JAMPRO
TRADE & INVESTMENT JAMAICA

Cassava

Investment Profile

DoBusiness JAMAICA
INVEST • TRADE • CONNECT

JAMPRO@ JANUARY 2018

CONTENTS

DISCLAIMER

- All information presented in this document is believed accurate at the time of preparation.
- The financial projections are generalized and assume established norms. There can be substantial variability in performance due to a multiplicity of factors including but not limited to management, cultural practices, climatic conditions and the complexities of the agroecological environment.
- Investors are encouraged to register with the relevant agencies of the Ministry of Industry, Commerce, Agriculture and Fisheries, and relevant industry associations to access incentives and technical assistance.

Executive Summary

Cassava (Manihot esculenta Crantz) has been regarded as a hardy crop which is tolerant to many pests, diseases, weeds and poor soils. The main uses of cassava in Jamaica in order of economic importance are for bammy, as a boiled staple and cassava chips. The tuberous root of sweet cassava is boiled and served as a staple in some rural communities.

Cassava is widely grown in tropical Africa, Asia and Latin America. Millions of people depend on cassava in these regions where it is grown by poor farmers, many of them women, often on marginal land. For those people and their families, cassava is vital for both food security and income generation.

For the years 2005 through 2015, average local annual production of both bitter and sweet cassava was 17,198 tonnes. Of this amount, sweet cassava production averaged 10,621 tonnes while bitter cassava production averaged 6,577 tonnes. On average, the yield from cassava planted is about 18,500 kg/hectare[1]. However, using best practices, yields of 30,000 to 58,000 kg/hectare can be expected. Most farmers producing cassava do so as part of an intercropping system and consider cassava to be a source of supplementary income.

The Jamaican dollar value farmgate price/kg for bitter cassava has increased by 30% in 2015 when compared to 2005. Despite this, however, there has been a 30% decline in US dollar value of farmgate prices. The main cause for this is the depreciation in the value of the Jamaican dollar over time. On the other hand, sweet cassava commands a slightly higher price relative to bitter cassava. Like bitter cassava, there has been an upward trend in the Jamaican dollar value over ten-year review period. The Jamaican dollar value for farmgate price/kg for sweet cassava has increased by 32% in 2015 when compared to 2005. Resulting from currency depreciation, there has been a 29% decline in US dollar value of farmgate prices for sweet cassava.

The best returns from investing in a five-acre cassava farm comes from having a significant, if not all funds being equity. The investor stands to gain much higher returns and positive future cash flows when very little debt is undertaken given that the financial margins on cassava are relatively low.

The main incentives provided by the Government of Jamaica to farmers and farming enterprises are captured under the Omnibus Incentives which includes benefits for entrepreneurs involved in agriculture. These include, employment tax credit which reduces the effective income tax rate to as low as 17.5%, duty free importation of equipment and machinery, and vehicle concessions once the farmer is registered with RADA.

1 This represents the average yield for the period 2005 – 2015.

Preamble[2]

Getting started or continuing in agribusiness requires careful planning. Agriculture has many peculiarities that result in variability in production and productivity, chief among which are soil fertility, climatic factors, seasonality, adaptability of the crop or livestock to the specific environment, choice of technology, field practices, post-harvest considerations and marketing. The multiplicity of factors impacting agricultural production undoubtedly places agribusiness at the high end of the risk scale. However, costly mistakes can be avoided, risks minimized, and success achieved, with good understanding of the chosen agricultural enterprise, proper business planning, prudent management and commitment.

The scenario will differ for each investor, whether they are continuing with an enterprise or they are completely new to the venture. The planning scope must therefore be wide and should explore beyond any obvious boundaries. Innovation can make a difference to the level of profitability, and the farmer is therefore encouraged to explore options such as vertical integration and adding value through agro-processing, embarking on the production of organic foods, expanding to achieve economies of scale, overcoming financing challenges by seeking equity financing from family and friends, and forming or supporting producer and marketing groups.

The farmer is being encouraged to question all aspects of the business they plan to enter, and to seek professional assistance to help resolve specific technical and management questions. In the sections that follow, information is compiled from many sources and presented in a format that can be used as a business planning primer.

2 Taken from Cassava Productivity Profile, 2009.

Product Background

Internationally, cassava is also known as manioc, manihot, yucca, mandioca, sweet potato tree, and tapioca plant. It is an important food crop in the tropics where it is grown for its starchy, tuberous roots.

Structure

Cassava is a shrubby perennial that grows to a height of 6-8 feet. The large compound, dark green, reddish veined leaves are palmately divided into about seven leaflets. The stems contain a soft white pith and have nodes from which new plants are obtained. The roots, which are the most valuable portions of the plant, grow in clusters of 4-8 at the stem base. Roots are from 1-4 inches in diameter and from 8-15 inches long, although roots up to 3 feet long are found. The pure white interior is firmer than potatoes and has very high starch content. The roots are covered with a thin reddish brown fibrous bark that is removed by scraping and peeling. The bark is reported to contain toxic hydrocyanic (prussic) acid, which must be removed by washing, scraping and heating.

The two types of recognized cassava are “bitter” and “sweet.” The sweet-type roots contain only a small amount of the acid and are boiled and used as a vegetable, along with the young leaves. The roots are also used for animal feed and the starch is used for glue, laundry starch, and tapioca pudding. Leaves are not eaten raw because of the poisonous substances. Bitter cassava, however, requires extensive processing and is generally reserved for commercial processing.

Health Benefits and Uses of Cassava

Cassava has a variety of nutrients that provide us with significant health benefits which help to promote long life. The most prominent nutrients found in cassava include magnesium, copper, vitamin C and folate. Cassava is a good source of carbohydrates, especially fibre. Fibre consumption is a beneficial part of a healthy lifestyle as it helps to reduce cholesterol and blood pressure. It also helps to stabilize blood sugar levels, lowering the risk of obesity.

Uses of Cassava

The main uses of cassava in Jamaica in order of economic importance are for bammy, as a boiled staple, and cassava chips. The tuberous root of sweet cassava is boiled and served as a staple in

PRODUCT BACKGROUND

some rural communities. In Jamaica, fresh tuberous roots are usually transported to cassava chip or bammy factories shortly after harvest, as quality is affected by delays in processing.

Cassava chips in countries such as Thailand mainly refer to chippings of cassava made by using a front-end loader to put the material into a chipping machine. The chips are sun dried and used as animal feed. On the other hand, cassava chips in Jamaica is a snack item made by slicing the cassava, deep frying and packaging into small plastic bags in much the same way as banana and plantain chips. Acceptance of cassava chips is improving among the Jamaican population alongside other lesser known chips such as breadfruit.

Although not a practice in Jamaica, cassava can be made into pellets for animal feed. A different cassava pellet, an extruded snack, is made with recipes that include modified cornstarch, modified wheat starch and tapioca starch. The pellets are prepared for eating by frying in hot oil or puffing in a hot air of steam.

Historically, cassava starch was made in Jamaica by traditional methods as a backyard operation up until the early 1980's. The starch was used for starching clothes before ironing so that they could be crinkle free. The tradition disappeared for the most part with the importation of spray starch.
Cassava can also be used accordingly:

Baked products: Dried roots can be milled into flour. Corn may be added during the milling process to add protein to the flour. The flour can be used for baking breads. Cassava flour may be used as partial substitute for wheat flour in making bread. Bread made wholly from cassava has been marketed in the U.S.A. to meet the needs of people with allergies to wheat flour. Tuberous roots can be peeled, grated and washed with water to extract the starch which can be used to make a range of breads, crackers, pasta and pearls of tapioca.

- Cassava fries: Cassava can be cut into processed into a product like French fries.
- Cassava leaves: The leaves can add protein to animal feed.
- ndustrial uses: Manufacture of products such as paper-making, textiles, adhesives, high fructose syrup, alcohol and biodegradable plastics.

Types of Cassavas Grown In Jamaica

Cassava is grown as an annual crop in Jamaica, given that it takes 7 – 12 months to reach maturity. There are two types of cassava grown in Jamaica, namely bitter cassava and sweet cassava. Both types are acceptable to consumers. The sweet cassava root is known to have a low level of cyanide but this is eliminated when the cassava is boiled in the traditional way similar to yams and potatoes. The

Situation Overview

Jamaica's Agricultural Sector

The agriculture sector plays a critical role in the development of the Jamaican economy. It affects national development through its impacts on GDP, employment, foreign exchange earnings and rural development. Despite the effects of droughts, the sector has proven to be resilient, accounting for approximately 7.3 percent of GDP in 2016 (Statistical Institute of Jamaica, 2017). In addition, the sector employs approximately 17% of the labour force (Statistical Institute of Jamaica, 2017) which is highly beneficial to the rural community.

The longer-term outlook for the Jamaican economy is of gradual recovery depending on global market conditions and the Government's continued commitment to macroeconomic stabilization, fiscal reforms, and addressing the economy's main structural challenges. Jamaica's strategy for meeting these challenges is based on its national development plan, Vision 2030, which aims to take the country to OECD standards of living. The agriculture sector is vital to this growth as it provides linkages to the manufacturing and tourism sectors and allows for development of the domestic and export markets. While cassava is not exported from Jamaica, the product's potential as a raw material in a variety of other products is outlined in this profile.

