce through various exporters if required. While the industry benefits from general Government policy and the various institutions, our review of the policies suggests that there is very little by way of commodity specific policies geared to provide strategic development of the sweet potato industry.

Development Needs: The development of the Industry calls for R&D and Technology Support with to:

1. Evaluation and characterization of existing cultivars.
2. Introduction / development of new cultivars / varieties.
3. R&D and technology support on product development and commodity utilization, including semi-processed products.
5. Improved quality through better crop agronomy, harvest and post harvest systems.
6. Standards need to be implemented to facilitate more efficient marketing.
7. Suitable in-field transportation access systems.
8. Control of major pests: sweet potato moth, the sweet potato weevil and “Scrabie”.
9. Screening and / or selection of planting material. Current system carries the risk of movement of contaminated planting material.
10. Development of a Regional Market Intelligence Network.
11. Establishment of food safety, GAP, GAMP.
12. Information on mechanized systems for washing; updated packaging and protocols for exports to other markets.

3.3 ST LUCIA

Sweet potato has remained a small-holder crop in St Lucia, with the bulk of production being utilized as food and a smaller amount for export. Sweet potato is produced year-round in St
St Lucian farmers grow a range of different strains / varieties of sweet potato. The Bush Buck or “Mandela” is the most popular variety of sweet potato grown in St Lucia. This genetic planting material was imported into St Lucia from South Africa circa 1990. The 826/7 variety developed by UWI is also grown. Planting dates recommended for inland cultivation is November to December and for coastal areas – June and July. Irrigation water is available in a few sweet potato growing areas such as Choiseul and the Mabouya Valley. Generally however, the crop is grown under rainfed conditions. Crops planted late in the rainy season are irrigated in some areas to sustain higher yield levels. Twelve-inch stem cuttings are retained from previous crops for use as planting material. In the case of St Lucia, the Government-assisted tractor pool service facilitates land preparation. This is generally used in the larger holdings. Sweet potato slips are planted about 1 foot (30 cm) apart within the row and 3 feet (90 cm) between the rows, giving a plant density of 14,520 per acre (35,864 plants/ ha). Planting however, is done manually by burying the cuttings in trenches made with a cutlass or hoe, or in ridges/banks from the land preparation stage.

Tubers are harvested manually and then placed in bags for field transportation and marketing. Sometimes tubers are washed before marketing. Tubers are not cured prior to sale. All tubers produced, regardless of size and shape, are retained for sale to the undiscriminating the local market. Most of the sweet potato produced in St Lucia is consumed locally. Most farmers sell directly to the St Lucia Marketing Board.

Pest control is an important cultural operation. The major insect pests are sweet potato moth (Megastes grandidis) and the sweet potato weevil (Cylas formicarius elegantulus). Diazinon and Furadan are used for control of these. Mites and field rats are also common pests. In some cases, field rats are reported to account for as much as 30% of losses. Generally, losses have been reported at less than 5% with good management and 50 – 80% with poor management. Chemical control methods are generally preferred.
The sweet potato growers would take their fresh produce to the wholesale / retail fresh produce markets as well as the St Lucia Marketing Board. Farmers can access limited market information and intelligence at the St Lucia Marketing Board and the Marketing Unit of the Ministry of Agriculture. Technology support is provided by the Extension Staff of the Ministry of Agriculture as well as the agricultural input service providers. Extension programmes focus on various areas of providing agronomic advice, such as post harvest handling and soil fertility testing. The commodity extension system is practiced in St Lucia. Belle-Vue Farmers Cooperative Society Ltd – Soufriere and Black Bay Farmers Cooperative members are active in the production of sweet potato.

While the industry benefits from general Government policy and the various institutions, our review of the policies suggests that there is very little by way of commodity specific policies geared to provide strategic development of the sweet potato industry.

Key areas identified for R&D and Technology Support are safer chemicals for pest control and the introduction / development of new varieties. In addition, the following are identified:

- Product development and commodity utilization
- Improved quality through better crop agronomy, harvest and post harvest systems
- Standards need to be developed to assist with grading and marketing.
- Suitable field transportation systems.

3.4 ST VINCENT

Sweet potato is an important crop to St Vincent as it plays a traditional role in food, nutrition and livelihood security, as well as in generating a significant amount of foreign exchange from exports. Production has remained a small-holder crop with holdings ranging from less than one acre (0.4 ha) up to a maximum of five acres (2.0 ha) in size. The production units can be found on the steep hillsides and slopes of St Vincent and cultivation is generally done using staggered plantings in an effort to schedule output to suit market conditions.
St Vincent farmers grow a range of different strains / varieties of sweet potato. The Varieties grown in St Vincent include Black Vine (white flesh, purple skin), Rasta (White flesh, purple skin), Wyllie (white flesh, purple-red skin), Charles Vine, Lovers Known – (red flesh), Bascombe – (yellow flesh) and CARDI Red.

Most of the sweet potato produced in St Vincent is concentrated in District Four (4). This area has about 118 ha producing about 1,569 tonnes or 59% of total production. Production according to varieties is as follows:

- **Black Vine** – 65 ha / 583 tonnes / 33%
- **Rasta** – 33ha / 296 tonnes / 17%
- **Wyllie & Charles Vine** – 20ha / 180 tonnes / 10%

Other important producing areas include District eight (8) which produces about 26% of total production on 57 ha as follows:

- **Black Vine** – 36 ha / 323 tonnes / 18%
- **Rasta** – 15 ha / 135 tonnes / 8%
- **Wyllie & Charles Vine** – 6 ha / 58 tonnes/ 3%

Sweet potato is produced under rainfed conditions, using either pure stand or in mixed or intercropped systems. Continuous cultivation is common. Marketable yield averages between 8,000 – 10,000 lbs acre (8,982 – 11,227 kg/ha). Irrigation is sometimes used in the dry season allowing for higher production levels. However, where reliable irrigation is available farmers may shift to other higher-priced crops. Mechanization is limited by the rugged terrain and steep slopes, and so land preparation is done manually. Ridges or banks are normally formed across slopes. Planting is done manually by burying the stem cuttings by hand or with simple hand implements at about 1 foot apart (30 cm) within the row and 3 feet 990 cm) between the rows.

The major insect pest is sweet potato moth (*Megastes grandalis*) and the sweet potato weevil (*Cylas formicarius elegantulus*). Field rats can cause significant losses in some cases. *Actara* is used by some farmers for pest control. Field losses are estimated to average at 33% under the low pesticide production system used in St Vincent.

Planting is generally done during the wet season, from November to January using 12-inch (30 cm) stem cuttings retained from the previous crop. Harvesting begins four months after planting.
from cuttings and is done manually by hand or with the use of simple hand implements. The tubers are then placed in bags for field transportation and marketing. Sometimes tubers are washed before marketing. No curing of tubers is done. About 59% of the sweet potato produced in St Vincent is consumed locally in the fresh, whole form. A small amount of Sweet Potato Chips (1,050 kg / month) is also produced for local consumption by the country’s three processors. Some of the unmarketable sweet potato goes into animal feed. The difference is exported, with an estimated 36% going to other CARICOM countries and 5% to extra-regional sources. Trinidad and Tobago and Barbados are key regional export market destinations. Hucksters play an important role in export trade.

St Vincent Marketing Corporation (STVMC) undertakes quality assurance on exports. Plant quarantine officers also inspect shipments before exports. The STVMC is the primary source of Market Information and would offer set prices. Statistical Unit of the Ministry of Agriculture collect, analyze and disseminate information on production and export. In addition, manual washing and packing facility are available. The inter-island schooner service is well developed between St Vincent, Trinidad and Tobago and Barbados. Shipments from St Vincent leave on a weekly basis to these ports.

Also, the Eastern Caribbean Trading Agriculture and Development Organization (ECTAD), an NGO provides training and marketing support and services to its members. In addition, ongoing training and support is given by the Ministry of Agriculture. R&D support is currently being addressed by CARDI and the Ministry of Agriculture. The Ministry and ECTAD provide technology transfer support on primary production and management. However, there is a need for revision of the efficacy of these support activities.

