

Nation Building Proposed Topic: “The management of Guava farming to create a more sustainable and productive Jamaican economy”

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Abstract

The purpose of this research is to learn the benefits guava farming in the development of the agricultural sector and to a greater extent the Jamaican Economy. Many countries have used guava farming to increase the exports of their local produce. As a government worker in Jamaica that works with the HEART Trust NTA which is the National Training Agency for the Government, I play a major role in Labour market research and working with Agricultural Agencies such the RADA and Agricultural institutions such as Ebony Park Academy which after speaking with farmers at both entities have shown me the potential of Guava farming to boost the nation's Gross Domestic Product and help the socio-economy of the country. We have used the mix method of collecting data which involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies.

Introduction

Background of the problem

Over the years Jamaica has become sluggish in creating new avenues for growth and development of the economy. As economies develop, agriculture tends to fall in relative importance in contribution to gross domestic product (GDP). Jamaica is one of the most productive islands in the Caribbean, known for its opulent resources; such as land, climate and custom which provides Jamaicans the ability to create quality products. Jamaican sugar cane has high demands internationally and so does the blue Mountain coffee. On the other hand, the economic growth of Jamaica faces many challenges: high crime and corruption, large-scale unemployment and underemployment, and a debt-to-GDP ratio of more than 120% (CIA- the World Facts Book).

It has already been proven that the agricultural sector is as one of Jamaica's prime sector for economic growth and development. Agriculture employs approximately one-fifth of the Jamaican workforce (CIA-World Facts Books). Stimulating growth in the agricultural sector will act as a catalyst for growth in other sectors such as tourism and manufacturing. In past years the agriculture sector has declined in providing steady growth and development and this is evident considering the current economic situation of Jamaica. According to the Scientific Research Council (SRC), there are some crops that Jamaica has the potential to maximize production to increase demand locally and compete on the international scale. With advances in technology comes the evolvement of a dynamic and changing marketplace. For Jamaica to successfully compete in the global market it has to efficiently produce quality products (goods and services) at international standards. Producing quality products is a necessary ingredient for global competitiveness and economic growth. Hence, Jamaica should also invest in agro-processing. According to www.practiceaction.com, agro-processing is turning primary agricultural products into other commodities for market. Agro-processing projects aim to increase income and access to food for the poor, by establishing small-scale, appropriate and sustainable processing businesses that are flexible, require little capital investment and can be carried out in the home without the need for sophisticated or expensive equipment. The overall potential of agro-processing is huge. It can reduce wastage, enhance food security, improve livelihoods for low-income groups and empower women. As a result of that, this research proposal seeks to explore the agricultural

sector to identify an agricultural product that the researchers believe has the capacity to contribute helpfully to Jamaica's economy.

There are many tropical and sub-tropical fruits that have the capability to blossom on the domestic and international markets, if they are properly produced; fruits such as pineapple, papayas, oranges, apples and grapes have proven this. Thus, the researchers believe that the *Psidium Guajava*, more popularly known as "Jamaican Guava" or just "Guava" has the same or even better ability to thrive from just being used or consumed as a simple fruit to being developed into economical and medical products through agro-processing. Guava trees are found almost everywhere in Jamaica, however not all parishes have a high production of this fruit. St. Thomas, Manchester and St. Elizabeth are being sought as having this fruit in abundance.

Guava is a native to Central America. It originates from the area between Mexico and Peru. The Spaniards took it across the Pacific to the Philippines and the Portuguese introduced it from the West to India. It is now a pantropic species found in Asia, Africa, the Pacific, South America and the Caribbean. The guava is a hardy tree that adapts to a wide range of growing conditions. It can stand a wide range of temperatures; the highest yields are recorded at mean temperatures of 23-28 deg. C. In the subtropics quiescent trees withstand light frost and 3.5-6 months (depending on the cultivar) of mean temperatures above 16 deg. C suffice for flowering and fruiting. It fruits at altitudes up to 1 500 m and survives up to 2 000 m. Guava is more drought-resistant than most tropical fruit crops. For maximum production in the tropics, however it requires rainfall distributed over the year. Many Jamaicans have a Guava tree in their backyard and might not be aware of the many benefits that can be derived from not only the fruit but also the leaves and bark of the tree. Therefore, the researchers are proposing that Jamaican farmers, distributors and manufacturers assess the many economical and medicinal benefits the guava has, in order to create various by-products to increase demand of the fruit locally and internationally which in turn will assist in the enhancement of the health and wealth of Jamaica's economy.

Rationale

Jamaica has the potential to grow guava in bulk to create a local and international demand which in return will contribute significantly to the competitiveness and economic growth of Jamaica. This research also seeks to explore the medicinal purposes of the fruit and the feasibility of preserving it in Jamaica for agro-processing and economic purposes.

Statement of the problem

There are many countries that utilize Guava for several purposes. The utilization and demand of the fruit presents an opportunity for Jamaica to enhance economic growth by making a tactical investment in Guava farming. Guava is a popular fruit in many international countries and is recognized by few countries in the Caribbean. The Guava should not just be recognized as a mere fruit but, it should be recognized for its health benefits and the many by-products that can be derived from it, such as food, cosmetics, and broiler feed and possibly pharmaceutical supplements.