Global Cassava Market

Cassava is a very important agricultural produce around the world. According to the World Bank, millions of people depend on cassava in Africa, Asia and Latin America. The crop plays a critical role in food security because of its ability to produce reasonable yields relative to most crops. More than half a billion people consume cassava as part of their regular diet and in addition, it provides a livelihood for millions of farmers, processors and traders globally.

The bulk of world trade in cassava is in the form of pellets and chips for feed (70 percent) and the balance mostly in starch and flour for food processing and industrial use. Very little is traded in the form of fresh root, given the product's bulkiness and perishable nature. Thailand is a dominant supplier to world markets, accounting for some 80 percent of global trade; VietnNam and Indonesia both have a share of about 8 percent; and a few countries in Asia, Africa and Latin America provide for the remainder (Prakash, undated).

Countries in the Far East are the major destination of international trade flows in cassava. Over the past few years, China has emerged as the leading cassava importer, procuring mostly feed ingredients. Presently, the country accounts for around 60 percent of the global market. China has surpassed the EU as the single most important destination for international cassava shipments. Imports by the EU have endured long-term decline. Despite a low tariff rate preferential quota for cassava-based feedstuffs, falling grain prices in the EU coupled with environmental concerns and animal disease outbreaks have

Situation Overview

Table 1 – Top Five Cassava Producing Countries		
Rank	Country	Production (tonnes)
1	Nigeria	54,831,600
2	Thailand	30,022,052
3	Indonesia	23,436,384
4	Brazil	23,253,514
5	Ghana	16,524,000

Original source http://www.fao.org/faostat/en/#data/QC

Local Cassava Market

The demand for locally produced cassava is driven largely by the production of bammy bread, however recent interest by the brewery Red Stripe has followed the trend in other markets to substitute barley for cassava. In 1992 with the growing popularity of bread made from wheat flour, the production of bammy bread was on the decline and with it a decline in the production of cassava. Since then however, with the assistance of an FAO funded project working with several women's groups and the Rural Agriculture Development Authority (RADA), the recipe for bammy bread was documented and standardized (with the addition of mould inhibitors to extend shelf life). Using locally designed and manufactured equipment (grinders, hydraulic press and standardized molding rings), the project helped to transform the manufacture of bammy bread into a modern, convenient, marketable food, standardized, attractively packaged and labeled with the names of the cooperatives/groups making them. Today bammy bread is routinely packaged, frozen and exported to Europe and North America. In fact, when local supplies fall short cassava is imported to Jamaica to meet the growing demand of the local bammy bread makers.

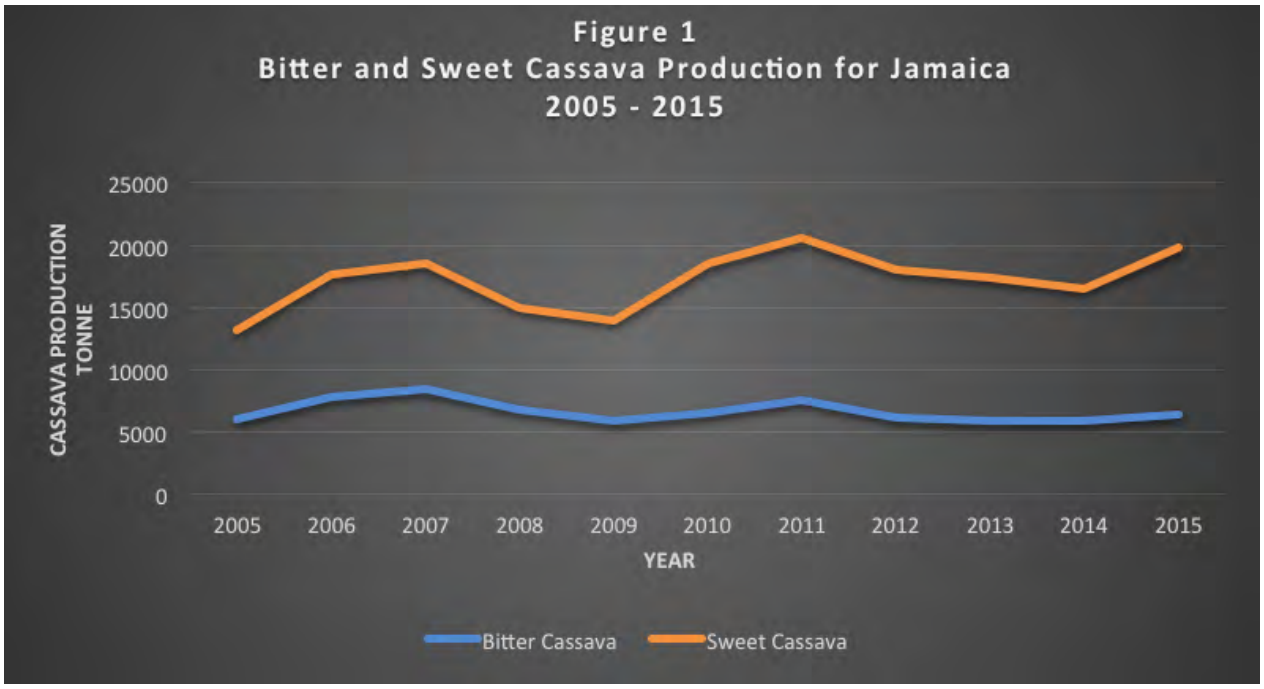
As world prices for food staples such as rice and wheat continue to spike, the demand for locally produced substitutes such as cassava and cassava products (including bammy bread, and cassava flour) will continue to increase. Further demand will come from beer manufacturer Red Stripe, a subsidiary of the global company Heineken. MICAF has undertaken an initiative to develop a viable cassava industry as a key component in a broader initiative to bolster Jamaica's food security. The government of Jamaica's (GOJ) plans to expand the Rural Agriculture Development Authority Twickenham Bammy Factory and increase the use of cassava products in the national school feeding programme, correctional facilities and the public hospital system. Also, the MICAF plans to partner with agro-processors and fresh produce exporters to find additional ready markets in the diaspora. All these developments bode well for those involved in growing cassava as demand is strong and is likely to become increasingly so in the years ahead.

Situation Overview

Local Production

Data provided by MICAF shows that for Jamaica, the production of both bitter and sweet cassava have been trending upwards for the period 2005 to 2015 (see Figure 1). In total, cassava production has increased by approximately 50% for the review period going from 13,224 tonnes in 2005 to 19,784 tonnes in 2015. The increase was driven mainly by a greater increase in the production of sweet cassava, which went up by 83% relative to the 7% increase in bitter cassava over the ten-year period.

For the years 2005 through 2015, average annual production of both bitter and sweet cassava was 17,198 tonnes. Of this amount, sweet cassava production averaged 10,621 tonnes while bitter cassava production averaged 6,577 tonnes.



Source: Graph generated from data provided by the MICAF

Situation Overview

On average, the yield from cassava planted is about 18,500 kg/hectare[3] . However, using best practices, yields of 30,000 to 58,000 kg/hectare can be expected (Purseglove 1974). The relatively low yield for cassava cultivated in Jamaica can be explained by the fact that the crop in most instances is not cultivated using best practices. Most farmers producing cassava do so as part of an intercropping system and consider cassava to be a source of supplementary income.

Farmgate Prices

The farmgate prices for both bitter and sweet cassava have trended upwards over the period 2005 – 2015.

Bitter Cassava

The Jamaican dollar value for farmgate price/kg for bitter cassava has increased by 30% in 2015 when compared to 2005. Prices went from J$33.37/kg in 2005 to J$43.42/kg in 2015. Despite this, however, there has been a 30% decline in US dollar value of farmgate prices. When converted, farmgate prices went from US$0.53/kg to US$0.37/kg (see Table 1). The main cause for this is the depreciation in the value of the Jamaican dollar over time.

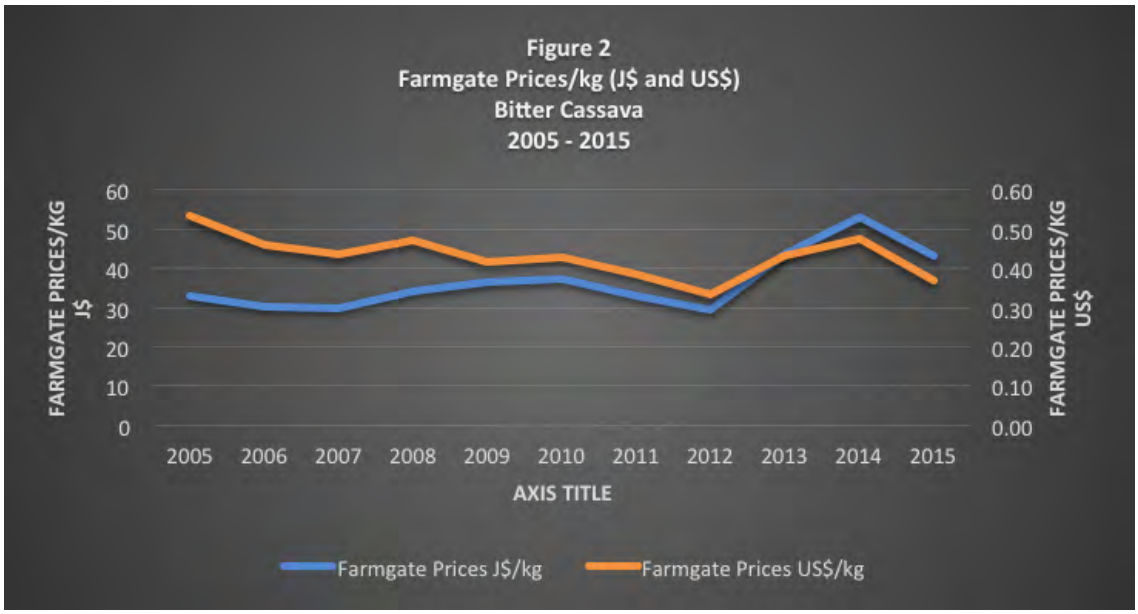
Table 2: Farmgate Prices/kg – Bitter Cassava

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Farmgate price J$/kg	33.37	30.43	30.09	34.45	36.69	37.58	33.32	29.52	43.83	53.1	43.42
Farmgate price US$/kg	0.53	0.46	0.44	0.47	0.42	0.43	33.32	0.33	0.43	0.48	0.37
Exchange rate US$1 = J$	62.59	65.9	69.04	72.91	88.28	87.33	86.08	88.8	100.89	111.3	117.31

The steady decline in the US dollar farmgate price/kg for bitter cassava can also be observed in Figure 2.