While the industry benefits from various institutions as well as general Government policy, our review of the policies suggests that there is very little by way of commodity specific policies geared to provide strategic development of the sweet potato industry. R&D and Technology support is essential to the following:

- Evaluation and characterization of existing cultivars
- Introduction / development of new cultivars / varieties
- R&D on product development and commodity utilization
- Improved quality through better crop agronomy, harvest and post harvest systems
Suitable in-field transportation systems.

Control of major pests: Sweet Potato weevil and Stem Borer.

Planting material taken from previous crop. No screening or selection undertaken. System carries the risk of movement of contaminated planting material

3.5 TRINIDAD AND TOBAGO

Sweet Potato production is considered an important food crop for Trinidad and Tobago. Over the years, production has remained a small-holder crop. The country has always recorded production deficits which are satisfied through imports from St Vincent and the Grenadines. Imports have been showing an overall increasing trend within recent years from 17 tonnes in 1994 to 894 tonnes in 2001. The per capita consumption of sweet potato was 0.89 kg of in 2000.

The Central Statistical Office recorded a cropped acreage of 26 hectares in Trinidad, grown mostly in County Caroni (Cunupia, Esmeralda, Longdenville) and Victoria (Buentento, St Julien, La Savanne, La Gloria). Together these accounted for approximately 90% of the total national output.

The “Chicken Foot” and the “O49” varieties are the major types of sweet potato grown in Trinidad and Tobago. The “Chicken Foot” genetic planting material was imported into Trinidad in 1980 and has been cultivated by vegetative propagation since that date. Production is normally done during the months of June to February of the following year while the soil moisture is adequate. Planting done in June is harvested in September/October (Petite Careme) and crop planted in October / November may be harvested in February/ March. Irrigation water may be available only in a few sweet potato growing areas such as Maloney.

Brushcutting is done to clear land of grass, shrubs and soil preparation is done using a wheel tractor. Land is ploughed, organic matter is incorporated and rotavated and soil is then ridged or banked. Ridges are made 1m apart and 25 - 40cm high. Planting is done manually by burying the stem cuttings in trenches made with a cutlass or hoe.
Planting material is retained from the previous crop for cultivation. Cuttings, about 30 cm in length are planted at about 60 cm within the row. Chemical pesticide application is done using knapsack sprayers, mist blowers or boom sprayers mounted on wheel tractors. Pest control is an important cultural operation. The major insect pests are sweet potato moth (*Megastes grandalis*) and root knot nematode (*Meloidogyne sp*). Major diseases are soft rot, root rot and viruses. Losses are estimated at less than 5% with good management and 50 – 80% with poor management.

Harvesting is done manually and sometimes mechanically with the use of a modified mould-board plough. The tubers are then placed in bags for field transportation and marketing. Sometimes tubers are washed before marketing. No curing of tubers is done. All tubers produced, regardless of size and shape, are retained for sale to the undiscriminating the local market. The market for Trinidad and Tobago sweet potato is the local fresh produce market. The sweet potato growers would take their fresh produce to the country’s two wholesale fresh produce markets or the numerous municipal markets located in the major towns.

Technology support is provided by the Extension Staff of the Ministry of Agriculture as well as the agricultural input service providers. Extension programmes includes agronomic advice, post harvest handling and soil fertility testing. For Trinidad and Tobago, R&D and Technology Support with respect to safer chemicals for pest control and introduction / development of new varieties are required. Other key R&D support areas include:

- R&D on product development and commodity utilization
- Improved quality through better crop agronomy, harvest and post harvest systems
- Standards need to be developed to assist with grading and marketing.
- There exists very little awareness among the local populace with regards to the effects of production on the environment and MRLs / toxicity residues in products
Section 4

ANALYSIS OF THE COST OF PRODUCING SWEET POTATO IN CARICOM

4.1 RELEVANCE OF FARM PRODUCTIVITY / COSTS FOR INDUSTRY COMPETITIVENESS

As outlined in the methodology for evaluating industry competitiveness, all segments of the value chain need to be evaluated for cost efficiency since collectively they contribute to the overall cost efficiency and consequently to the competitiveness of the entire industry. The first stage in the value chain is the production activities. Productivity at the farm level as well as the cost of production generally contributes most to overall cost at the market. Accordingly, it is not only critical to determine overall productivity and costs but more importantly to be able to identify the key components of cost and technology in order to ascertain whether they reflect:

(i) levels of technical efficiency that are possible.
(ii) a choice of technology that optimizes production.
(iii) a level of management that would lead to production optimization and cost efficiency.
(iv) cost levels for various production operations that are within industry possibilities.

This Section of the Competitiveness Report therefore presents the results of the Cost of Production Studies for Sweet Potato in the selected countries. It includes a discussion of the methodology, scope and assumptions of the analysis and a diagnostic evaluation of costs. The last mentioned provides answers to the questions posed above and in this regard provides a basis for identifying opportunities for enhancing overall industry efficiency.

4.2 METHODOLOGY & SCOPE

Given the limitation on time and resources, the methodology proposed for the Cost of Production estimates was the development of costs for representative or typical farms. This required firstly,
information from the Country and Commodity Coordinators on the major producing areas in their respective countries, the relative importance of each area in terms of the aggregate country output, farm characteristics, and the technology in use. Additionally, where Cost of Production estimates were available, these were requested. Some of this data were available for Jamaica, and St Lucia and Guyana.

Following receipt of the above data, field visits were conducted to the countries of the study during the last quarter of 2005 and the first quarter of 2006. The visits allowed for first-hand discussion with farmers in the selected areas, the collection of primary data on costs, and provided for validation and/or update of cost information. The field visits were also done to determine the prevailing conditions of production, identify technologies in use and to ascertain the constraints to production as perceived by the farmers.

Cost of production was disaggregated into:

(i) Operational Costs
(ii) Fixed Cost

Operational cost was further disaggregated according to the major cultural operations involved in Sweet Potato production and included the following:

(i) Seedling Establishment
(ii) Land Preparation
(iii) Chemical Control of Pest & Disease
(iv) Irrigation
(v) Fertilizing
(vi) Post Harvest expenses
(vii) Marketing

The Fixed Cost associated with Sweet Potato production included costs relating to the following:

(ii) Cost of Operating Capital
(iii) Land Charges (Imputed)
(iv) Overhead (covering management, packaging & other expenses)
Costs were determined both in local currency and USA dollars, the latter allowing for comparison across countries.

4.3 OVERALL RESULTS ON SWEET POTATO COST OF PRODUCTION

4.3.1 Overall Results - Costs

The range of unit cost values for sweet potato in the industry in the selected countries is presented in Table 4.1 and Figure 4.1. Unit cost ranged from a high of USD 0.75/kg of Sweet Potato for St Lucia to a low of USD 0.11/kg for Jamaica.

For the countries included in the Study the estimated cost of production is shown in Figure 4.1. These were as follows:

- Jamaica - from a high of USD 0.23/kg to a low of USD 0.11/kg Sweet Potato
- Trinidad and Tobago - from a high of USD 0.34/kg to a low of USD 0.17/kg of Sweet Potato
- St Vincent - cost was USD 0.44/kg Sweet Potato
- Guyana - cost was USD 0.28/kg Sweet Potato

In general, the results suggest a larger percentage of the farms achieved unit cost of production in the higher ranges, from USD 0.23 to USD 0.44/kg. Costs were much higher in the case of St Lucia, partly due to very low yields. Further details of yields and costs in the various countries of the study are presented in the Country Reports below.

Production technologies generally varied in the industry across the region. In the Cockpit Country in Jamaica and on the steep slopes and volcanic soils in St Vincent growers used minimum tillage. St Lucia and Guyana had a range of small-farmer operations using hand tillage and larger farmers using mechanical land preparation. In Trinidad and Tobago growers employed machinery for land preparation and in a few cases harvesting was partially mechanical. Within technologies, factors other than cultural operations which accounted for yield / cost efficiency variability included the following:
(i) Management capability & experience in growing sweet potato
(ii) Soil characteristics and the local agro-environmental climate
(iii) Usage and type of agrochemicals, method of application / sequencing of agrochemicals
(iv) Variety

Table 4.1: Unit Cost of Production of Sweet Potato in Selected CARICOM Countries (2005 Av.)