Significance of the study

The fact that Jamaica has to compete with international markets, the country should capitalize on an agricultural product that has the ability to cater to the health and economic well-being of the Jamaican people. This study will investigate the health and economic benefits of the *Psidium Guajava*, a potentially profitable fruit that not only can be eaten as a fresh fruit but can constitute many by-products. The *Psidium Guajava* also has several health benefits but it is not fully capitalized on. The researchers hope to find valuable information to assist in increasing the awareness of the product both economically and medically.

Alternative hypothesis

- A large-scale production of Guava will enhance Jamaica's economy.
- *Null Hypothesis*
- A large-scale production of Guava will not enhance Jamaica's economy.

- *General Objective:*
- To improve the economy of Jamaica through a large-scale production of Guava.
- *Specific Objective:*
- Using Guava to its full potential to supply local and international markets

Research questions

1. How will the cultivation of Guava on a large-scale assist in Jamaica's economic growth and development?
2. What resources are there in Jamaica to produce Guava on a full scale?
3. Are there available markets to accommodate the exportation of Guava?
4. What are the by-products that can be derived from Guava to support or contribute to Jamaica's domestic market?
5. Is Guava readily available for convenient use to the Jamaican people?

Research objectives

1. To discover possible ways in which Guava can aid in Jamaica's economic growth and development.
2. To explore the health benefits of Guava.
3. To explore the accessibility and preservation of Guava yearly to the Jamaican population.

Limitations of the study

It is always possible that future research may cast doubt on the validity of any hypothesis or the conclusions from a study. Every study no matter how well it is conducted has some limitations. The proposed research will be no different.

1. Time constraints of the semester require less time that may be ideal for an extensive study.
2. Resource constraints forced me to select three parishes for the study. Therefore, results are only related to those areas.
3. The personal interview method of data collection requires the respondents to recall from their memories about cultural operations of guava cultivation. Hence, the findings may be subject to memory lapses of the respondents.
4. Agricultural consultation was limited to the Rural Agricultural Department Agency (RADA) in Mandeville and the Ebony Park Academy.
5. The research is mainly focused on starting Guava farms in the parishes selected, thereby Jamaica would be able to produce our own by-products for local market, as well as be able to export Guavas to other countries.
6. The research is focused on Jamaica tapping into the Guava export markets and competing with other countries that are already exporters of Guavas.
7. This research was dependent on secondary information from mainly other countries that currently participate in large scale farming of Guava.

Delimitations of the study

1. The proposed research is somewhat limited in its scope. The description of a problem is not the purpose of the research but more so its purpose is to explore and understand how Guava production can aid in building Jamaica's economy.
2. The proposed research will be conducted in three parishes; St Elizabeth, St Thomas, and Manchester.
3. This research will not be focusing in debt on the financial aspect of the development.

Literature review and theoretical considerations

The psidium guajava: description

The Psidium Guajava is native to the Caribbean, and is a part of the Myrtle family of plants. Its skin is thin, light yellow and blushed with pink (Life plus Vitamins). Guavas emit a strong, sweet, pungent fragrance, it may be round, ovoid, or pear-shaped, 2 to 4 in (5-10 cm) long, with 4 or 5 protruding floral remnants (sepals) at the apex; and thin, light-yellow skin, frequently blushed with pink. Next to the skin

is a layer of somewhat granular flesh, 1/8 to 1/2 in (3-12.5 mm) thick, white, yellowish, light- or dark-pink, or near-red, juicy, acid, sub acid, or sweet and flavorful. The central pulp, concolorous or slightly darker in tone, is juicy and normally filled with very hard, yellowish seeds, 1/8 in (3 mm) long, though some rare types have soft, chewable seeds. Actual seed counts have ranged from 112 to 535 but some guavas are seedless or nearly so. When immature and until a very short time before ripening, the fruit is green, hard, gummy within and very astringent (Morton, 1987). A small tree grows to 33 ft. or 10 m high, with spreading branches, the guava is easy to recognize because of its smooth, thin, copper-colored bark that flakes off, showing the greenish layer beneath; and also because of the attractive, "bony" aspect of its trunk which may in time attain a diameter of 10 in or 25 cm. The leaves, aromatic when crushed, are evergreen and slightly irregular in outline; 2 3/4 to 6 in (7-15 cm) long.