3 This represents the average yield for the period 2005 – 2015

Situation Overview



Sweet Cassava

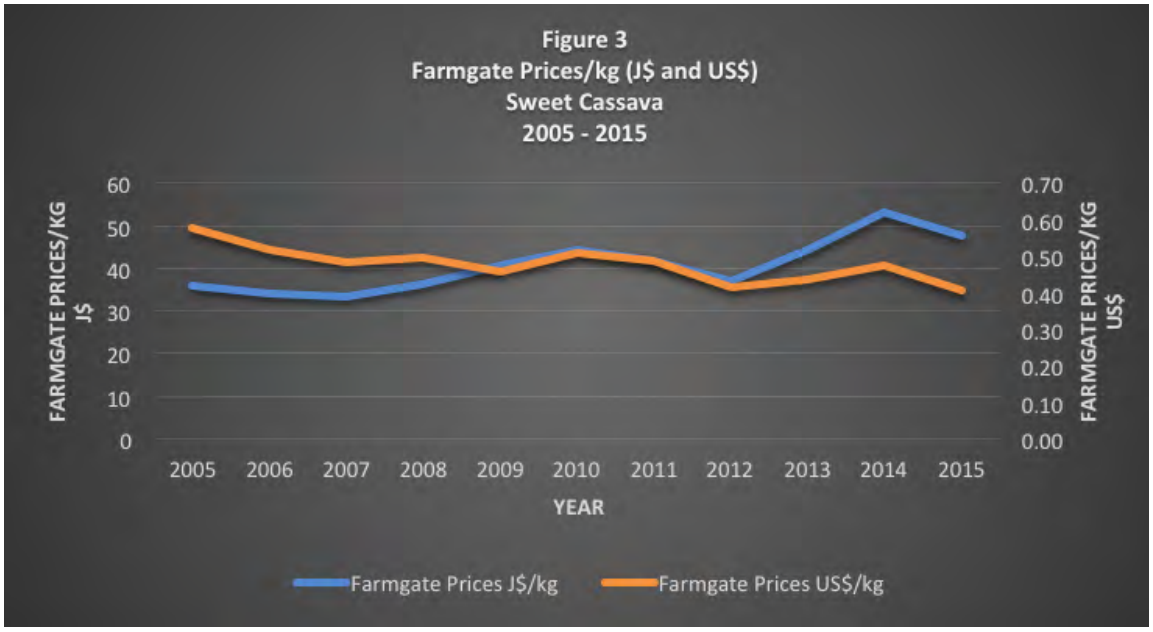
Sweet cassava commands a slightly higher price relative to bitter cassava. Like bitter cassava, however, there has been an upward trend in the Jamaican dollar value over ten-year review period. The Jamaican dollar value for farmgate price/kg for sweet cassava has increased by 32% in 2015 when compared to 2005. Prices went from J$35.96/kg in 2005 to J$43.42/kg in 2015. Resulting from currency devaluation, there has been a 29% decline in US dollar value of farmgate prices for sweet cassava. When converted, farmgate prices went from US$0.57/kg to US$0.41/kg (see Table 3). The main cause for this is the depreciation in the value of the Jamaican dollar over time.

Table 3: Farmgate Prices/kg – Sweet Cassava

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Farmgate price J$/kg	35.96	34.14	33.41	36.19	40.51	44.32	41.78	36.88	44.1	52.89	47.64
Farmgate price US$/kg	0.57	0.52	0.48	0.50	0.46	0.51	0.49	0.42	0.44	0.48	0.41
Exchange rate US$1 = J$	62.59	65.9	69.04	72.91	88.28	87.33	86.08	88.8	100.89	111.3	117.31

Situation Overview

The steady decline in the US dollar farmgate price/kg for sweet cassava can also be observed in Figure 3.



SWOT ANALYSYS

Criteria	Industry Strengths and Opportunities	Industry Weaknesses and Threats
Product	• Cassava tolerates acid soils, periodic and extended drought and defoliation by pests. • It is highly compatible with many types of intercropping systems and flexible with regard to the time of harvest	• Strong competition from major exporters • Cassava has slow initial growth, during which soil erosion may occur, especially on sloping or slightly sloping land. It is therefore necessary to avoid planting cassava on hillsides or to develop effective methods to reduce soil erosion in fields. Soil erosion can be controlled through a range of methods, from zero tillage to ridging and intercropping with cowpeas; or planting 'eating sugarcane' or pineapples on the contour of slopes.
Government Policy	• The continued focus of government to develop agriculture • The provision of incentives geared towards agriculture production (Omnibus Incentives) • Access to Pension funds for farmers	• Improvements needed in policy to address praedial larceny • Access to credit still a challenge for small farmers in particular

Situation Overview

SWOT ANALYSYS cont'd

Criteria	Industry Strengths and Opportunities	Industry Weaknesses and Threats
Current Production	• Opportunity to have two crop cycles increases earning potential • The crop matures in 7-9 months, during which time intercropping with short term vegetable crops early in the crop cycle will offer solutions for cash returns	• Impacts of climate change with respect to droughts, floods can affect product quality and quantity
Market	• Local cassava demand is consistent which provides a reliable market for the commodity • The growing Jamaican diaspora provides the opportunity for export to major cassava consuming countries • Niche market development is also another opportunity • Cassava is a key input into a wide variety of food production and industrial processes	• There is strong global competition
Future Production Capacity	• Opportunities exist for value added products using cassava. For example, cooked, mashed cassava is an excellent food for babies and the seeds are a rich source of vitamins A, B and E, omega-3 and omega-6, zinc and selenium. • With the new focus of Red Stripe to use cassava in their beer production, this provides increased opportunities for farmers to increase their production capacity	• Making the industry more attractive to young people • The financial margins on cassava are relatively low, and therefore it is imprudent to use loan funds for its production.

Agronomics[4]

Planting Material Selection

The varieties grown successfully in Jamaica include: Sao Pedro (high starch content), Bogor (sweet type) and Ambon (high protein). Cuttings used for propagation should be from plants that are high yielding and free of diseases, and conform to the following recommendations:

- Mature stems from plants 8-12 months old and 2.5 to 3.5 cm in diameter are recommended for planting.
- Stems portions which are too young or too old should be avoided.
- Stems from very old plants are often lignified with less food reserves. Roots and shoot formation will be delayed.
- Stems cuttings which are too young are susceptible to attack by soil borne pathogens and sucking insects. They also tend to dehydrate quickly.
- Stem cuttings for planting should have at least 4-6 nodes and should average about 20 cm (8 ins.) in length.
- A clean sharp machete should be used in the preparation of planting material.
- Cuttings can be treated by dipping in a fungicidal and insecticidal solution for 5-7 minutes then allowed to air dry. This treatment protects cuttings from attack by soil borne pathogens and by surface pests such as mites and mealy-bugs, greatly improving the sprouting percentages. Treated cuttings increase yield by more than 25 percent.

Land Preparation

Land should be ploughed to a depth of 30cm (12 ins.) and then harrowed. Ridges should be created with heavy clays where drainage may be a problem.

Planting

Cassava cuttings may be planted vertically, at an angle, or horizontally (moderately slant). At least two thirds of the cuttings should be placed below the ground. This will facilitate good root development and prevent cuttings from drying out rapidly in case of prolonged drought. Planting should coincide with the rainy season if no irrigation is available.

Spacing

Cuttings should be planted at the required spacing of 0.9m x 0.9 m (3ft x 3ft) across the field on the prepared ridges. Twelve thousand (12, 000) plants are required per hectare (4,840/acre).

4 Information taken from Cassava Productivity Profile, 2009

Agronomics

Weed control

Newly planted cassava grows slowly and is vulnerable to weed competition. Weeds can reduce yields up to 50 percent. Therefore, it is important to control weeds in the first 3-4 months after planting. Weeds can be controlled by hand weeding and herbicides.

Fertilizer Application

Fertilizer application is optional. Fertilizer should be applied if the crop is grown in the same area over two seasons.