<table>
<thead>
<tr>
<th>Markets</th>
<th>Cost of Production (USD/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamaica</td>
<td>0.11 – 0.23</td>
</tr>
<tr>
<td>St Vincent</td>
<td>0.44</td>
</tr>
<tr>
<td>St Lucia</td>
<td>0.75</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>0.17 – 0.34</td>
</tr>
<tr>
<td>Guyana</td>
<td>0.28</td>
</tr>
</tbody>
</table>
4.3.2 Overall Results - Yields

Sweet Potato yields range from 6 to 28 tonnes/ha in the Region. In Trinidad and Tobago, yields ranged from 10 to 28 tonnes/ha and in Jamaica from 9 – 16 tonnes (Table 4.2). St Vincent reported yields of 8 tonnes/ha; St Lucia 6 tonnes/ha and Guyana, an average of 10 tonnes/ha. The potential yield of sweet potato for St Lucia however, is reported at 20 tonnes/ha marketable (Source: Min. of Agric.) and in other countries, significant improvements are also expected with improved (virus-free) planting material. Field losses should average about 10% and ranges from 5% to as much as 50%.

Table 4.2: Yields of Sweet Potato in Selected CARICOM Countries (2005 Av.)

<table>
<thead>
<tr>
<th>Markets</th>
<th>Marketable Yield (Tonnes/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamaica</td>
<td>9 - 18</td>
</tr>
<tr>
<td>St Vincent</td>
<td>8</td>
</tr>
<tr>
<td>St Lucia</td>
<td>6</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>10 - 28</td>
</tr>
<tr>
<td>Guyana</td>
<td>10</td>
</tr>
</tbody>
</table>
4.4 COUNTRY REPORT - TRINIDAD AND TOBAGO

The review of costs of various operations reflects different levels of inputs and technology used in the production of sweet potato in Trinidad and Tobago. Cost of production ranged from USD 2,946/ha in Farm 3 to USD 5,656/ha in Farm 2 as shown in Table 4.3.

Farm 2 recorded the highest yield at 28,068 kg/ha at a cost of USD 0.20/kg while Farm 3 recorded the lowest yield of 10,105 kg/ha at a cost of USD 0.29/ha. Farm 2 incorporated poultry manure in the soil at land preparation and is located on the relatively infertile / fertile Las Lomas / Piarco soil series. This results show unit costs of USD 0.17/kg – USD 0.34/kg as shown in Figure 4.2.

The analysis also shows pest, disease and weed control comprise of the highest cost components ranging from 11% - 42% as presented Figure 4.3. The other major cost component comprised the harvesting operation which averaged 18%. Land preparation was estimated at an average of 13% while marketing cost (estimated the same for all farms) at 10%.

Table 4.3: Cost of Production of Sweet Potato, Trinidad and Tobago (USD/ha)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Farm #1 Caroni Basin</th>
<th>Farm #2 Lond’le</th>
<th>Farm #3 Lond’le</th>
<th>Farm #4 Moruga</th>
<th>Farm #5 Esm’d’a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Seedling Establishment</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2. Land Preparation</td>
<td>572</td>
<td>412</td>
<td>588</td>
<td>476</td>
<td>588</td>
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<td>3. Planting</td>
<td>262</td>
<td>274</td>
<td>125</td>
<td>125</td>
<td>510</td>
</tr>
<tr>
<td>4. Chemical Control (total)</td>
<td>443</td>
<td>2258</td>
<td>537</td>
<td>1419</td>
<td>1294</td>
</tr>
<tr>
<td>5. Irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Fertilizing</td>
<td>1019</td>
<td>1623</td>
<td>455</td>
<td>1758</td>
<td>647</td>
</tr>
<tr>
<td>7. Harvesting</td>
<td>1310</td>
<td>428</td>
<td>627</td>
<td>470</td>
<td>902</td>
</tr>
<tr>
<td>8. Post Harvest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Marketing</td>
<td>431</td>
<td>431</td>
<td>431</td>
<td>431</td>
<td>431</td>
</tr>
<tr>
<td>Total Operational Cost</td>
<td>4037</td>
<td>5427</td>
<td>2764</td>
<td>4681</td>
<td>4372</td>
</tr>
<tr>
<td>Fixed Charges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Cost of Capital</td>
<td>70</td>
<td>92</td>
<td>45</td>
<td>80</td>
<td>87</td>
</tr>
<tr>
<td>12. Land Charges</td>
<td>137</td>
<td>137</td>
<td>137</td>
<td>137</td>
<td>137</td>
</tr>
<tr>
<td>Total fixed cost</td>
<td>208</td>
<td>230</td>
<td>182</td>
<td>217</td>
<td>225</td>
</tr>
<tr>
<td>Total All Costs</td>
<td>4244</td>
<td>5656</td>
<td>2946</td>
<td>4898</td>
<td>4596</td>
</tr>
<tr>
<td>Returns/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Yield (kg/ha)</td>
<td>25261</td>
<td>28068</td>
<td>10105</td>
<td>20209</td>
<td>13377</td>
</tr>
<tr>
<td>14. Cost /kg</td>
<td>0.17</td>
<td>0.20</td>
<td>0.29</td>
<td>0.24</td>
<td>0.34</td>
</tr>
</tbody>
</table>
Figure 4.2: Unit Cost of Production and Yield for Sweet Potatoes in Trinidad and Tobago (2005/06)

Figure 4.3: Range of Contribution of Various Cultural Operations to Direct Unit Production Costs (%). Sweet Potato Production in Trinidad and Tobago - 2005/06
Improving Productivity and Cost Efficiency in Sweet Potato: The analysis of Sweet Potato production indicate a wide range in the cost efficiency of growers with unit production cost ranging from USD 0.17/kg – USD 0.34/kg. Data suggest that some producers were able to double yields levels achieved by others and also reduce costs by as much as 50%. We note that production technology for sweet potatoes in Trinidad & Tobago is generally standard in the industry. The major factor accounting for superior performance in terms of cost efficiency and productivity appears to be the management factor (as it related to pest and disease control as well as fertilizer response) rather than variety or soils. Early detection of pest and disease problem, and knowledge of effective solutions to such problems seem to be the most important factor as it relates to costs and yields. We therefore suggest that the key to improving cost efficiency in the industry is mastering pest and disease detection and control. We therefore recommend specialist entomology intervention in the sweet potato-growing sub-sector and effective technology transfer by highly trained extensionist. A combination of using the Farmer School approach, special seminars and individual farm intervention could quickly enhance management techniques and farmer capability in this industry in the short-term.

With respect to the need to reduce cost, R&D is needed on the major items of cost. These include harvesting cost which is entirely a labour cost item. One farmer innovated by modifying a mouldboard plough to replace the labour required for digging the Sweet Potato during harvest. Indeed, this should be the subject of further research and refinement and the technology should be disseminated on a timely basis to the rest of the industry. Agrochemical cost which includes the use of costly agrochemicals as well as application cost can be reviewed in terms of (i) IPM and (ii) mechanization, as two cost reduction initiatives. Similarly fertilizers/plant nutrition should be reviewed in terms of the potential benefits of incorporating poultry manure at land preparation, given that one farmer achieved high yields and low costs on the Piarco Fine Sands which are known for its low natural fertility.

4.5 JAMAICA

Cost profiles were developed for typical sweet potato production activities in Jamaica under similar cultural operations. Since the crop was sold at the farm gate, no major marketing costs
were calculated except for on-farm collection and preparation for farm gate sales. These profiles were developed using data provided by field officers as well as those collected during our visits to various sweet potato producing areas.

The cost profile together with average yields for sweet potato production in the major producing areas in Jamaica is presented in Figure 4.4. While these geographic locations differ, they also represent different ecological zones. There are also some differences in agronomic operations. This serves to explain noticeable differences in cost levels. Thus, for example, small parcels and sloping lands may require more time because of difference in soil type and more refined tillage. In addition, the use of banking is not a universal practice in land preparation and when done, adds to costs. Application rate for fertilizers also differs across the producing areas. Yield levels also vary- which explains the differences in regional costs.