Varieties of guava

According to www.tradewindsfruit.com, the following are the most common varieties of guavas that are available:

- **Beaumont Red**- The most popular commercial variety in Hawaii. It produces very large, green and sometimes slightly yellow fruits with a pink flesh. Some fruits can weigh up to a pound.
- **Mexican Cream**- Medium sized, yellow skinned guava with spicy, cream-colored flesh
- **Pear**- Medium sized, pear shaped guava with yellow or greenish tinged skin. Flesh is orange-pink, well-flavored, usually with few seeds.
- **Red Indian**- Medium sized, yellow fleshed fruit, sometimes with a red tint. Flesh is red, sweet, with many seeds.
- **Red Malaysian** - Red colored guava, with pink-red flesh. This variety is unique not just for its fruit, but it's for its foliage, which is tinted a deep red color. The flowers are bright pink. The Red Malaysian guava is often grown for ornamental purposes as well as fruit.
- **Ruby**- Red-fleshed guava with small, but sweet fruit.
- **South African**- Yellow skinned, pink fleshed guava with medium sized fruit.
- **White Indian**- Small to medium sized fruit with white flesh.

Health benefits of guava

Many Jamaicans are not aware of the medical benefits that can be obtained from Guava. Guava contains many nutrients that contribute to a healthy lifestyle. According to Parimin S.P., in every one hundred grams of fresh ripe Guava is 0.9 grams of protein, 0.3 gram of fat, 14 grams of carbohydrates, 12.2 mg of calcium, 28 mg of phosphorus, 1.1 mg iron, 25 the vitamin A, 0.02 mg vitamin B1, 87 mg of vitamin C (five times more than orange and other citrus) that lie in its skin, firm flesh and central pulp, 86 gram of water, with a total of 50 calories (Penebar Swadaya, 2007). Research done at Singh Medical Hospital and Research Centre (Morrabad, India) showed that guava can lower levels of total blood cholesterol and triglycerides and blood pressure in hypertensive patients. According to the study, guava consumption of 0.5 to 1 kg/day for four weeks, the risk heart disease can be reduced to 16 percent. The guava was also found of lycopene, a carotenoid substance (a pigment important in plant) which has antioxidant activity, so that the whole body is protected against attacks of several types of cancer. Guava is also saturated, sodium free and are high in fiber (Life plus Vitamins). Studies have proven a lower risk of cancer among people who eat more fruits and vegetables rich in dietary fiber, carotenoids and vitamin C.

According to www.organicfacts.com the following are a list of illnesses that can be reduced by regular consumption of Guava.

- **Diarrhea & Dysentery**: Astringents (compounds that make your gums feel tighter and fresh after you chew guava leaves or eat a raw guava or use some toothpaste) in the Guava binds up loose bowels in diarrhea. These astringents are alkaline in nature and have disinfectant and anti-bacterial properties, thus help cure dysentery by inhibiting microbial growth and removing extra mucus from the intestines. Guava is also beneficial in gastroenteritis due to reasons stated above.
- **Constipation**: The dietary fiber in guava is known to reduce constipation. Its seeds, if ingested whole or chewed, serve as excellent laxatives. These two properties of guava help forming bowels, retaining water and clean your intestines and excretory system thoroughly. It is said that single

constipation can lead to seventy-two types of ailments. It is absolutely true. Every way to your total health goes through proper digestion and more importantly, proper excretion. Guava ensures both of these.

- **Cough & Cold:** Juice of raw and immature guavas or decoction of guava-leaves is very helpful in giving relief in cough and cold by loosening cough, reducing mucus, disinfecting the respiratory tract, throat and lungs and inhibiting microbial activity due to its astringent properties. The vitamin-C and iron are proven to be preventive against cold and viral infections. In some areas in India, roasted ripe guava is used as a remedy against extreme cases of cough and cold and congestion.
- **Skin Care:** Guavas can help improve your skin texture and avoid skin problems more than the best of beauty creams or skin toner gels can do. This is chiefly due to the abundance of astringents in its fruits (more in immature ones) and in leaves. You can benefit from it either by eating the fruits (this help tighten your muscles apart from your skin) or by washing your skin with the decoction of its immature fruits and leaves. It will tone up, tighten the loosened skin, and keep your skin glowing and free from aging, wrinkles and other disorders.
- **High Blood Pressure:** Guava helps reduce cholesterol in blood and prevents it from thickening, thereby maintaining fluidity of blood and reducing blood pressure. Studies have shown that food stuffs which lack fiber (such as refined flour) add to blood pressure, due to quick conversion to sugar. Guava, being very rich in fiber and hypoglycemic in nature, helps reduce blood pressure.
- **Weight Loss:** Guava is very helpful for those who want to lose weight without compromising with their intake of proteins, vitamins and fiber. Guava, being very high in roughage and very rich in vitamins, proteins and minerals, but with no cholesterol and less digestible carbohydrates, is very filling and satisfies appetite very easily. Just have a medium sized guava in the lunch and you will not feel hungry till night. But ironically, it helps gaining weight in lean and thin people. This is probably due to its richness in nutrients, which keeps your metabolism right helping proper absorption of nutrients.
- **Scurvy:** As mentioned before, Guava outdo many other fruits, including orange and other citrus fruits, when it comes to concentration of vitamin-C, whose deficiency causes scurvy and which is the only remedy to it.
- **Dengue fever:** Guava juice helps with dengue fever to purify the blood. It helps to keep the parasites out of the blood so that the blood platelets do not drop, with lower chance of getting malaria.
- **Other Benefits:** Guava helps control diabetes, protects prostate, its lycopene reduces the risk of cancer, the juice of the leaf's cures toothache, swollen gums & oral ulcers, heals wounds when applied externally, convulsions, epilepsy, and bacterial infections. The bark and leaves are also used in childbirth to expel the placenta.