Post-Harvest

Cassava matures within 7-12 months after planting. However, for best economic returns harvesting should be done 9-12 months after planting. Signs of maturity include: uniform leaf fall, uniform colour of leaves from dark to pale green and easy removal of the thin outer layer of tuberous roots. Since there is no sharply defined maturity period, harvesting may extend over several weeks or even months, determined by utilization systems.

The shelf life of cassava is only a few days unless the roots receive special treatment. Removing the leaves two weeks before harvest lengthens the shelf life to two weeks. Dipping the roots in paraffin or a wax or storing them in plastic bags reduces the incidence of vascular streaking and extends the shelf life to three or four weeks. Tuberous roots can be peeled and frozen. Traditional methods include packing the roots in moist mulch to extend shelf life.

Support Services[5]

There is a plethora of loan facilities at various financial institutions for agricultural purposes, at reduced interest rates (see Appendix 4 for a listing of loan facilities) available on the market. This is supported by various government incentives aimed at boosting investment within the sector. Under the Omnibus Incentives, Agricultural projects can benefit from the following incentives:

- Employment Tax Credit (ETC) and thus face an effective corporate income tax rate as low as 17.5%
- Capital Allowances that cover, among other things, a broadened definition of 'industrial buildings'
- Duty-free Importation of Equipment and Machinery, as well as revised tariff rates ranging from 0% to no higher than 20% (with some exceptions).
- Productive Input Relief (PIR) that provides for duty free importation of certain agricultural-related equipment and machinery used in the production of primary products or in quality control and testing of agricultural products that would have normally attracted customs duties and the Additional Stamp Duty (ASD) when these are being purchased for productive use.
- Concession on specific vehicles, where farmers registered with their local Rural Agriculture Development Authority (RADA), are able to access a concession on specific vehicles for farming purposes once in every five (5) years. Eligible vehicles include Toyota Hilux, Nissan Frontier, Ford Trucks other than F1 50s, and other pickups.

5 Adapted from Ginger Investment, 2009

Support Services

JAMPRO
JAMPRO's continuous mission is to promote Brand Jamaica, attract and land jobs and wealth-creating investments to Jamaica and secure lucrative markets for quality Brand Jamaican products. As the Agency seeks to facilitate local investments, a number of support services are available, namely:

- Provision of business information and advisory services
- Trade and investment incentives
- Export-related training
- Creation of business linkages
- Provision of funding sources and technical assistance
- Enterprise Rating and Upgrading Investment facilitation
- Business development initiatives

RADA

The Rural Agricultural Development Authority (RADA) promotes agricultural development in Jamaica through an extension service. Farmers can solicit information and technical assistance in areas such as agronomy, plant health, irrigation post-harvest techniques, production and marketing.

Agro Investment Corporation

The Agro-Investment Corporation (AIC) is an agricultural investment facilitation, advisory and management agency, which functions as the MICAF business facilitation department. The agency is responsible for agricultural investment promotion and facilitation, as well as project and market development. AIC provides investment support to entrepreneurs, covering the investment chain from the identification of opportunities through to feasibility studies, business planning, fundraising, operations management, long term business performance monitoring and technical support.

Financial Analysis Summary (Equity)

Important Assumptions

To conduct the financial analysis for the five-year period, the following assumptions were made:

- The investment will be financed by 100% equity
- The estimates are made for a 5-acre area of production
- Yield per acre of 17,600 kg is based on estimated yields for best practice farming in cassava.
- Projected farmgate price of cassava is J$50/kg or US$0.38/kg and remains unchanged for the five years
- There is one crop cycle for the year

Additional assumptions are provided in Appendix 5.

Investment Cost

The initial investment is estimated at US$37,699 (see Appendix 6) This is expected to produce 88,000 kg of cassava and yield a profit of US$4,090 for each year of production.

Revenue Forecast
Total revenue for cassava is expected to be at US$31,678 per year for the five-year duration. See Appendix 10 for further details.

Return on Investment

The estimated financials of the project are promising show an Internal Rate of Return (IRR) of 6.30 percent and Net Present Value (NPV) of (US$3,498.00) when future cash flows were discounted utilizing a rate of 10 percent based on the going bank lending rate.

Sensitivity Analyses indicates that a 10 percent increase in capital cost/operating expenses or a 10 percent decrease in revenue resulted in a negative NPV averaging (US$11,642) and an IRR average of (2.88) percent. Refer to Appendices 11, 12 and 15 for further details on these analyses

Table 4: Sensitivity Analysis

Variables	NPV US$)	IRR %
No Change in Parameters	(3,498.00)	6.30
10% increase in the cost of capital	(7,267.52)	2.87
10% increase in operating expenses	(12,118.70)	-3.59
10% decline in revenue	(15,541.00	-7.92

Financial Analysis Summary (Equity)

Detailed Calculations are shown in Appendix 15

Break-even Analysis
The project is expected to break-even (recover cost) after selling 53,247kg each year. See Appendix 15 for further details.

Ratio Analysis
The overall view is that the venture will be moderately profitable as indicated by the Profitability Index (PI) of 1.20 which suggests that the present value of the future cash is a little more than that of the initial investment. Also, the Return on Investment which measures the profit that each dollar invested is also moderate at 11 percent. See Table 5 which contains the ratio analysis of the project. These are future estimates of the investment performance based on current assumptions.

The projected Balance Sheet includes the variables used in the calculation of some of the ratios outlined above. See Appendix 14.

Table 5 – Financial Ratios/Evaluation

Total Asset Turnover	0.65
Current Ratio	20.46
Payback Period (years)	4.18
Debt/Equity Ratio	0.00
Initial Investment/acre (USD)	7,540
Avg. Earnings (USD)	31,768
Profitability Index	1.20
Avg. Net Return per Acre (USD0	817
Return on Asset	0.11
Return on Equity	0.12
Operation Expense Ratio	0.92
Net Income Ratio	0.13
Return on Investment	0.11

Financial Analysis Summary (Debt)

Important Assumptions

To conduct the financial analysis for the five-year period, the following assumptions were made:

- The investment will be financed by 60% debt and 40% equity
- The estimates are made for a 5-acre area of production
- Yield per acre of 17,600 kg is based on estimated yields for best practice farming in cassava.
- Projected farmgate price of cassava is J$50/kg or US$0.38/kg and remains unchanged for the five years
- There is one crop cycle for the year

Investment Cost

The initial investment is estimated at US$37,699 (see Appendix 18). This is expected to produce 88,000 kg of cassava per year and yield a profit of US$1,993 for the first year of production. Net profits are projected to increase to $3,789 by the fifth year.

Revenue Forecast

Total revenue for cassava is expected to be at US$31,678 per year for the five-year duration. See Appendix 20 for further details.

Return on Investment

The estimated financials of the project indicate that borrowing to produce cassava on this small scale may not be the best option. With debt, the Internal Rate of Return (IRR) is negative (22.74%) and the Net Present Value (NPV) is also negative at (US$25,359.00) when future cash flows were discounted utilizing a rate of 10 percent based on the going bank lending rate. As such, investors should use as much of their own equity as possible for more positive results.

Sensitivity Analyses indicates that a 10 percent increase in capital cost/operating expenses or a 10 percent decrease in revenue resulted in a negative NPV averaging (US$33,504.84) and an IRR average of (45.76%) percent. Refer to Appendices 19, 21 and 25 for further details on these analyses

Projected Profit and Loss

The production of cassava is expected to yield a net profit of US$1,993 in year 1 and this is projected to increase to US$3,789 by year 5. Gross margin and net profit margin is forecasted to average approximately 78.2 percent and 6.3 percent respectively over the entire five-year period (details are shown in Appendix 23

Financial Analysis Summary (Debt)

Projected Cash Flow

The cash flow projections for cassava production are positive for the entire five-year period. The net cash flow is expected to average US$3,255. See Appendix 22

Sensitivity Analysis
To obtain the sense of variability and the project's vulnerability to macro or micro environmental changes in cost, revenue, and the operating expenses, sensitivity analyses were conducted. The results of these analyses are summarized in Table 6.

Table 6: Sensitivity Analysis

Variables	NPV	IRR
No Change in Parameters	($25,359.00)	-22.74
10% increase in the cost of capital	($29,128.98	-24.80%
10% increase in operational expenses	($33,982.23)	-43.79%
10% decline in revenue	($37,403.31)	-68.70%

Detailed Calculations are shown in Appendix 25

Break-even Analysis

The project is expected to break-even (recover cost) after selling 53,274kg each year. See Appendix 25 for further details.

Ratio Analysis
The overall view is that the venture of producing cassava on 5 acres with debt might not yield much profitability as indicated by the Profitability Index (PI) of 0.33. This data suggests that the present value of the future cash roughly one third of the initial investment. Also, the Return on Investment which measures the profit that each dollar invested is very low, at only 5%. See Table 7 which contains the ratio analysis of the project. These are future estimates of the investment performance based on current assumptions.

Financial Analysis Summary (Debt)

Table 7 – Financial Ratios/Evaluation

Total Asset Turnover	0.76
Current Ratio	0.93
Payback Period (years)	11.58
Debt/Equity Ratio	1.50
Initial Investment/acre (USD)	7,540
Avg. Earnings (USD)	31,678
Profitability Index	0.33
Avg. Net Return per Acre (USD0	398.61
Return on Asset	0.06
Return on Equity	0.36
Operation Expense Ratio	0.92
Net Income Ratio	0.06
Return on Investment	0.05

The projected Balance Sheet includes the variables used in the calculation of some of the ratios outlined above. See Appendix 25.