With respect to cost per hectare, total costs of production during the 2004/5 crop year ranged from USD 1,420 – 2,207 (Table 4.4). These costs were lowest in the Mocho area of Clarendon and highest in Kaldare / Portland. Highest yields were reported in Kaldare / Portland at 17,461 kg/ha and 16,844 kg/ha in Southfield / St Elizabeth while the other three areas had low yields of 8,892 kg/ha. With respect to the contribution to total cost, land preparation, harvesting and chemical control were the highest cost components (Figure 4.5)
Table 4.4: Cost of Production Comparison - Sweet Potato – Jamaica (USD/ha)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>JAMAICA REGION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black River St Eliza</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
</tr>
<tr>
<td>1. Seedling Establishment</td>
<td>658</td>
</tr>
<tr>
<td>2. Land Preparation</td>
<td>270</td>
</tr>
<tr>
<td>3. Planting</td>
<td>315</td>
</tr>
<tr>
<td>4. Chemical Control (total)</td>
<td>235</td>
</tr>
<tr>
<td>5. Irrigation</td>
<td>384</td>
</tr>
<tr>
<td>6. Fertilizing</td>
<td>25</td>
</tr>
<tr>
<td>Total Operational Cost</td>
<td>1888</td>
</tr>
<tr>
<td>Fixed Charges</td>
<td></td>
</tr>
<tr>
<td>11. Cost of Capital</td>
<td>83</td>
</tr>
<tr>
<td>12. Land Charges</td>
<td>78</td>
</tr>
<tr>
<td>Total fixed cost</td>
<td>162</td>
</tr>
<tr>
<td>Total All Costs</td>
<td>2049</td>
</tr>
<tr>
<td>Returns/ha</td>
<td></td>
</tr>
<tr>
<td>13. Yield (kg/ha)</td>
<td>8892</td>
</tr>
<tr>
<td>14. Cost /kg</td>
<td>0.23</td>
</tr>
</tbody>
</table>

Figure 4.4: Unit Cost of Production and Yields for Sweet Potatoes in Jamaica (2004/05)
Improving Productivity and Cost Efficiency in Sweet Potato: The unit costs for Sweet Potato are sensitive to yield levels which in turn are related to the amount of fertilizer used, the nature of land preparation and crop care. The differences between expected yield and actual yield are mainly attributed to damages caused by the sweet potato weevil, which, if not treated or prevented, will result in significant increases in costs. Effective Pest Control is critical for the maintenance of high levels of marketable yields on a sustained basis.

Level of fertilization and crop care are the other two critical areas. Minimization of expenditure on land preparation seems difficult to address, more so on the hilly terrain and the karst topography of the Cockpit Country. In this regard, a key component for sustained competitiveness will require the allocation of suitable lands for large-scale cultivation of sweet potato. These lands should be able to facilitate a high level of mechanization. Irrigation infrastructure will be required for year-round production in some areas.
4.6 GUYANA

The total costs of producing one (1) hectare of sweet potato in Guyana was estimated at USD 2,782 / ha as shown in Table 4.5. This cost was derived from data given by growers in the New Amsterdam – Mara area during 2005. Given the yield of 10,060 kg/ha in that area, this translated to a unit cost of USD 0.28/kg.

From the field data, the harvesting cost was accounted for 41% of total operational cost, fertilizer 21% and land preparation 15%. In Guyana, chemical control of pests, diseases and weeds accounted for only 13% of total operational cost.

Improving Productivity and Cost Efficiency in Sweet Potato: Screening and development of new virus free cultivars can serve to increase productivity of sweet potato in Guyana and NARI has been undertaking a series of field trials in this regard (use of virus-free planting material has increased productivity by 30% in China Trials using up to 63,000 plants/ha has resulted in experimental yields of 16 – 24 tonnes/ha and an average of 21 tonnes/ha, that is within range of other major global producers. Six tonnes/ha are considered as low yields and 39 tonnes/ha as high).

The country has large tracts of suitable land for sweet potato cultivation but soil fertility and plant nutrition issues may pose some limitations. The presence of the sweet potato moth (*Megastes grandalis*), the sweet potato weevil (*Cylas formicarius elegantulus*) and “Scrabie” has been a major limiting factor to high productivity and sustainable means of control would serve to increase productivity and reduce costs.

Guyana has the potential to substantially increase production; however limited market opportunities have served to limit the amount of production. Increases in large-scale production can lead to lower costs derived from economies of scale.
Table 4.5: Cost of Production Comparison - Sweet Potato – Guyana (USD/ha)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Total Cost (USD/ha)</th>
<th>Cultural Operations as a % of Total Operational Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Seedling Establishment</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>2. Land Preparation</td>
<td>375</td>
<td>15%</td>
</tr>
<tr>
<td>3. Planting</td>
<td>178</td>
<td>7%</td>
</tr>
<tr>
<td>4. Chemical Control (total)</td>
<td>323</td>
<td>13%</td>
</tr>
<tr>
<td>5. Irrigation</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>6. Fertilizing</td>
<td>527</td>
<td>21%</td>
</tr>
<tr>
<td>7. Harvesting</td>
<td>1044</td>
<td>41%</td>
</tr>
<tr>
<td>8. Post Harvest</td>
<td>81</td>
<td>3%</td>
</tr>
<tr>
<td>9. Marketing</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total Operational Cost</td>
<td>2529</td>
<td>100%</td>
</tr>
<tr>
<td>Fixed Charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Cost of Capital</td>
<td>253</td>
<td></td>
</tr>
<tr>
<td>12. Land Charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total fixed cost</td>
<td>253</td>
<td></td>
</tr>
<tr>
<td>Total All Costs</td>
<td>2782</td>
<td></td>
</tr>
<tr>
<td>Returns/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Yield (kg/ha)</td>
<td>10060</td>
<td></td>
</tr>
<tr>
<td>14. Cost /kg</td>
<td>0.28</td>
<td></td>
</tr>
</tbody>
</table>

4.7 ST VINCENT AND THE GRENADINES

In the case of St Vincent, the total costs of producing one (1) hectare of sweet potato was estimated at USD 3,481 / ha as shown in Table 4.6. This cost was derived from data provided by growers in 2005/06. Growers reported average yields of 7,860 kg/ha. This relatively low yield level results in a comparably high unit cost of USD 0.44/kg.

With respect to contribution to total cost, land preparation, harvesting, chemical control and fertilizing accounted for the largest components. Land preparation accounted for 45% of total operational cost, harvesting cost was 16% and chemical control 14%. In St Vincent there is the concern about plant nutrition and the use and non-use of fertilizers. The data show that fertilizer cost accounted for 10% of total operational cost.
**Improving Productivity and Cost Efficiency in Sweet Potato:** The high field losses (33% avg) is due to the low pesticide production. Thus, damage due to insect pest such as the sweet potato moth (*Megastes grandidis*) and the sweet potato weevil (*Cylas formicarius elegantulus*) as well as Field Rats go unabated. Various viruses are suspected to be present, transmitted by cuttings from previous crops, but this would need confirmation. Some farmers do not use fertilizers and pesticides and normally, two weed control practices may be done. Irrigation water is available in a few sweet potato growing areas.

Key issues facing the St Vincent sweet potato industry includes the optimal level of pesticide application for effective control of the major pests in the short term, and the development of sustainable control methods in the longer term. The range of agricultural chemicals as well as its usage and pesticide residues is important as St Vincent seeks to expand its exports to the international marketplace. In this regard, the presence of viruses in the planting material of St Vincent sweet potatoes should also be the subject of further examination.

St Vincent has highlighted a physiological problem with the sweet potato. Approximately 50% of the root tuber may rot. It is suspected that this problem may be related to soil fertility and the use of fertilizers which were prescribed for bananas. This problem exists in the Georgetown area, but not in other growing areas.