Cultivation of guava on a large scale to assist in jamaica's economic growth and development

Economic growth in Jamaica is driven by three primary industries: services, which comprise 65% of GDP, manufacturing and mining, 28%, and agriculture, 7%. In spite of its relatively small contribution to GDP, agriculture, which is very labor intensive, absorbs 21% of the country's employed labor force, provides primary products for agro-industries, such as rum manufacture, and accounted for just over 20% of exports (valued at US\$276 million) in 2004.

(Agricultural Development Profile, 2006). Agriculture has the potential for expanding aggregate output and value-added but is now at a cross roads with an overall decline in public sector activity and quietly resurgent private interest, in a number of sub-sectors. Therefore, cultivating guava in Jamaica on a full scale can benefit the country's economy. International demand for fruits shows related growth due to the important place fruits occupy in the diet of either American or European consumers who associate healthy eating habits to fresh fruit and vegetable consumption. There are a number of countries such as U.S.A, and China and many others who import guavas for other reasons such as resell of the fruit, medicinal, and vegetative. If these countries are targeted then exportation will contribute significantly to Jamaica's economic growth and Gross Domestic Product (GDP).

There many unemployed individuals in Jamaica's population. According to The World Fact-book in 2011 Jamaica's unemployment rate was 12.7%. The production of guava on a large scale in Jamaica will be a means of creating jobs for the many who are unemployed. Job creation is equivalent to wealth creation thus contributing to growth of Jamaica's economy. Producing and exporting guava will influence the sale of other Jamaica products and will capitalize on the brand Jamaica because it is synonymous with excellent goods and services. Individuals will not just see guava but they will recognize Jamaican products and will be more inclined to buy our produce because of the value in the brand Jamaica. This will in turn interest investors to make significant investments in Jamaica, again contributing positively to Jamaica's economic growth, competitiveness and development.

Pakistan is one of the largest producers of guava in the world. Based on an article entitled Guava exports reach Rs1 Billion, published by Shahid Shahon, on the website known as International the News, Guava exports of Pakistan have reached Rs1 billion, which could further be increased if value addition through processing plants is undertaken. Pakistan's guava production increased from 19,000 tons in 1958 to 552,000 tons in 2008 with an annual growth rate of 6.9 percent. Mexico has also become one of the largest producers and exporters of guava to America earning profits that are growing yearly. This information provides us with the necessary foundation to know that guava can be highly profitable if exported through the right channels to a market that can accommodate it. According to the gleaner in an article entitled, Canco Expanding Export Markets into Cananda, published by the gleaner November 10, 2010, it is implied that Guava is mostly used and exported as it pertains to processed products as only processed Guava products are the main focus of the article, but research has shown that the guava fruit (not being processed) can also be very profitable on international market, in fact, most of Pakistan's and Mexico's exportation is not processed guava products but the fruit itself. This form of exporting guava would be less costly to produce while being highly profitable on the international market allowing the country to receive huge amounts of foreign currency to help boost the economy. If this is implemented, then famers will also benefit by being able to gain access to job opportunities while this market grows. We could also open small manufacturing companies that could produce goods and services that are created from guava so that more jobs can be created in the country which leads to economic growth. One may argue about the age of the article but there has not been much development of Guava exports from 2010. It is a known fact, that guava is used to create products mostly focusing on Jams (in Jamaica); however, there are many byproducts that can be created from guava but are not being produced. According a survey and a promotional exercise of the product of a variety of byproducts of guava, persons found the items to be very tasty and some of these products were seen as possible substitute products for many items on the market both local and international. Therefore, the profitability of these processed guava products locally and internationally is very high. Guava has great potential which can help to sustain economic growth. Pakistan and Mexico have shown great evidence of this; therefore, we should use the evidence to our advantage.

Resources to produce guava on a full scale in jamaica

A resource is a source or supply from which benefit is produced. Typically, resources are materials or other assets that are transformed to produce benefit and, in the process, may be consumed or made unavailable (Britannic Encyclopedia). The cultivation of guava requires a number of resources, both natural and manmade, that are crucial for full scale cultivation as well as the successful growth of the plant. Jamaica has unmatched comparative advantage for growing guavas due to its warm less humid tropical climate, plentiful rainfall and vast opportunities for irrigation. The guava thrives in both humid and dry climates. In India, it flourishes up to an altitude of 3,280 ft (1,000 m); in Jamaica, up to 3,906 ft (1,200 m); in Costa Rica, to 4,590 ft (1,400 m); in Ecuador, to 7,540 ft (2,300 m). It can survive only a few degrees of frost. Young trees have been damaged or killed in cold spells at Allahabad, India, in California and in Florida. Older trees, killed to the ground, have sent up new shoots which fruited 2 years later. The guava requires an annual rainfall between 40 and 80 in (1,000-2,000 mm); is said to bear more heavily in areas with a distinct winter season than in the) Tropics (Morton J, 1987). The guava tolerates and can withstand strong prevailing winds or winds of hurricane velocities. Its root system is a fine mat supporting the tops and requires a tremendous horizontal wind force to uproot the

tree. In addition, the guava wood is strong and flexible and pliable, enabling the tree and its branches to bend in a whip like fashion in a strong wind.