References

1. Bank of Jamaica. Exchange Rate Data 2005 – 2016

2. Food and Drug Organization. Information on Cassava Diseases. Retrieved from http://www.fao.org/ag/save-and-grow/cassava/en/6/index.html

3. International Society for Plant Pathology. Guide to Identification and control of Cassava Diseases. Retrieved from http://www.isppweb.org/foodsecurity_casava_diseases.asp.

4. Jamaica Trade and Invest. How do agriculture projects benefit under the Omnibus Incentives? Retrieved from http://www.jamaicatradeandinvest.org/faqs/how-do-agricultural-projects-benefit-under-omnibus-incentives.

5. Jamaica Trade and Invest. Cassava Productivity Profile, 2009

6. Jamaica Trade and Invest. Ginger Investment Profile 2009. Prepared by Elite Business Solutions, 2009.

7. Ministry of Industry, Commerce, Agriculture and Fisheries (2017). Cost of Production Estimates 2016.

8. Prakash, Adam. Cassava: International market profile. Background Paper for the Competitive Commercial Agriculture in Sub-Saharan Africa (CCAA) Study. Trade and Markets Division, Food and Agriculture Organization of the United Nations.

9. Statistical Institute of Jamaica. Cassava Trade data 2005 - 2016

10. The Observatory of Economic Complexity. Export and Import Data on Cassava. Retrieved from http://atlas.media.mit.edu/en/

11. World Bank, 2017. The World Bank in Jamaica. Retrieved from http://www.worldbank.org/en/country/jamaicaoverview.

List of Appendices

APPENDICES 1-4

APPENDIX 1 – MAJOR EXORTERS OF CASSAVA, 2015

Country	Export Value (US$mn)	Percent of Global Export Earnings
Thailand	$1,600	48
Vietnam	$418	12
Cambodia	$406	12
United States	$190	5.7
China	$185	5.5

Source: http://atlas.media.mit.edu/en/visualize/tree_map/hs92/export/show/all/0714/2015/

APPENDIX 2 MAJOR IMPORTERS OF CASSAVA

Country	Export Value (US$ mn)	Percent of Global Import Spending
China	$1,960	58
Vietnam	$219	6.5
Thailand	$218	6.5
United States	$205	6.1
United Kingdom	$127	3.8

Source: http://atlas.media.mit.edu/en/visualize/tree_map/hs92/export/show/all/0714/2015/

APPENDIX 3 – COMMON DISEASES OF CASSAVA

DISEASE	SYMPTOM	TREATMENT
Bacterial Blight	**Distinctive symptoms of the disease include the appearance of water soaked spots or lesions on leaves of infected plants. The spots often start along the veins, margins and tips of leaf blades. As the disease develops, neighboring spots join to form large brown patches or blights killing the leaf blade as it expands. The leaf dries or wilts and finally falls.**	**A common cassava disesase which transmitted by infected planting material and farm tools. It can be controlled by using varieties with good tolerance, soaking stakes in hot water before planting, sterilizing tools with disinfectant, and intercropping to reduce plant-to-plant dissemination.**
Root Rot	**A parasitic mushroom (Polyporus sulphureus), originally suspected to be pathogenic on woody plants, has been found attacking cassava plants and causing severe root rots. This parasitic mushroom is capable of causing 100% yield loss on farms where susceptible cultivars are planted.** **General symptoms of root rot diseases include wilting of leaves, which in most cases is accompanied by defoliation. Other symptoms include swollen roots with colored inner tissues (Figure 19). Rotten roots may be soft and produce an offensive odor (this is often associated with rots caused by bacteria). Shoot or stem dieback is a feature of plants with underground rotten roots. Root rot diseases may lead finally to death of infected plants.**	**One important characteristic of land suitable for cassava cultivation is that it should not be subject to flooding. Waterlogged soils also promote root rot diseases and must be avoided at all times. Farming close to rivers and streams must be avoided as these areas are likely to be flooded at some time in the year. A sandy loamy soil that is well drained is a good soil type for cassava.** **Cassava stems from fields with visible signs of root rot diseases must not be used as planting materials, even if they look healthy. Stems from such fields are likely to carry spores of root rot fungi.** **Localized or natural quarantine measures to check movement of planting materials from root rot endemic areas into new localities may be necessary to check the spread of root rot diseases.**
Cassava Antthrachnose Disease (CAD)	**The main distinctive symptom of CAD is the appearance of cankers or sore-like lesions on the stem of susceptible varieties. The cankers may be formed at the nodes bearing petioles or along any part of the stem depending on the variety.** **Depending on varieties or existing environmental factors, cankers may be small or large. Young and older parts of stems may bear cankers. Cankers may develop cracks, exposing inner tissues of stems to the external environment. Cracks when present serve as entry points for other disease-causing organisms. Development of cankers may result in distortions in the shape of infected stems.**	**The most reliable control s to use desired anthracnose resistant varieties particularly in localities with high CAD pressures. Cultivation of disease resistant or tolerant varieties is even more important in large scale production systems that require stable high yields to feed industries that depend mainly on cassava as raw material.** **Stems and leaves from infected plants after harvest must be destroyed by burning to reduce the number of fungal spores and other infective structures that can cause infections in the next generation of plants.**

Sources:

1) http://www.fao.org/ag/save-and-grow/cassava/en/6/index.html
2) http://www.isppweb.org/foodsecurity_casava_diseases.asp

APPENDICES 4 – AVALIALBLE LOAN FACILITIES

Financial Institution	Loan Purpose	Requirements	Types of Collateral
Development Bank of Jamaica (DBJ	**Modernization of agricultural and agro-processing line of credit. Loans can be accessed through the National People's Corporative Bank**	**Collateral at least 140% of the loan; Equity ranging between 10-30%; Existing market contracts; Business Plan; Registration of Business; Tax Registration Number (TRN); Tax Compliance Certificate (TCC); RADA Registration**	**Real estate (land title) - 1st and 2nd mortgage; Lien or Bill of Sale (if insured) on equipment; Lien/Bill of Sale on vehicles aged 1-6 years (60 to 90% of forced sale value depending on age); Hypothecation - Cash at Bank; Life Insurance (if loan exceeds J$600,000)**
National People's Cooperative Bank	**Loans offered specifically for agricultural start-up businesses; The PC Bank also vets loans offered by the JBDC and DBJ**	**Collateral at least 140% of the loan; C8Equity ranging between 10-10 %; Existing market contracts (for loans vetted for the DBJ/JBDC); Business Plan; Registration of Business; Tax Registration Number (TRN); Tax Compliance Certificate (TCC); RADA Registration**	**Real estate (land title) - 1st and 2nd mortgage; Lien or Bill of Sale (if insured) on equipment; Lien/Bill of Sale on vehicles aged 1-6 years (60 to 90% of forced sale value depending on age); Hypothecation - Cash at Bank; Life Insurance (if loan exceeds J$600,000)**
Credit Unions	**Loans offered for all types of businesses, including agriculture**	**Collateral and other requirements are not consistent across all credit unions, and individual union may need to be contacted to determine loan requirements**	**Check with financial institution**

APPENDIX 5 - 15

FINANCIAL PROJECTIONS (EQUITY)

APPENDIX 5 – FINANICAL ASSUMPTIONS

Important Assumptions

To conduct the financial analysis for the five-year period, the following assumptions were made:

Initial Expenditure/Capital Outlay

- **The investment will be financed by 100% equity**
- **The estimates are made for a 5-acre area of production**
- **Irrigation facilities, including water, are in place**
- **The condition of the land is fair and needs minimal clearing and standard preparation**

Operational Expense

- **Equipment and machinery will be hired to conduct all mechanical operations**
- **Year one land preparation is capitalized**
- **Operational expenses are assumed fixed for the five years**

Production and Revenue

- **Yield per acre of 17,600 kg is based on estimated yields for best practice farming in cassava.**
- **Projected farmgate price of cassava is J$50/kg or US$0.38/kg and remains unchanged for the five years**
- **There is one crop cycle for the year**
- **Exchange rate is J$130:US$1**
- **Sales/output is based on 95% of total output yield, making provisions for spoilage**
- **A discount rate of 10% is used to determine the IRR and NPV**

APPENDIX 6 – SUMMARY OF INVESTMENT COSTS (USD)

Summary of Investment Costs (USD)				
	Unit	**Amount**	**Unit Price**	**Total**
Leasehold Improvements				
Shed				**500**
Fencing				**2000**
Subtotal				**2500**
Machinery and Equipment				
Pick-up truck	**Each**	**1**	**20000**	**20000**
Knapsack sprayer	**Each**	**2**	**100**	**200**
Mist blower	**each**	**1**	**1000**	**1000**
Miscellaneous (10%)				**2120**
Subtotal				**23320**
Establishment Cost				**8,451**
Subtotal				**34,271**
Contingency (10%)				**3,427**
Total Project Costs				**37,699**

APPENDIX 7 – SUMMARY OF INVESTMENT COST USD (10% INCREASE)