Ambiguity also exists with respect to post harvest washing of the sweet potato as it is believed that this process accelerates spoilage. This problem as well as the physiological problem discussed above remains to be investigated and the results transferred to growers and entrepreneurs in the industry.
Table 4.6: Cost of Production Comparison - Sweet Potato – St Vincent (USD/ha)

<table>
<thead>
<tr>
<th>Operations</th>
<th>Total Cost (USD/ha)</th>
<th>Cultural Operations as a % of Total Operational Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Seedling Establishment</td>
<td>61</td>
<td>2%</td>
</tr>
<tr>
<td>2. Land Preparation</td>
<td>1345</td>
<td>45%</td>
</tr>
<tr>
<td>3. Planting</td>
<td>153</td>
<td>5%</td>
</tr>
<tr>
<td>4. Chemical Control (total)</td>
<td>432</td>
<td>14%</td>
</tr>
<tr>
<td>5. Irrigation</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>6. Fertilizing</td>
<td>311</td>
<td>10%</td>
</tr>
<tr>
<td>7. Harvesting</td>
<td>489</td>
<td>16%</td>
</tr>
<tr>
<td>8. Post Harvest</td>
<td>204</td>
<td>7%</td>
</tr>
<tr>
<td>9. Marketing</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total Operational Cost</td>
<td>2996</td>
<td>100%</td>
</tr>
</tbody>
</table>

Fixed Charges

| 11. Cost of Capital         | 180                 |
| 12. Land Charges            | 306                 |
| Total fixed cost            | 486                 |
|                               | 0                   |
| **Total All Costs**         | **3482**            |

Returns/ha

| 13. Yield (kg/ha)           | 7860                |
| 14. Cost /kg                | 0.44                |

4.8 ST LUCIA

The total cost of producing one (1) hectare of sweet potato in St Lucia was the forth highest in the Region, and the yield was also the lowest. Total cost was estimated at USD 4,505 / ha and yield at 6,000 kg/ha as shown in Table 4.7. This translated to a very high unit cost of USD 0.75/kg.

Fertilizing cost comprised the greatest cost items at 45% of total operational cost, land preparation accounted for 18% and chemical control 11%. Post harvest cost was also 11%, but harvesting cost only 8%.

**Improving Productivity and Cost Efficiency in Sweet Potato:** The high incidence of pests and diseases as well as field rats, and the range of chemicals used in pest control can serve to limit marketing and sustainability in the sweet potato industry. Further, the retention and use of
planting material from the previous crop for use in the following crop sustains the transmission of pests and suspected viruses.

The pests found in St Lucia, the sweet potato moth (*Megastes grandidis*) and the sweet potato weevil (*Cylas formicarius elegantulus*) are common to most countries of the Region and the incidence of Field Rats has been escalating. In addition, the range of agricultural chemicals being used for control of these pests is of major concern to human health and sustainability.

Another common issue that requires attention should expansion programmes be developed is the release and availability of large tracts of suitable fertile lands which would facilitate large-scale mechanization. The development of irrigation will require attention, more so for dry season cultivation.

**Table 4.7: Cost of Production Comparison - Sweet Potato – St Lucia (USD/ha)**

<table>
<thead>
<tr>
<th>Operations</th>
<th>Total Cost (USD/ha)</th>
<th>Cultural Operations as a % of Total Operational Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Seedling Establishment</td>
<td>124</td>
<td>3%</td>
</tr>
<tr>
<td>2. Land Preparation</td>
<td>744</td>
<td>18%</td>
</tr>
<tr>
<td>3. Planting</td>
<td>163</td>
<td>4%</td>
</tr>
<tr>
<td>4. Chemical Control (total)</td>
<td>441</td>
<td>11%</td>
</tr>
<tr>
<td>5. Irrigation</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>6. Fertilizing</td>
<td>1806</td>
<td>45%</td>
</tr>
<tr>
<td>7. Harvesting</td>
<td>326</td>
<td>8%</td>
</tr>
<tr>
<td>8. Post Harvest</td>
<td>449</td>
<td>11%</td>
</tr>
<tr>
<td>9. Marketing</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total Operational Cost</strong></td>
<td><strong>4053</strong></td>
<td>100%</td>
</tr>
<tr>
<td>Fixed Charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Cost of Capital</td>
<td>324</td>
<td></td>
</tr>
<tr>
<td>12. Land Charges</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td><strong>Total fixed cost</strong></td>
<td><strong>452</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total All Costs</strong></td>
<td><strong>4505</strong></td>
<td></td>
</tr>
<tr>
<td>Returns/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Yield (kg/ha)</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>14. Cost /kg</td>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY TABLE 4.8: COST OF PRODUCTION COMPARISON - Sweet Potato (USD)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRINIDAD</th>
<th>JAMAICA REGION</th>
<th>Guyana</th>
<th>St Vincent G/Town</th>
<th>St Lucia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Farm #1 Caroni Basin</td>
<td>Farm #2 Lond’le</td>
<td>Farm #3 Lond’le</td>
<td>Farm #4 Moruga</td>
<td>Farm # 5 Esm’da</td>
</tr>
<tr>
<td>Total Cost of Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Seedling Establishment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Land Preparation</td>
<td>572</td>
<td>412</td>
<td>588</td>
<td>476</td>
<td>588</td>
</tr>
<tr>
<td>3. Planting</td>
<td>262</td>
<td>274</td>
<td>125</td>
<td>125</td>
<td>510</td>
</tr>
<tr>
<td>4. Chemical Control (total)</td>
<td>443</td>
<td>2258</td>
<td>537</td>
<td>1419</td>
<td>1294</td>
</tr>
<tr>
<td>5. Irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Fertilizing</td>
<td>1019</td>
<td>1623</td>
<td>455</td>
<td>1758</td>
<td>647</td>
</tr>
<tr>
<td>7. Harvesting</td>
<td>1310</td>
<td>428</td>
<td>627</td>
<td>470</td>
<td>902</td>
</tr>
<tr>
<td>8. Post Harvest</td>
<td>431</td>
<td>431</td>
<td>431</td>
<td>431</td>
<td>431</td>
</tr>
<tr>
<td>9. Marketing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Operational Cost</td>
<td>4037</td>
<td>5427</td>
<td>2764</td>
<td>4681</td>
<td>4372</td>
</tr>
<tr>
<td>Fixed Charges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Cost of Capital</td>
<td>70</td>
<td>92</td>
<td>45</td>
<td>80</td>
<td>87</td>
</tr>
<tr>
<td>12. Land Charges</td>
<td>137</td>
<td>137</td>
<td>137</td>
<td>137</td>
<td>137</td>
</tr>
<tr>
<td>Total Fixed Cost</td>
<td>208</td>
<td>230</td>
<td>182</td>
<td>217</td>
<td>225</td>
</tr>
<tr>
<td>Total All Costs</td>
<td>4244</td>
<td>5656</td>
<td>2946</td>
<td>4898</td>
<td>4596</td>
</tr>
<tr>
<td>Returns/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Yield (kg/ha)</td>
<td>25261</td>
<td>28068</td>
<td>10105</td>
<td>20209</td>
<td>13377</td>
</tr>
<tr>
<td>Unit Cost &amp; returns</td>
<td>0.17</td>
<td>0.20</td>
<td>0.29</td>
<td>0.24</td>
<td>0.34</td>
</tr>
<tr>
<td>14. Cost /kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The CARICOM Regional Transformation Programme for Agriculture: Sweet Potato Industry in CARICOM
Competitiveness and Industry Development Strategies
5.1 INTRODUCTION

In this Section of the Report we measure the competitiveness of Sweet Potato exports, both with respect to the export and domestic markets. With respect to the former, the market study revealed that the two export markets of interest to regional producers were the UK and Canada. Competitiveness in the domestic market was of interest given the fact that the US is a potential exporter of Sweet Potato to the Region.

The application of the quantitative model depended on inputs from two studies conducted as part of the overall RTP project – the Market Intelligence Study for Sweet Potato and the Industry Productivity and Cost of Production Study. The market intelligence analysis provided information on prices, supply condition and competitiveness factors operating in each of the markets of interest. In Section two of the present Report we highlighted the key competitiveness issues in each market and the main parameters for the competitiveness analysis being presented here.

The Cost of Production Studies (Section 4) provided information on the productivity and cost efficiency of Sweet Potato production in the various countries based on sample data for representative farms in each of the main growing areas. These studies estimated the cost of growing Sweet Potato as well as an analyses of the structure of cost with respect to the various cultural operations.

5.2 SOURCES OF COMPETITION

As discussed in the Market Report, most of the Sweet Potatoes produced in the countries of the study are consumed in households in the freshly-cooked form with very little entering the food
service industry. Only two countries export Sweet Potato, Jamaica and St Vincent. The former exports small quantities to Canada and the United Kingdom and the latter to the United Kingdom.

The market intelligence study revealed that the internal market is the major market of relevance to CARICOM. The Canadian market is relatively small and so is the UK. In addition, the UK market is dominated by African and Asian suppliers. The North American market is dominated by its own production and more specifically, the USA market is protected from competition by SPS regulations. USA’s supplies dominate the Canadian market.