Extensive land is available for estate type guava growing organized around an out-grower set up. Guava has its' greatest potential in parishes of Manchester, St Elizabeth and St Thomas which has the land capacity to plant enough guava for local and international consumer. The guava seems indiscriminate as to soil, doing equally well on heavy clay, marl, light sand, gravel bars near streams, or on limestone soil which is found in Manchester; and tolerating a pH range from 4.5 to 9.4. It is somewhat salt-resistant. Good drainage is recommended but guavas are seen growing spontaneously on land with a high-water table—too wet for most other fruit trees. Braes River in St Elizabeth has a high-water table which is ideal for the cultivation of this crop.

According to the Ministry of Agriculture and Fishery, Jamaica has a vast amount of natural resources, especially those of soil, water, plant and animal diversity, vegetation cover, renewable energy sources, climate, and ecosystem services which are fundamental for the structure and function of agricultural systems and for social and environmental sustainability. Nevertheless, the resolution of natural resource challenges will demand new and creative approaches by stakeholders with diverse backgrounds, skills and priorities (Green Facts). Capabilities for working together at multiple scales and across different social and physical environments are not well developed. For example, there have been few opportunities for two-way learning between farmers and researchers or policy makers. Community-based partnerships with the private sector would be a first step in the development of guava cultivation; this would represent a new and promising way forward. Man power which are human resources are also available, this can be assumed based on the high unemployment rate in Jamaica, and if full scale production of pineapple was to be done in Jamaica then this would create jobs for a lot of unemployed persons.

Guava production

Post harvesting

Just after harvesting, the unwanted fruits are sorted out and healthy lot is marketed. The fruit are packed in wooden boxes or bamboo baskets and transported to the market or processing unit. Fruit should never be packed in Hessian bags as it may cause considerable damage to the fruits even in short-distance transport. For long –distance transport, a layer of cushion material (dry grass, paddy straw, paper-wool etc.) should be used at the bottom of the container. Refrigerated transport can reduce the spoilage of fruits. Siddiqui et. al. (1991) stated that fruit positioned in the natural posture with the pedicel end vertically upward during transport showed better keeping quality than fruits kept in reverse or horizontal position.

Marketing

In the process of production of guava, marketing plays a vital role. Marketing is a part and parcel of production. It is an important stage where the producer converts his labor and other inputs used in to cash and is at this stage that he will be in a position to find out whether his investment on the enterprise is rewarding or not. In the process of marketing the producer has to incur various marketing costs. These costs are determined by the producer's performance and efficiency of different marketing functionaries which in turn influence the returns to the growers (Byresh T, 2007).

There are a numerous marketing channels that can be made available for local farmers:

1. Producer → Consumer (direct sale)
2. Producer → Cooperative → Consumer (cooperative sale)
3. Producer → Commission Agents → Wholesalers → Retailers → Consumer (middle-men sales)
4. Producer → Pre-harvest Contractor → Commission Agents → Wholesalers → Retailers → consumer (pre-harvest contract sale).

Storage

The shelf life of guava fruit at ambient condition is relatively short due to rapid development of fungal rot. However, fruits may be stored for a few days to adjust the market demand (AGRISNET).

Fruits can be stored for 2-4 weeks at relatively low temperature coupled with high humid condition as follows:

Recommended storage condition of guava

Temp. (°C)	RH (%)	Duration (weeks)
5-10	90	2-3
10	90	3
10	85-9	2-3

Pre-harvest sprays of Calcium Nitrate (1.5%) and Alar (75 Ppm) are effective for minimizing physiological weight loss during storage and maintaining eating quality and marketability of fruits more than 8 days. Wrapping of fruits with newspaper is also found to be effective to enhance to shelf-life of fruits by about 3 days.

Packaging

Packaging is important, and serves multiple functions: guide for usage and handling, marketing display and the information carrier for chain actors and consumers. Especially for fresh product, the package protects the product against physical, chemical and biological decay (ESCAP, 2008). Longer shelf life can be achieved with optimal packaging. Still, a lot of fruit products are on display in supermarkets with no packaging on the items. Products that have a limited shelf life, like pre-cut fruit (guava), definitely benefit from individual packaging during the whole chain and until the moment of consumption moment. In traditional packaging a plastic film is used to create a gas barrier, so optimal CO₂, O₂ and H₂O levels can be achieved at the equilibrium stage. The gas diffusion characteristics of the film are specified by the product.