Summary of Investment Costs (USD) - 10% Increase				
	Unit	Amount	Unit Price	Total
Leasehold Improvements				
Shed				550
Fencing				2,200
Subtotal				2,750
Machinery and Equipment				
Pick-up truck	each	1	22,000	22,000
Knapsack sprayer	each	2	110	220
Mistblower	each	1	1,100	1,100
Miscellaneous (10%)				2,332
Subtotal				25,652
Establishment Cost				9,297
Subtotal				37,699
Contingency (10%)				3,770
Total Project Costs				41,468

FINANCIAL SUMMARY CONTINUED

Break-even Analysis					
	YR1	YR2	YR3	YR4	Y5
P = Selling Price	0.38	0.38	0.38	0.38	0.38
V = Variable Cost per unit (USD)	0.08	0.08	0.08	0.08	0.08
X = Number of Units Produced and Sold	83,600	83,600	83,600	83,600	83,600
TR = Total Revenue (USD)	31,768	31,768	31,768	31,768	31,768
TC = Total Cost (USD)	22,746	22,746	22,746	22,746	22,746
TFC = Total Fixed Cost (USD)	15,827	15,827	15,827	15,827	15,827
TVC = Total Variable Costs (USD)	6,918	6,918	6,918	6,918	6,918
CM = Contribution Margin: P - V	0.30	0.30	0.30	0.30	0.30
CMR = Contribution Margin Ratio = CM/p	0.78	0.78	0.78	0.78	0.78
Break-even units (kg)	53,247	53,247	53,247	53,247	53,247

APPENDIX 24 – PROJECTED BALANCE SHEET

..					
	YR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Fixed Assets	31,820	31,820	31,820	31,820	31,820
Other					
Less: Accumulated Depreciation	4,932	9,865	14,797	19,730	24,662
Net Fixed Assets	26,888	21,955	17,023	12,090	7,158
Current Assets					
Cash	3,255	3,255	3,255	3,255	3,255
Account Receivables	2,611	2,611	2,611	2,611	2,611
Total Current Assets	5,866	5,866	5,866	5,866	5,866
Total Assets	32,754	27,821	22,889	17,956	13,024
Current Liabilities					
Accounts Payable	569	569	569	569	569
Loan payable	5,767	5,767	5,767	5,767	5,767
Total Current Liabilities	6,336	6,336	6,336	6,336	6,336
Long Term Liabilities					
Loan outstanding	18,949	14,895	10,415	5,467	0
Total long-term liabilities	18,949	14,895	10,415	5,467	0
Total Liabilities	25,285	21,231	16,751	11,803	6,336
Capital					
Share Capital	0	0	0	0	0
Capital Reserve	0	0	0	0	0

Net Profit	**1,994**	**2,377**	**2,802**	**3,271**	**3,789**
Owner's Equity	**5,475**	**4,213**	**3,336**	**2,883**	**2,899**
Total Capital	**7,469**	**6,590**	**6,138**	**6,154**	**6,688**
Total Liabilities and Net worth	**32,754**	**27,821**	**22,889**	**17,957**	**13,024**

APPENDIX 25 – FINANCIAL SUMMARY

NPV and IRR Sensitivity Analysis								
	Normal (No Change in Parameters)		10% Increase in Capital Expense		10% Increase In Operation Expense		10% Decrease in Revenue	
	Capital Inv.	Net Cash Flow	Capital Inv.	Net Cash Flow	Capital Inv.	Net Cash Flow	Capital Inv.	Net Cash Flow
	37,699	(37,699)	41,468	(41,468)	37,699	(37,699)	37,699	(37,699)
YR1		3,255		3,255		981		78
YR2		3,255		3,255		981		78
YR3		3,255		3,255		981		78
YR4		3,255		3,255		981		78
YR5		3,255		3,255		981		78
	NPV	($25,359.00)	NPV	($29,128.98)	NPV	($33,982.23)	NPV	($37,403.31)
	IRR	-22.74%	IRR	-24.80%	IRR	-43.79%	IRR	-68.70%

Financial Ratios/Financial Evaluation			
Total Asset Turnover	**0.76**	**Average Net Return per acre**	**398.61**

Current Ratio	**0.93**	**Return on Asset**	**0.06**
Pay Back Period (Years)	**11.58**	**Return on Equity**	**0.36**
Debt/Equity Ratio	**1.50**	**Operation Expense Ratio**	**0.92**
Initial Investment/acre	**7540**	**Net Income Ratio**	**0.06**
Average Revenue	**31768**	**Return on Investment**	**0.05**
Profitability Index	**0.33**		

APPENDIX 20 – PROJECTED REVENUE SCHEDULE (USD)

PROJECTED REVENUE SCHEDULE (USD)						
	Unit	YR1	YR2	YR3	YR4	YR5
No. of acres		5	5	5	5	5
Yield per acre	Kg	17,600	17,600	17,600	17,600	17,600
Yield for per crop cycle (5 acres)		88,000	88,000	88,000	88,000	88,000
No. of crop cycles		1	1	1	1	1
Total yield for the year	Kg	88,000	88,000	88,000	88,000	88,000
Projected Sales Volume (95%)	Kg	83,600	83,600	83,600	83,600	83,600
Price per kg						
Projected JMD Price/kg		50	50	50	50	50
Project Exchange Rate		130	130	130	130	130
Project price/kg (USD)		0.38	0.38	0.38	0.38	0.38
Sales Value (Revenue, USD)		31,768	31,768	31,768	31,768	31,768

APPENDIX 21 – PROJECTED REVENUE SCHEDULE (USD)_- 10% DECLINE IN PRODUCTION

PROJECTED REVENUE SCHEDULE (USD) – 10% Decline in Production						
	Unit	YR1	YR2	YR3	YR4	YR5
No. of acres		5	5	5	5	5
Yield per acre	kg	15,840	15,840	15,840	15,840	15,840
Yield for per crop cycle (5 acres)		79,200	79,200	79,200	79,200	79,200
No. of crop cycles		1	1	1	1	1
Total yield for the year	kg	79,200	79,200	79,200	79,200	79,200
Projected Sales Volume (95%)	kg	75,240	75,240	75,240	75,240	75,240
Price per kg						
Projected JMD Price/kg		50	50	50	50	50
Project Exchange Rate		130	130	130	130	130
Project price/kg (USD)		0.38	0.38	0.38	0.38	0.38
Sales Value (Revenue, USD)		28,591	28,591	28,591	28,591	28,591

APPENDIX 22 – PROJECTED CASH FLOW (USD)

Projected Annual Cash Flow						
	Base Year	YR1	YR2	YR3	YR4	YR5
Inflows						
Revenue		31,768	31,768	31,768	31,768	31,768
Other Revenues						
Total Revenues		31,768	31,768	31,768	31,768	31,768
Loan	22,619					
Equity	15,080	-	-	-	-	-
Total Inflows	37,699	31,768	31,768	31,768	31,768	31,768
Outflows						
Initial Capital Costs	37,699	-	-	-	-	-
Capital Replacement						
Operating Expenses		22,746	22,746	22,746	22,746	22,746
Total Outflows		22,746	22,746	22,746	22,746	22,746
Net Cash Flow before Debt Service		9,022	9,022	9,022	9,022	9,022
Debt Service:						
Principal		3,671	4,055	4,479	4,949	5,467
Interest		2,097	1,712	1,288	819	301
Total Debt Service		5,767	5,767	5,767	5,767	5,767
Net Cash Flow After Debt Service		3,255	3,255	3,255	3,255	3,255
Accumulated Cash Flow		3,255	6,510	9,765	13,020	16,275

APPENDIX 23 – PROJECTED PROFIT AND LOSS ACCOUNT (USD)

Projected Profit and Loss Statement					
Income	**YR1**	**YR2**	**YR3**	**YR4**	**YR5**
Sales	**31,768**	**31,768**	**31,768**	**31,768**	**31,768**
Less: Direct Expenses	**6,918**	**6,918**	**6,918**	**6,918**	**6,918**
Gross Profit	**24,850**	**24,850**	**24,850**	**24,850**	**24,850**
Less:					
Indirect Expenses	**15,827**	**15,827**	**15,827**	**15,827**	**15,827**
Interest payments	**2,097**	**1,712**	**1,288**	**819**	**301**
Depreciation	**4,932**	**4,932**	**4,932**	**4,932**	**4,932**
Total	**22,857**	**22,472**	**22,048**	**21,579**	**21,060**
Net Profit/Loss	**1,993**	**2,377**	**2,802**	**3,271**	**3,789**
Cumulative Net Profit/Loss	**1,993**	**4,370**	**7,172**	**10,444**	**14,233**
Gross Margin (%)	**78.2**	**78.2**	**78.2**	**78.2**	**78.2**
Net Margin (%)	**6.3**	**7.5**	**8.8**	**10.3**	**11.9**