Given the level of Sweet Potato production in the US, expansion of exports into the Region (as already exists in the case of Barbados & Trinidad) competition from this source of supply is therefore the subject of further examination in this Section. The challenge for CARICOM producers and exporters of Sweet Potato is to improve the cost efficiency of their operations while maintaining and improving quality.

5.3 METHODOLOGY

5.3.1 Defining Market Competitiveness

As indicated above, our analysis here is limited to cost/price competitiveness. The analysis considers one export destination - the United Kingdom market. In addition, given the production capability that exists in the USA, the potential threat of exports into the Region is examined.

The methodology for quantitative evaluation of international competitiveness is based on cost / price competitiveness. Essentially the analysis attempts to determine whether our farmers and exporters could deliver a quality product of the preferred variety on a timely basis and in commercially economical volumes to the market at prices that are competitive with our main competitors in those markets. The analytical model therefore builds up cost (simulation) along the value chain from the farm gate to the wholesale delivery point in the Terminal Wholesale Market of the importing country or at the wholesale level in the local market.
The Flow Chart in Figure 5.1 identifies the typical intermediaries and items of cost along the marketing chain associated with Sweet Potato exports to extra-regional markets. Final landed cost at the export market destination includes the following:

1. Production cost, including primary packing and other on-farm post harvest cost
2. Entrepreneurial margin for the producer
3. Transport to a packinghouse
4. Packinghouse costs – sorting, grading, packing, packing material, storage
5. Entrepreneurial Margin for the packer / exporter
6. Administration cost: satisfying export protocols and documentation
7. Transport and handling from the packing house to the export terminal (typically the sea port)
8. Cost of sea transport to the destination country/market
9. Receiving and handling cost at the receiving the sea port
10. Transport from the receiving sea port to the designated produce terminal
11. Entrepreneurial margin for the Importer

(i) EXPORT PRICE COMPETITIVENESS

In our model, competitiveness is measured by comparing the Final Landed Cost (FLC) at the market destination with the average Terminal Wholesale price of Sweet Potato of the same variety and grade/quality. Our measure of EXPORT competitiveness is the EXPORT COMPETITIVENESS COEFFICIENT (ECC) defined as the ratio the Final Landed Cost of Sweet Potato to the average wholesale price at the Terminal Market (TWP):

\[
ECC = \frac{FLC}{TWP} \quad \text{Eq’n (1)}
\]

Where: ECC = export competitiveness coefficient
FLC = the final landed price at the export market destination
TWP = average wholesale price of Sweet Potato at the export terminal market

Exports are considered price competitive when the ECC < 1. The degree of competitiveness or uncompetitiveness (ECCD) is measured by the difference between the value 1 and the ECC. A positive ECCD value indicates a competitive export whereas a negative value for ECCD indicates that the export is not competitive. For example, when ECC = 0.85; then ECCD = 0.15. The ECCD therefore measures the extent to which landed price is below the terminal wholesale price.
market price. In this example, the exported product arrives in the terminal market at a cost that is 15% below the prevailing terminal wholesale price, clearly a competitive position.

\[
\text{ECCD} = 1 - \text{ECC} \quad \text{Eq'n (2)}
\]

Where ECCD = degree of competitiveness
ECCD > 1 indicates a competitive export
ECCD < 1 indicates an uncompetitive export

(ii) IMPORT PRICE COMPETITIVENESS
Similar to Export Competitiveness, we measure of IMPORT competitiveness using the IMPORT COMPETITIVENESS COEFFICIENT (ICC) defined as the ratio the Final Landed Cost of Sweet Potato to the average wholesale price at the Local Market (LWP):

\[
\text{ICC} = \frac{\text{FLC}}{\text{LWP}} \quad \text{Eq'n (1)}
\]

Where: ECC = export competitiveness coefficient
FLC = the final landed price at the export market destination
LWP = average wholesale price of Sweet Potato at the local level

5.3.2 Calculating the ECC: Parameters/Input Coefficients Used in Simulation of Landed Market Cost

The calculation of the ECC is the starting point in the analysis is the ex-farm cost of production for Sweet Potato. Section 4 reported on the costs of production surveys conducted for representative farm types in the seven countries included in the study. Cost of Sweet Potato delivered to the Terminal Market was simulated by including all costs from the farm to the export destination. The main parameters employed in the simulation of landed costs are as follows:

1. Cost of Sweet Potato production (USD/kg)
2. Entrepreneurial Margins for the various Marketeers along the value chain
3. Ocean Transport Freight Rates
4. Local Transport cost
5. Port handling charges
Illustration Showing Major Supply Operations from Farm to Terminal Market

- **Farmer’s Production Unit**: Farmer’s production cost plus farmer’s margin
- **Exporter**: Broker operations: documentation & plant quarantine
- **Packing House Operations**: Sorting, purchase boxes, packing, transport to port
- **Shipping Port (Sea Port)**: FOB at shipping Port / Sea Port
- **Freight Carrier Delivery**: Freight Cost
- **Export Destination**: CIF at Export Destination: UK Port
- **Sea Port Warehouse in Metropolitan Country**: Broker / customs at Export documentation at destination
- **Terminal Market at Export Destination**: Transport to Terminal Market / Warehouse. Cold storage and handling expenses
- **Terminal Market / Terminal Market Prices**: Add Marketing Margin of Importer at Terminal Market at Export Destination
- **Average Wholesale Price at Terminal Market Export Destination**
5.3.2.1 Cost of Production Benchmarks

The cost of production studies developed costing for the typical grower in the main producing areas in Jamaica, St Vincent, Guyana, St Lucia and Trinidad and Tobago. In all countries, we found that the major variety grown was the ‘Yellow-Flesh’ types of various landraces and called by different names such as “Rasta” and “Chicken Foot” in the respective countries. In the case of Jamaica a significant amount of production was done in the Cockpit Country, in Guyana on the riverine soils and the white sands, in St Vincent on the deep volcanic soils on steep and gentle slopes and in St Lucia in small plots of pockets of fertile soils. In Trinidad, most of the Sweet Potato is grown on white sands in Cunupia.

5.3.2.2 Export: Entrepreneurial Margins

The following were the entrepreneurial margins used in the simulation of cost in deriving estimates of the landed cost at the terminal market.

- Farmers Margin = 30 % of cost of on-farm production
- Exporter’s margin = 25 % of cif cost at the destination market
- Importer’s margin = 50 % of cost delivered to the terminal market

5.3.2.3 Sea Freight Rates

The prevailing Ocean Freight rates to the United Kingdom averaged USD 0.13/kg

5.3.2.4 Terminal Market Wholesale Prices for Sweet Potato

In selecting an appropriate market price as a Benchmark for determining competitiveness, a conservative approach was adopted. The market study reviewed available terminal market prices for Sweet Potato over the past two to three years. A price reflecting the lower end of the market was selected as comparator. The average wholesale price for fresh Sweet Potato tubers in the New Spitalfields & New Covent Garden Markets was USD 1.58/kg (2003/05 av).

5.3.2.5 Others Parameters

- Brokers fee = 2 % of cost
- Finance charges = 6 % per annum
- Packaging & miscellaneous charges (refer to simulation model)
Table 5.1: Cost of Production of Sweet Potato in Selected CARICOM Countries (2003/05 Av.)

<table>
<thead>
<tr>
<th>Markets</th>
<th>Cost of Production (USD/kg&lt;sup&gt;3&lt;/sup&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamaica</td>
<td>0.11 – 0.23</td>
</tr>
<tr>
<td>St Vincent</td>
<td>0.44</td>
</tr>
<tr>
<td>St Lucia</td>
<td>0.75</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>0.17 – 0.34</td>
</tr>
<tr>
<td>Guyana</td>
<td>0.28</td>
</tr>
</tbody>
</table>

5.4 EXPORT COMPETITIVENESS: SWEET POTATO INTO THE UK MARKET

We now present the results of the competitiveness analysis with respect to exports into the UK. The level of export competitiveness for the sample farms in the main producing areas across the Region is presented in Figures 5.1. We note the following general conclusions from the analysis with respect to firstly, the competitiveness of production in the selected countries; and secondly, the attractiveness of the various markets for CARICOM exporters.