Available markets to accommodate guava exports from jamaica

Consumer demand for tropical and sub-tropical fruits is potentially great as evidence by the widespread acceptance of such fruits as avocado, papayas, mangos and pineapple. According to the Division of Research and Industry at the University of Miami, some forty years ago these fruits mentioned were virtually unknown in some areas and were just known as luxury fruits in others. The acceptance of these fruits shows that tropical fruits such as Guava have potential markets when they are made readily available to consumers. Before a new fruit is introduced on the market, proper information should be gained concerning its appropriate harvesting, packaging and shipping.

According to an article posted December 28, 2011 on www.fruitsportal.com, Mexico's guava exports to the U.S. have increased by a modest 5% from January to September 2011, compared with 2010's 28% surge, according to government statistics. The Ministry of Agriculture, Livestock, Rural Development and Fishing (SAGARPA) said since 2008 when Mexico was given export access to the U.S., volumes have climbed from 839 metric tons (MT) to more than 4,300MT for 2010, representing 400% growth. Agribusiness promotion undersecretary Ernesto Fernández Arias, said guava sales to the U.S. in 2008 accounted for 38% of the Mexican market, growing to 90% in 2010. He also added that in 2010, 22,000 hectares of land was devoted to growing guava delivering 305,000MT with Aguascalientes, Michoacán and Zacatecas producing 90% of the national total. According to United Nations Food and Agriculture statistics, Mexico is one of the top four countries for producing guavas and is the largest grower in Central and South America. Other countries where Mexico exports the fruit are Canada, Guatemala, Japan, France and Poland. The Guavas exported is used commercially to produce jams, concentrates and purees. This proves that there are numerous markets that Jamaica can dominate exports by producing the best quality, fresh Guavas.

Guavas offer supplementary advantages for a whole utilization; one such advantage includes the guava pulp use by many juice manufacturing companies. There is a growing demand of Guava pulp in local and international markets. Guava nectar is used in tropically themed alcoholic drinks. The consumption of guava also has health benefits, it is the most therapeutically used plant in the Philippines because of the many nutrients it contains, vitamins A, B and C, iron, antioxidants, carotenoids, calcium, carbohydrates, fiber, niacin, phosphorous, protein and potassium (www.slurppy.com). Guava also is a valuable component for anti-aging skin care as it contains moisture retaining B vitamins which help

prevent the oxidation process of the cell. India, Brazil, Pakistan and Mexico are the major producers of guava in the world; however, Mexico and Pakistan are the main exporters of the crop. Thus, there is an opportunity for Jamaica to increase in growth and development by being competitive and taking advantage of available Guava export markets.

Guava by-products

Guava has great potential for extensive commercial production because of its ease of culture, high nutritional value and popularity of processed products. Currently, there are a few by-products that are derived from Guava such as jam, jellies, paste, juice, baby foods, puree, beverage base, and syrup. However, there are still other by-products that Jamaica can capitalize on from this tropical fruit. In an article published, Thursday September 1, 2011 in the Gleaner, there is proof that Jamaica can capitalize on the production of Guava and thus, using guava for agro-processing purposes. According to the article, "Guava sauce is the new kid on the block, a new innovative product that's 100 per cent Jamaican. It is great for making gravy, salad dressing and a flavorful addition to barbecue sauce". Jamaican gourmet guava sauce is the first product in the Beechwood Products brand. The line was initiated by the Women's Resource and Outreach Centre (WROC) to encourage the production of alternative crops for agro-processing. In the article, Marketing Officer Alexis McDavid and WROC board member Kathleen Goldson-Clarke stated that guava is a very resilient crop found in abundance in the parish of St. Thomas where they get their guavas to produce the sauce which is manufactured by CANCO Ltd. They additionally stated that Guava is the best alternative for ex-banana farmers to produce on a large scale. With this said, the researchers are proposing to produce some products as well, that is guava tart bread and guava cheese cake. Testing will be done on a sample of the population to make a genuine decision on the success this product would have on the local market.

There is also consideration of producing guava duff which is already popular in the Bahamas (researchers believe guava duff will be better utilized as a Jamaican brand product); guava wine and guava flavored tea bags. A study done by A. A. El-Deek, M. A. Asar, S. M. Hamdy, and A. A. Abdalla, in the Poultry Production. Department, Faculty of Agriculture, Alexandria University, in Alex. Egypt, states that there is a possible utilization of guava in broiler finisher diets. The biggest impediments to livestock production in developing countries are the high cost of feed ingredients. Guava pulp having so many vitamins could possibly be added to the broiler feed for chickens after it has been processed. Hence, the researchers are proposing this as another by-product to support the local market. Guava has a distinctly sweet odor. It is being used in other countries in cosmetic products. Subsequently, the researchers would suggest that Jamaica could also capitalize on cosmetic by-products from the fruit that could contribute to the domestic market. Some of these cosmetic products such lotions, shampoos and conditioners, facial or bath soaps, facial masks, and toothpaste could be produced by some off our local manufacturers.