APPENDIX 18 – PROJECTED OPERATING EXPENSES (USD)_

Projected Operating Expenses (USD)									
	Unit	Amount		Unit Price	YR1	YR2	YR3	YR4	YR5
DIRECT EXPENSES									
labour Costs	acre	5		746.2	3,731	3,731	3,731	3,731	3,731
Material Inputs	acre	5		347.6	1,738	1,738	1,738	1,738	1,738
Sub-total: Direct Labour Costs					5,469	5,469	5,469	5,469	5,469
Supervision (15% of Labour and Material Costs)					820	820	820	820	820
Sub-Total: Direct Labour Costs, Material Inputs, Supervision					6,289	6,289	6,289	6,289	6,289
Contingency (10%)					629	629	629	629	629
Total Direct Costs, Contingency, Supervision Cost					6,918	6,918	6,918	6,918	6,918
INDIRECT EXPENSES									
Land lease	month	12	53.8	0	646	646	646	646	646
Salaries and Wages	month	12	615	0	7,380	7,380	7,380	7,380	7,380
Water	month	12	77	0	924	924	924	924	924
Electriciy	month	12	38.5	0	462	462	462	462	462
Internet	month	12	26.9	0	323	323	323	323	323
Interest payments	Annual								
Fuel	month	12	231	0	2,769	2,769	2,769	2,769	2,769
Equipment Maintainance	month	12	38	0	462	462	462	462	462
Motor Vehicle Maintenance	quarter	4	231	0	923	923	923	923	923
Motor Vehicle Insurance	annual	1	500	0	500	500	500	500	500
Sub-total: Indirect Costs					14,389	14,389	14,389	14,389	14,389
Contingencies (10% of Indirect Costs)					1,439	1,439	1,439	1,439	1,439
Total Indirect Costs and Contigencies					15,827	15,827	15,827	15,827	15,827
TOTAL OPERATING EXPENSES					22,746	22,746	22,746	22,746	22,746

APPENDIX 19 – PROJECTED OPERATING EXPENSES (USD) – 10% INCREASE

Projected Operating Expenses (USD)								
	Unit		Unit Price	YR1	YR2	YR3	YR4	YR5
DIRECT EXPENSES								
labour Costs	acre		821	4,104	4,104	4,104	4,104	4,104
Material Inputs	acre		416	1,912	1,912	1,912	1,912	1,912
Sub-total: Direct Labour Costs				6,016	6,016	6,016	6,016	6,016
Supervision (15% of Labour and Material Costs)				902	902	902	902	902
Sub-Total: Direct Labour Costs, Material Inputs, Supervision				6,918	6,918	6,918	6,918	6,918
Contingency (10%)				692	692	692	692	692
Total Direct Costs, Contingency, Supervision Cost				7,610	7,610	7,610	7,610	7,610
INDIRECT EXPENSES								
Land lease	month	12	59.3	711	711	711	711	711
Salaries and Wages	month	12	676.5	8,118	8,118	8,118	8,118	8,118
Water	month	12	84.7	1,016	1,016	1,016	1,016	1,016
Electriciy	month	12	42.3	508	508	508	508	508
Internet	month	12	29.6	355	355	355	355	355
Fuel	month	12	253.8	3,046	3,046	3,046	3,046	3,046
Equipment Maintainance	month	12	42.3	508	508	508	508	508
Motor Vehicle Maintenance	quarter	4	253.8	1,015	1,015	1,015	1,015	1,015
Motor Vehicle Insurance	annual	1	550	550	550	550	550	550
Sub-total: Indirect Costs				15,827	15,827	15,827	15,827	15,827
Contingencies (10% of Indirect Costs)				1,583	1,583	1,583	1,583	1,583
Total Indirect Costs and Contigencies				17,410	17,410	17,410	17,410	17,410
TOTAL OPERATING EXPENSES				25,020	25,020	25,020	25,020	25,020

APPENDIX 16 - 25

FINANCIAL PROJECTIONS (DEBT)

APPENDIX 16 – FINANCIAL ASSUMPTIONS

Important Assumptions

To conduct the financial analysis for the five-year period, the following assumptions were made:

Initial Expenditure/Capital Outlay

- **The investment will be financed by 60% debt and 40% equity**
- **The estimates are made for a 5-acre area of production**
- **Irrigation facilities, including water, are in place**
- **The condition of the land is fair and needs minimal clearing and standard preparation**

Operational Expense

- **Equipment and machinery will be hired to conduct all mechanical operations**
- **Year one land preparation is capitalized**
- **Operational expenses are assumed fixed for the five years**

Production and Revenue

- **Yield per acre of 17,600 kg is based on estimated yields for best practice farming in cassava.**
- **Projected farmgate price of cassava is J$50/kg or US0.38/kg and remains unchanged for the five years**
- **There are two crop cycles for the year**
- **Exchange rate is J$130:US$1**
- **Sales/output is based on 95% of total output yield, making provisions for spoilage**
- **A discount rate of 10% is used to determine the IRR and NPV**

APPENDIX 17 – SUMMARY OF INVESTMENT COSTS (USD)

Summary of Investment Costs (USD)				
	Unit	**Amount**	**Unit Price**	**Total**
Leasehold Improvements				
Shed				**500**
Fencing				**2000**
Subtotal				**2500**
Machinery and Equipment				
Pick-up truck	**Each**	**1**	**20000**	**20000**
Knapsack sprayer	**Each**	**2**	**100**	**200**
Mist blower	**each**	**1**	**1000**	**1000**
Miscellaneous (10%)				**2120**
Subtotal				**23320**
Establishment Cost				**8,451**
Subtotal				**34,271**
Contingency (10%)				**3,427**
Total Project Costs				**37,699**

APPENDIX 17 – SUMMARY OF INVESTMENT COST USD (10% INCREASE)

Summary of Investment Costs (USD) - 10% Increase				
	Unit	Amount	Unit Price	Total
Leasehold Improvements				
Shed				550
Fencing				2,200
Subtotal				2,750
Machinery and Equipment				
Pick up truck	each	1	22,000	22,000
Knapsack sprayer	each	2	110	220
Mistblower	each	1	1,100	1,100
Miscellaneous (10%)				2,332
Subtotal				25,652
Establishment Cost				9,297
Subtotal				37,699
Contingency (10%)				3,770
Total Project Costs				41,468

Break-even Analysis					
	YR1	YR2	YR3	YR4	Y5
P = Selling Price	0.38	0.38	0.38	0.38	0.38
V = Variable Cost per unit (USD)	0.08	0.08	0.08	0.08	0.08
X = Number of Units Produced and Sold	83,600	83,600	83,600	83,600	83,600
TR = Total Revenue (USD)	31,768	31,768	31,768	31,768	31,768
TC = Total Cost (USD)	22,746	22,746	22,746	22,746	22,746
TFC = Total Fixed Cost (USD)	15,827	15,827	15,827	15,827	15,827
TVC = Total Variable Costs (USD)	6,918	6,918	6,918	6,918	6,918
CM = Contribution Margin: P – V	0.30	0.30	0.30	0.30	0.30
CMR = Contribution Margin Ratio = CM/p	0.78	0.78	0.78	0.78	0.78
Break-even units	53,247	53,247	53,247	53,247	53,247

APPENDIX 14 – PROJECTED BALANCE SHEET (USD)

Projected Balance Sheet (USD)					
	YR	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Fixed Assets	31,820	31,820	31,820	31,820	31,820
Other					
Less: Accumulated Depreciation	4,932	9,865	14,797	19,730	24,662
Net Fixed Assets	26,888	21,955	17,023	12,090	7,158
Current Assets					
Cash	9,022	9,022	9,022	9,022	9,022
Account Receivables	2,611	2,611	2,611	2,611	2,611
Total Current Assets	11,633	11,633	11,633	11,633	11,633
Total Assets	38,521	33,589	28,656	23,724	18,791
Current Liabilities					
Accounts Payable	569	569	569	569	569
Loan payable	-	-	-	-	-
Total Current Liabilities	569	569	569	569	569
Long Term Liabilities					
Loan outstanding	-	-	-	-	-
Total long-term liabilities	0	0	0	0	0
Total Liabilities	569	569	569	569	569

Capital					
Share Capital	0	0	0	0	0
Capital Reserve	0	0	0	0	0
Net Profit	4,090	4,090	4,090	4,090	4,090
Owner's Equity	33,862	28,930	23,998	19,065	14,133
Total Capital	37,952	33,020	28,088	23,155	18,223
Total Liabilities and Net worth	38,520	33,588	28,656	23,723	18,791

NPV and IRR Sensitivity Analysis								
	Normal (No Change in Parameters)		10% Increase in Capital Expense		10% Increase in Operating Expense		10% Decrease in Revenue	
	Capital Inv.	Net Cash Flow	Capital Inv.	Net Cash Flow	Capital Inv.	Net Cash Flow	Capital Inv.	Net Cash Flow
	37,699	(37,699)	41,468	(41,468)	37,699	(37,699)	37,699	(37,699)
YR1		9,022		9,022		6,748		5,845
YR2		9,022		9,022		6,748		5,845
YR3		9,022		9,022		6,748		5,845
YR4		9,022		9,022		6,748		5,845
YR5		9,022		9,022		6,748		5,845
	NPV	($3,498.00)	NPV	($7,267.52)	NPV	($12,118.70)	NPV	($15,541.00)
	IRR	6.30%	IRR	2.87%	IRR	-3.59%	IRR	-7.92%

APPENDIX 15 – FINANCIAL SUMMARY

Financial Ratios/Financial Evaluation			
Total Asset Turnover	0.65	Average Net Return per acre	817.97
Current Ratio	20.46	Return on Asset	0.11
Pay Back Period (Years)	4.18	Return on Equity	0.12
Debt/Equity Ratio	0.00	Operation Expense Ratio	0.92
Initial Investment/acre	7540	Net Income Ratio	0.13
Average Revenue	31,768	Return on Investment	0.11
Profitability Index	1.20		