(i) Competitiveness of CARICOM Sweet Potato exports

Generally, we note the following patterns:

- Among all seven countries, Jamaica’s low cost producer is highly competitive in the UK market, but the high cost producer is only marginally competitive.

- The Trinidad and Tobago low cost producer is competitive in the UK market but the high cost producer is highly uncompetitive.

- Guyana, St Lucia and St Vincent are not competitive in the UK Market.

- The Breakeven cost for CARICOM producers who wish to supply this market is USD 0.26/kg.
(ii) Market Attractiveness:
With respect to the market analyzed we note the following:

- the UK market is the most attractive to CARICOM exporters of Sweet Potato on account of the openness and size. This market also possesses an attractive wholesale market price.
- The USA market was not analysed based on its large-scale domestic production and its SPS restrictions for entry.
- The Canadian market is well supplied by USA exporters. This market is also relatively small in size.
5.5 COMPETITIVENESS OF SWEET POTATO IMPORTS FROM THE US

We now consider the competitiveness of Sweet Potato imports into the CARICOM Region. The purpose here is to advise on the potential competition from US imports of Sweet Potato into CARICOM. The analysis of the competitiveness of Sweet Potato imports in the domestic market was based on a comparison of the simulated landed price versus the domestic supply cost of Sweet Potato at the wholesale point in the local market.

Imported Sweet Potato is defined as having a Competitive Advantage if the landed price of the product is below the local price, measured at the wholesale level. Accordingly, a negative price differential (i.e. local – landed) suggests that the landed product would be more expensive than the locally produced.

Parameters: An important cost component in the importation of commodities is the respective freight rates from source. Given that one of the likely shipping points for US Sweet Potato is Miami, the import competitiveness calculation was based on freight rates ex Miami. The refrigerated cargo freight rate from the Port of Miami was USD 0.13/kg. Other parameters used in the calculation of Import Competitiveness are presented in Box 1 below:

Mark-Up and CET: This import competitiveness analysis for Sweet Potato assumed an importer’s markup of 15% on imports and the 40% CET.

<table>
<thead>
<tr>
<th>Assumptions: Rates and Charges Applied to Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Freight</td>
</tr>
<tr>
<td>ii. Insurance</td>
</tr>
<tr>
<td>iii. OER</td>
</tr>
<tr>
<td>iv. Duty</td>
</tr>
<tr>
<td>v. Broker's Fee</td>
</tr>
<tr>
<td>vii. Port Charges</td>
</tr>
<tr>
<td>viii. Handling &amp; Transport</td>
</tr>
<tr>
<td>ix Interest</td>
</tr>
<tr>
<td>x. Cold storage cost</td>
</tr>
<tr>
<td>xi. Marketing margin of importer</td>
</tr>
</tbody>
</table>

- Freight rate per kg as given by shipping firms using a volume of 25 tonnes / 40 ft reefer unless otherwise stated.
- Insurance at a rate of USD 0.01/kg.
- An official exchange rate of the respective countries.
- The CET of 40% applies to Sweet Potato imports from all extra-regional countries.
- Broker fee is applied a rate of 2% on the cif.
- Port Charges applied a rate of USD 129 plus USD 23.00 per import bill of landing per shipment.
- Internal transport estimated at $TT 1,000.00.
- Interest for financing is charged at a rate 12% per annum.
- Cold storage cost charged at a rate of $TT 0.10/lb.
- Estimated time in cold storage is 3 months maximum.
- Marketing margin of importer estimated at 15%.
Export Price of Sweet Potato from the US: A review of the wholesale prices for Sweet Potato at the terminal markets in the US during 2003/05 show an average wholesale price of USD 0.80/kg ex Miami. On average, the Miami prices were lower than New York. This price was used to estimate the competitiveness of imports from Miami to various markets in the CARICOM Region.

Competitiveness of Imports from the USA: The price competitiveness of Sweet Potato exported from the USA into CARICOM was analyzed using US prices for 2003/05 and also assuming two scenarios with respect to the CET - a 40% CET applied to imports and a 0% CET. In both cases, potential imports of Sweet Potato from the USA Miami Terminal Market were highly uncompetitive (Tables 5.2 & 5.3). At a 40% CET Sweet Potato exports from the US lands at a price of USD 1.62/kg. When compared with the farm gate or local wholesale prices in the various countries analyzed, the local produce had significant price advantage (Table 5.2). If we assumed a CET of 0%, the landed price for US Sweet Potato is USD 1.16/kg, which also above the prices in the local market.

Table 5.2: Competitiveness Analysis for US Exports of Sweet Potato into CARICOM
(Assuming prices & cost for 2003/05 and a 40% CET)

<table>
<thead>
<tr>
<th>Destination</th>
<th>Terminal Market Price (USD/kg)</th>
<th>Simulated Landed Price for Imports (USD/kg)</th>
<th>Local Sweet Potato W/Sale Prices (Based on 30% cost of Production markup) (USD/kg)</th>
<th>Price Differential (TTD/kg) (Local Price – Sim. Landed Price)</th>
<th>Competitive Advantage (+)/Disadvantage (-) (Diff as a % of Actual Local Price)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamaica (Low Price)</td>
<td>0.80</td>
<td>1.62</td>
<td>0.14</td>
<td>-$1.48</td>
<td>-1032</td>
</tr>
<tr>
<td>Jamaica (High Price)</td>
<td>0.80</td>
<td>1.62</td>
<td>0.30</td>
<td>-$1.32</td>
<td>-441</td>
</tr>
<tr>
<td>St Lucia</td>
<td>0.80</td>
<td>1.62</td>
<td>0.98</td>
<td>-$0.64</td>
<td>-66</td>
</tr>
<tr>
<td>St Vincent</td>
<td>0.80</td>
<td>1.62</td>
<td>0.57</td>
<td>-$1.05</td>
<td>-183</td>
</tr>
<tr>
<td>Guyana</td>
<td>0.80</td>
<td>1.62</td>
<td>0.36</td>
<td>-$1.25</td>
<td>-345</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago (Low Price)</td>
<td>0.80</td>
<td>1.62</td>
<td>0.22</td>
<td>-$1.40</td>
<td>-633</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago (High Price)</td>
<td>0.80</td>
<td>1.62</td>
<td>0.44</td>
<td>-$1.18</td>
<td>-266</td>
</tr>
</tbody>
</table>
Table 5.3: Competitiveness Analysis for 2003/05: Sweet Potato Imports from Various the USA at Zero % CET

<table>
<thead>
<tr>
<th>Destination</th>
<th>Terminal Market Price (USD/kg)</th>
<th>Simulated Landed Price for Imports (USD/kg)</th>
<th>Local Sweet Potato W/Sale Prices (Based on 30% cost of Production markup) (USD/kg)</th>
<th>Price Differential (TTD/kg) (Local Price – Sim. Landed Price)</th>
<th>Competitive Advantage (+) / Disadvantage (-) (Diff as a % of Actual Local Price)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamaica (Low Price)</td>
<td>0.80</td>
<td>1.16</td>
<td>0.14</td>
<td>-$1.02</td>
<td>-715</td>
</tr>
<tr>
<td>Jamaica (High Price)</td>
<td>0.80</td>
<td>1.16</td>
<td>0.30</td>
<td>-$0.87</td>
<td>-290</td>
</tr>
<tr>
<td>St Lucia</td>
<td>0.80</td>
<td>1.16</td>
<td>0.98</td>
<td>-$0.19</td>
<td>-19</td>
</tr>
<tr>
<td>St Vincent</td>
<td>0.80</td>
<td>1.16</td>
<td>0.57</td>
<td>-$0.59</td>
<td>-104</td>
</tr>
<tr>
<td>Guyana</td>
<td>0.80</td>
<td>1.16</td>
<td>0.36</td>
<td>-$0.80</td>
<td>-220</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago (Low Price)</td>
<td>0.80</td>
<td>1.16</td>
<td>0.22</td>
<td>-$0.94</td>
<td>-427</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago (High Price)</td>
<td>0.80</td>
<td>1.16</td>
<td>0.44</td>
<td>-$0.72</td>
<td>-164</td>
</tr>
</tbody>
</table>

5.6 KEY FINDINGS ON COMPETITIVENESS

1. Competitiveness of Sweet Potato Exports: Only Jamaica and Trinidad could export Sweet Potato competitively to the UK market. (based on production and market conditions in 2005/06).
   a. Most Growers of Sweet Potato in Jamaica could export competitively to the UK. The more efficient growers enjoy a considerable price margin in the UK market with landed cost being approximately USD 0.38 / kg below terminal wholesale price. However, the less efficient growers are only marginally competitive.
   b. Only the more efficient Sweet Potato growers in Trinidad can compete in the UK Sweet Potato with an estimated margin of USD 0.24/kg.
   c. Growers in St Lucia, St Vincent and the Grenadines and Guyana are not price competitive in the UK market although St Vincent currently has some exports to that market.