Availability of guava to the jamaican people

The psidium guajava usually grows wild in Jamaica; many people fail to recognize the many uses which guava has because of the perception of the fruit as just another wild fruit. The availability of guava to the Jamaica people is a question that can be answered by most people back yards and small farms because many persons have a wild guava tree growing somewhere near their house. Guava is available to the Jamaican people and even if we were to plant it on a large scale, we would still be able to acquire land to do so. According to a farm by the name of, guava has great potential and can be grown in large abundance in parishes such as Manchester, St Elizabeth and St Thomas because they have the right soil type and there would not be any problem to acquire land to plant the guavas for local and international consumers. St. Thomas already has guava plantations because local farmers in St. Thomas turn to guava production because of low banana production.

Methodology

This research proposal examines how the cultivation, production and creation of by-products from guava can be used to upsurge the well-being of individuals and to positively stir economic growth and development of Jamaica in the right direction. The researcher seeks to increase Guava farming and

introduce new by-products thereby allowing individuals to become more aware of the health and economic benefits of guava. This chapter is vital to describe the methods selected to gather information needed for the completion of a research of this magnitude. The researcher will demonstrate how the data or information gathered will be retrieved, stored, analyzed, and use to the maximum benefits of this proposal. Researchers will also present the findings in the following chapter.

Research design

Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone (Sagpub, 2006).

Furthermore, this project utilized the use of both primary and secondary data. However, it is rooted in a qualitative economic growth and stability position of the Jamaican economy that recognizes the importance of locating the research within a particular social, cultural, and historical context. It also takes seriously the social construction of these contexts and the identities participants construct within them.

Qualitative research seeks out the ‘why’, not the ‘how’ of its topic through the analysis of unstructured information (Zikmund et. al). A qualitative evaluation is utilized for this research project leveraging subjective methods such as interviews, research and observations to collect substantive and relevant data. These interviews were conducted with practicing diplomats from RADA and a retired agricultural engineer from Manchester. This qualitative approach was valuable due to the varying experiences of the diplomats in Jamaica and other country cultural situations. Recent research on intercultural communication and instructional design was consulted to validate collected data.

Sampling

The general population for this study would be composed of individual consumers, local farmers, and rural agricultural officials. The researchers would choose to survey individuals with a vast knowledge of Guava and some of its already marketed by-products and also potential growers. For the results to be truthful, researchers strive to cover a sample size of one hundred (100) persons. Respondents will be gathered within the parishes of Manchester, St. Thomas, and St Elizabeth. Individuals will be chosen by chance. Non-probability sampling is the technique the researchers decided on using. This means that individuals will be selected based on the researcher’s personal assessment or convenience. Of the one hundred (100) questionnaires that will be distributed, forty (40) will be distributed to farmers, ten (10) to Rural agricultural officials and fifty (50) to consumers.

Data collection sources and procedures

The sources that will be used in the data collection process will be in the form of documents, individuals and observations to provide information for the valuation of this research proposal. Secondary data which was used for prior researches will also be used as a tool for gathering information. These secondary data will be retrieved from the internet, magazines, newspaper and governing bodies in Jamaica that provide statistics on aspects of the proposed study. We will source information from individuals by means of interviews using telephone or face-to-face and also the distribution of questionnaires. The information will be easily analyzed because of the vast amount of data that will be gathered through these methods. The researchers will go into the parishes of Manchester, St Thomas and St Elizabeth in search for farmers who currently grow and sell Guavas to local manufacturers. Some of these farmers might also be consumers of the fruit. The researchers will conduct one-on-one interviews with the farmers to hear their personal views of what they think of using guava to produce original Jamaican by-products. The interview with the Rural Agricultural Development Authority (RADA) was done in a face-to-face conversation with Mr. Winston Miller, acting deputy agricultural officer at the Mandeville branch. A second interview was done face-to-face with Mr. Trevor Peart a

champion farmer and retired agricultural engineer from Kendal, Manchester. Observations will be based on the natural resources favorable to growing Guava on a large scale in Jamaica such as our climatic conditions, our soil types and also from the quantity of Guava already being grown in St. Thomas.

Data analysis procedure

Data analysis procedure will be provisional as the researchers will use different methods to bring out details of different viewpoints of the respondents. The analysis will clarify and explain the many benefits of guava. It will also shade some light to better understand the proposal and to gather meaning that may apply to the understanding of the issues or concerns associated with Guava. This will equip the researchers to reach the goal of identifying key information needed to develop the guava in a way that will be beneficial to the society. Data analysis will involve the use of graphs.

Presentation of Findings

Information collected for this proposed research will be presented verbally and non-verbally at the request of Texila American University.

Data presentation

One hundred (100) respondents were selected as a sample of the population of farmers, consumers, RADA officials and prospective consumers in Bellefield, Manchester, Braes River, St. Elizabeth and St. Thomas to obtain the results for this research. The research was both qualitative and quantitative in nature as it seeks to investigate Guava farming on a large scale. The respondents were selected based on simple random sampling and convenience. Most of the questionnaires prepared for customers were received because they were collected on the spot. The farmers who responded were few, about 15 of the 40 questionnaires prepared for the farmers were done.

The demographic profile of the consumer respondents showed that 28% of the respondents were males and 72% signified females within the various age groups. The collected questionnaires were analyzed and tallied and the useful information was used to create this research proposal.