APPENDIX 10 – PROJECTRED REVENUE SCHEDULE (USD)

PROJECTED REVENUE SCHEDULE (USD)						
	Unit	YR1	YR2	YR3	YR4	YR5
No. of acres		5	5	5	5	5
Yield per acre	kg	17,600	17,600	17,600	17,600	17,600
Yield for per crop cycle (5 acres)		88,000	88,000	88,000	88,000	88,000
No. of crop cycles		1	1	1	1	1
Total yield for the year	kg	88,000	88,000	88,000	88,000	88,000
Projected Sales Volume (95%)	kg	83,600	83,600	83,600	83,600	83,600
Price per kg						
Projected JMD Price/kg		50	50	50	50	50
Project Exchange Rate		130	130	130	130	130
Project price/kg (USD)		0.38	0.38	0.38	0.38	0.38
Sales Value (Revenue, USD)		31,768	31,768	31,768	31,768	31,768

APPENDIX 11 – PROJECTED REVENUE SCHEDULE (USD_- 10% DECLINE IN PRODUCTION

PROJECTED REVENUE SCHEDULE (USD) – 10% Decline in Production						
	Unit	YR1	YR2	YR3	YR4	YR5
No. of acres		5	5	5	5	5
Yield per acre	Kg	15,840	15,840	15,840	15,840	15,840
Yield for per crop cycle (5 acres)		79,200	79,200	79,200	79,200	79,200
No. of crop cycles		1	1	1	1	1
Total yield for the year	Kg	79,200	79,200	79,200	79,200	79,200
Projected Sales Volume (95%)	Kg	75,240	75,240	75,240	75,240	75,240
Price per kg						
Projected JMD Price/kg		50	50	50	50	50
Project Exchange Rate		130	130	130	130	130
Project price/kg (USD)		0.38	0.38	0.38	0.38	0.38
Sales Value (Revenue, USD)		28,591	28,591	28,591	28,591	28,591

APPENDIX 12 – PROJECTED CASH FLOW (USD)

Projected Annual Cash Flow						
	Base Year	YR1	YR2	YR3	YR4	YR5
Inflows						
Revenue		31,768	31,768	31,768	31,768	31,768
Other Revenues						
Total Revenues		31,768	31,768	31,768	31,768	31,768
Loan						
Equity	37,699	-	-	-	-	-
Total Inflows		31,768	31,768	31,768	31,768	31,768
Outflows						
Initial Capital Costs	37,699	-	-	-	-	-
Capital Replacement						
Operating Expenses		22,746	22,746	22,746	22,746	22,746
Total Outflows		22,746	22,746	22,746	22,746	22,746
Net Cash Flow before Debt Service		9,022	9,022	9,022	9,022	9,022
Debt Service:						
Principal						
Interest						
Total Debt Service		0	0	0	0	0
Net Cash Flow After Debt Service		9,022	9,022	9,022	9,022	9,022
Accumulated Cash Flow		9,022	18,044	27,067	36,089	45,111

APPENDIX 13 – PROJECTED PROFIT AND LOSS STATEMENT

Projected Profit and Loss Statement					
Income	**YR1**	**YR2**	**YR3**	**YR4**	**YR5**
Sales	**31,768**	**31,768**	**31,768**	**31,768**	**31,768**
Less: Direct Expenses	**6,918**	**6,918**	**6,918**	**6,918**	**6,918**
Gross Profit	**24,850**	**24,850**	**24,850**	**24,850**	**24,850**
Less:					
Indirect Expenses	**15,827**	**15,827**	**15,827**	**15,827**	**15,827**
Interest payments					
Depreciation	**4,932**	**4,932**	**4,932**	**4,932**	**4,932**
Total	**20,760**	**20,760**	**20,760**	**20,760**	**20,760**
Net Profit/Loss	**4,090**	**4,090**	**4,090**	**4,090**	**4,090**
Cumulative Net Profit/Loss	**4,090**	**8,180**	**12,270**	**16,359**	**20,449**
Gross Margin (%)	**78.2**	**78.2**	**78.2**	**78.2**	**78.2**
Net Margin (%)	**12.9**	**12.9**	**12.9**	**12.9**	**12.9**

APPENDIX 8 – PROJECTED OPERATING EXPENSES (USD_

Projected Operating Expenses (USD)									
	Unit	Amount		Unit Price	YR1	YR2	YR3	YR4	YR5
DIRECT EXPENSES									
labour Costs	acre	5		746.2	3,731	3,731	3,731	3,731	3,731
Material Inputs	acre	5		347.6	1,738	1,738	1,738	1,738	1,738
Sub-total: Direct Labour Costs					5,469	5,469	5,469	5,469	5,469
Supervision (15% of Labour and Material Costs)					820	820	820	820	820
Sub-Total: Direct Labour Costs, Material Inputs, Supervision					6,289	6,289	6,289	6,289	6,289
Contingency (10%)					629	629	629	629	629
Total Direct Costs, Contingency, Supervision Cost					6,918	6,918	6,918	6,918	6,918
INDIRECT EXPENSES									
Land lease	month	12	53.8	0	646	646	646	646	646
Salaries and Wages	month	12	615	0	7,380	7,380	7,380	7,380	7,380
Water	month	12	77	0	924	924	924	924	924
Electricity	month	12	38.5	0	462	462	462	462	462
Internet	month	12	26.9	0	323	323	323	323	323
Interest payments	Annual								
Fuel	month	12	231	0	2,769	2,769	2,769	2,769	2,769
Equipment Maintenance	month	12	38	0	462	462	462	462	462
Motor Vehicle Maintenance	quarter	4	231	0	923	923	923	923	923
Motor Vehicle Insurance	annual	1	500	0	500	500	500	500	500
Sub-total: Indirect Costs					14,389	14,389	14,389	14,389	14,389
Contingencies (10% of Indirect Costs)					1,439	1,439	1,439	1,439	1,439
Total Indirect Costs and Contingencies					15,827	15,827	15,827	15,827	15,827
TOTAL OPERATING EXPENSES					22,746	22,746	22,746	22,746	22,746

APPENDIX 9 – PROJECTED OPERATING EXPENSES (USD) – 10% INCREASE

Projected Operating Expenses (USD)								
	Unit		Unit Price	YR1	YR2	YR3	YR4	YR5
DIRECT EXPENSES								
labour Costs	acre		821	4,104	4,104	4,104	4,104	4,104
Material Inputs	acre		416	1,912	1,912	1,912	1,912	1,912
Sub-total: Direct Labour Costs				6,016	6,016	6,016	6,016	6,016
Supervision (15% of Labour and Material Costs)				902	902	902	902	902
Sub-Total: Direct Labour Costs, Material Inputs, Supervision				6,918	6,918	6,918	6,918	6,918
Contingency (10%)				692	692	692	692	692
Total Direct Costs, Contingency, Supervision Cost				7,610	7,610	7,610	7,610	7,610
INDIRECT EXPENSES								
Land lease	month	12	59.3	711	711	711	711	711
Salaries and Wages	month	12	676.5	8,118	8,118	8,118	8,118	8,118
Water	month	12	84.7	1,016	1,016	1,016	1,016	1,016
Electricity	month	12	42.3	508	508	508	508	508
Internet	month	12	29.6	355	355	355	355	355
Fuel	month	12	253.8	3,046	3,046	3,046	3,046	3,046
Equipment Maintenance	month	12	42.3	508	508	508	508	508
Motor Vehicle Maintenance	quarter	4	253.8	1,015	1,015	1,015	1,015	1,015
Motor Vehicle Insurance	annual	1	550	550	550	550	550	550
Sub-total: Indirect Costs				15,827	15,827	15,827	15,827	15,827
Contingencies (10% of Indirect Costs)				1,583	1,583	1,583	1,583	1,583
Total Indirect Costs and Contingencies				17,410	17,410	17,410	17,410	17,410
TOTAL OPERATING EXPENSES				25,020	25,020	25,020	25,020	25,020

JAMPRO
TRADE & INVESTMENT JAMAICA

HEAD OFFICE
18 Trafalgar Road
Kingston 10, Jamaica W.I.
Phone: +1 876 978 7755;
978-3337
Toll Free: +1 888 INVESTJA
468-3785 (Local)
+1 877 JAMVEST | 526-8378 (Overseas)
Fax: +1 876 946 0090
Email: info@jamprocorp.com

WESTERN REGIONAL OFFICE
Montego Bay Convention Centre
Rose Hall, Montego Bay
St. James, Jamaica W.I.
Phone: +1 876 952 3420
Fax: +1 876 952 1384
Email: jampromobay@jamprocorp.com

NORTH AMERICAN REGIONAL OFFICE
303 Eglinton Avenue East, 2nd Floor
Toronto, Ontario, M4P 1L3, Canada
Tel: 416 932 2200 (main) 416-598-3008
Fax: 416 932 2207
Toll-Free: 1 877 744 2208
Email: jamprocanada@jamprocorp.com

EUROPEAN REGIONAL OFFICE
1 Prince Consort Road,
London SW7 2BZ, England
Phone: + 44 20 7 584 8894
Fax: + 44 20 7 823 9886
Email: jamprouk@jamprocorp.com

DoBusiness JAMAICA
INVEST • TRADE • CONNECT

#DoBizJA

www.tradeandinvestjamaica.org