2. The CARICOM Market -Competitiveness of US Imports: Sweet Potato imports from the US into CARICOM are not Price competitive. However, we note the presence of small quantities of US type Sweet Potato in some supermarkets reflecting the presence of a small Niche segment.
Section 6

INDUSTRY DEVELOPMENT STRATEGIES: THE WAY FORWARD

This report examined the Sweet Potato industry throughout the value chain. In particular, we reviewed the production conditions/industry characteristics in each of the major producing countries; we reviewed the market situation, both extra-regional and regional; estimated the cost of producing Sweet Potato in each country, and finally undertook a competitiveness analysis, both in the extra-regional and CARICOM markets.

In this Section of the Report we present the industry development strategies / interventions considered necessary to transform Sweet Potato production from what is basically a commodity oriented industry to one that is more competitive and broad-based, both in terms of the use of the fresh product as well as value added.

6.1 KEY ISSUES IMPACTING ON INDUSTRY DEVELOPMENT

From the analyses of the Sweet Potato industry presented in the Market Intelligence Report as well as this present (Competitiveness) Report, we have identified the main issues that are relevant to the transformation of this Industry. We summarize these as follows:

1. Extra-Regional Market Opportunities: The only significant extra-regional market for CARICOM Sweet Potato exports is the UK market. Although providing some window for CARICOM Sweet Potato, the UK market is a highly competitive market with a number of traditional suppliers from Africa and Asia having strong market presence.

2. Competitiveness of Sweet Potato Exports: Only Jamaica and Trinidad are price competitive in the UK market.
3. The CARICOM Market:
   (iii) Intra-regional trade in Sweet Potato is rather limited with the largest volume taking place between St Vincent and Trinidad & Tobago. With the exception of Jamaica and St Vincent most of the Sweet Potato produced in CARICOM is consumed in the producing country.
   (iv) Competitiveness of US Imports: Sweet Potato imports from the US into CARICOM are not Price competitive.

4. Value-Added Products: Regional production of value added products from Sweet Potato is negligible.

5. Productivity of Sweet Potato: Sweet Potato yields in CARICOM are well below potential, with significant losses due to diseases and pests.

6.2 PLATFORM FOR INDUSTRY DEVELOPMENT

Our proposal for the transformation of the CARICOM Sweet Potato industry is grounded on the following three platforms:

   (iv) Improving Productivity and Cost Efficiency
   (v) Expansion / Growth of the Domestic / CARICOM Market through the promotion of consumption and development of convenience ready to cook / ready to eat products
   (vi) Product development for application into end uses, including application of S&T/R&D aimed at the development of high-valued products that exploit the health benefits of Sweet Potato.

Additionally, a number of other factors suggest a good potential for the development of a viable Sweet Potato industry in CARICOM, including the fact that Sweet Potato has good shelf life, the crop exhibits high versatility with respect to growing conditions and low susceptibility to natural disasters such as hurricanes. It is also amenable to the typical small scale farming systems that characterize the Region.
6.3 THE WAY FORWARD: INDUSTRY DEVELOPMENT STRATEGIES

The development of the Sweet Potato industry in CARICOM calls for intervention in the THREE PLATFORM AREAS identified above. We now present strategies for addressing the development challenges in each of these areas. Specifically, we recommend the following strategies:

A. STRATEGIES TO IMPROVE PRODUCTIVITY & COST EFFICIENCY

Sweet Potato productivity in the Region is well below the plant’s agronomic potential. Problems of heavy and persistent attacks from the Sweet Potato weevil and the Sweet Potato stem borer together have resulted in significant losses of marketable yield, ranging as high as 40% in some countries. To the above, we may add losses due to nematodes, viruses and other non-detecting yield reducing factors.

Source of the Problem: Two factors that contribute to the high losses in the production of Sweet Potato are:

(ii) The failure of growers to use CLEAN planting material (carryover of disease from previous crops)

(ii) The high incidence of pest & disease and the high cost of control

Strategies:

To address the two main problems impacting on low productivity and high cost in the production of Sweet Potato we propose the following measures:

• Development of a Regional action plan for R&D to develop technology for controlling the common pests and diseases in a sustainable manner.

• Implementation of a system of quality assurance/regulations to ensure the use of disease free planting material. Towards this end, we recommend the adoption of protocols to enhance quality assurance in the industry, in particular focusing on the quality of planting material, the use of agro-chemicals and the quality of the final product with respect to food safety.

STRATEGY A1: A REGIONAL SWEET POTATO R&D PROGRAMME (AGRONOMIC)
Given the commonality of the Pest and Disease problem facing the Sweet Potato Industry throughout the Region we propose a REGIONAL R&D PROGRAMME. This initiative should involve the participation of the key stakeholders – Caribbean governments, the private sector involved in the Industry (whether production, processing or marketing) and R&D institutions. The aim of the Programme is to:

- find a sustainable cost effective solution to the Industry’s pest and disease problems
- develop systems / protocols to ensure that growers have access to clean planting material
- conduct genetic R&D evaluation and selection of Sweet Potato planting material for the industry.

**Specifically, we propose the following action:**

1. The establishment of an R&D fund for a Sweet Potato Industry Research Programme (SPIRP) with contribution from stakeholders and the donor community. We suggest the wider Caribbean rather than only CARICOM given the fact that the problem extends to other Caribbean countries.

2. The SPIRP should be established as a CONTESTABLE R&D FUND for R&D in the following areas: AGRONOMY, ENTOMOLOGY / PLANT PROTECTION, GENETIC.

R&D Institutions would be invited to bid for resources from the fund to undertake specific research relating to the problems /issues impacting on productivity and cost efficiency. We suggest that participation in the bids should not be limited to Regional R&D institutions but should be open to institutions outside of the Region.

3. The SPIRD should be managed by a Committee comprising key stakeholders

4. Bids for R&D should emphasize sustainable and cost effective solutions, including genetic and biological technology options.

**STRATEGY A2: PRODUCTION & SUPPLY OF CLEAN PLANTING MATERIAL**

The common practice of using planting material form previous crops is considered by industry experts to be a major source of crop losses. The industry in Jamaica, with the assistance of USAID has initiated a project to supply growers with disease free material. Based on the experience of other countries, for example China, clean planting material could boost average yields by as much as 40 %. Clearly, this has significant implications for improvement in cost efficiency.
The specific action being proposed here is for Ministries of Agriculture to develop Protocols for the production of Clean Sweet Potato planting material and to make these available to growers.

**B. EXPANSION / GROWTH OF THE DOMESTIC / CARICOM MARKET**

The domestic market in CARICOM is characterized by very low per capita consumption of Sweet Potato. We propose the following strategies to expand the consumption / utilization of Sweet Potato in the Region:

**STRATEGY B1: THE PROMOTION OF READY TO COOK AND READY TO EAT SWEET POTATO PRODUCTS**

Given the consumption trends in the Region to more convenience foods, we are of the view that the availability of more convenient Sweet Potato products and prepared foods could encourage higher levels of consumption. Many such products are well known at the household level or in the food service industry but not commercially available. We suggest the development of ready to cook and ready to eat products by the Industry and the promotion of entrepreneurial activities in the supply/marketing of such products.

**C. HIGH END PRODUCT DEVELOPMENT**

Beyond the traditional uses of Sweet Potato, recent research has highlighted significant health benefits from consumption of Sweet Potato and Sweet Potato based products. We therefore propose that the Industry’s stakeholders support an R&D programme of work to investigate and develop such products.

**STRATEGY C1: R&D TO DEVELOP HIGH END PRODUCTS**

We therefore recommend the commissioning of R&D work in product development by relevant institutions in the Region with a focus on high end products, including exploiting the health benefits of the Sweet Potato.