Farmer analysis

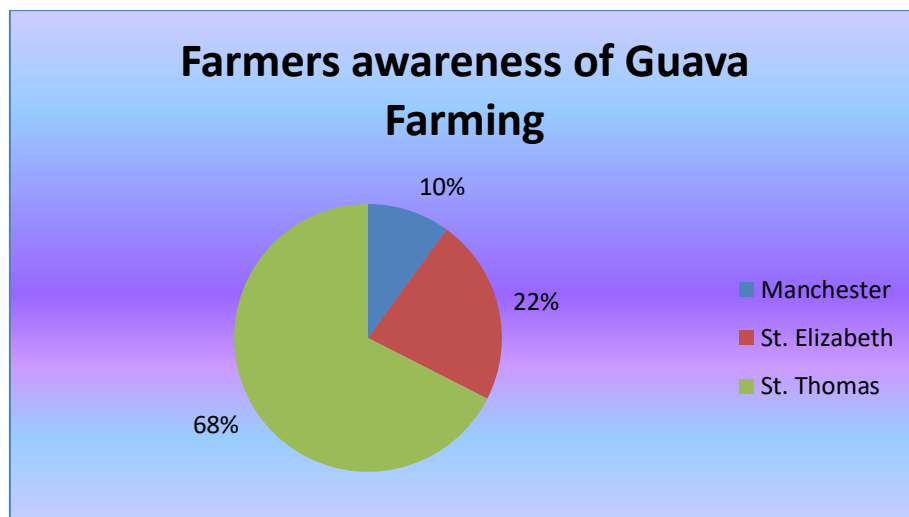


Figure 1. Illustrates that 10% of the farmers in Manchester and 22% of the farmers in St. Elizabeth are aware of the many benefits that Guava has and that it could be profitable to invest in guava farming. St. Thomas farmers are the most aware with 68% claiming that they already knew of the many possibilities existed with Guava.

Consumer analysis

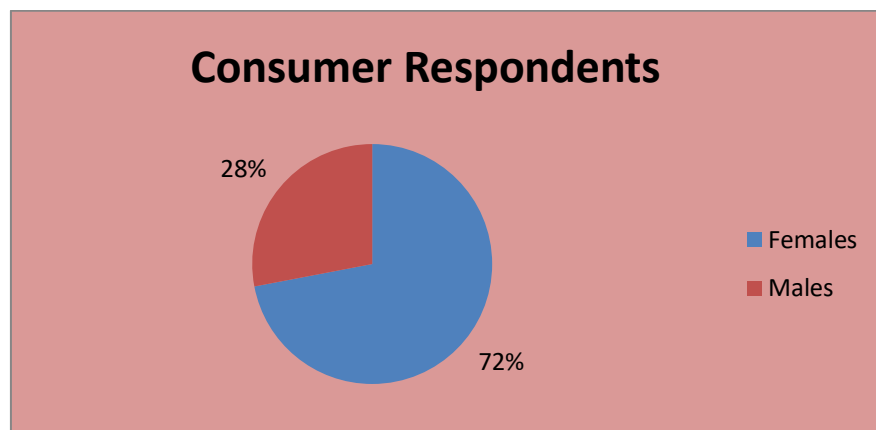


Figure 2. Shows that 28% of consumer responding to the survey were males and the remaining 72% were females.

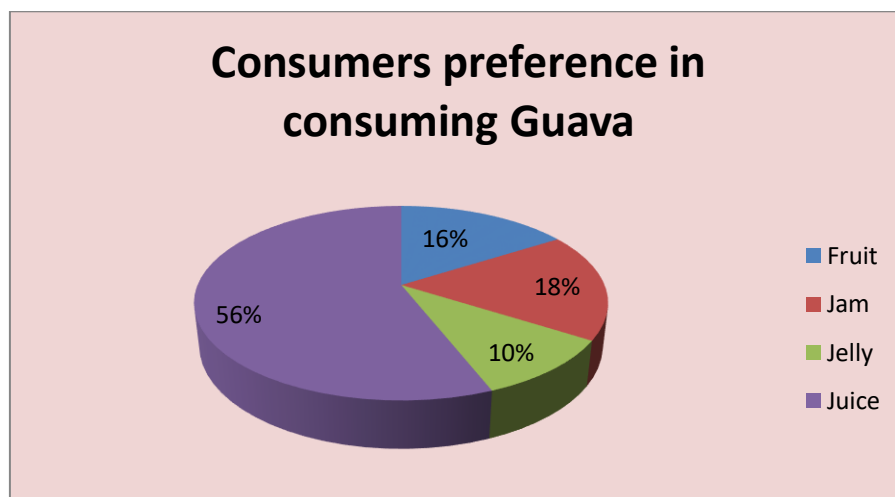


Figure 3. Shows the consumers taste and preference in consuming Guava. Most consumers prefer to consume Guava as juice with 56% of the respondents stating this. Others prefer to consume it as jam (18%), fruit (16%), and jelly (10%) respectively

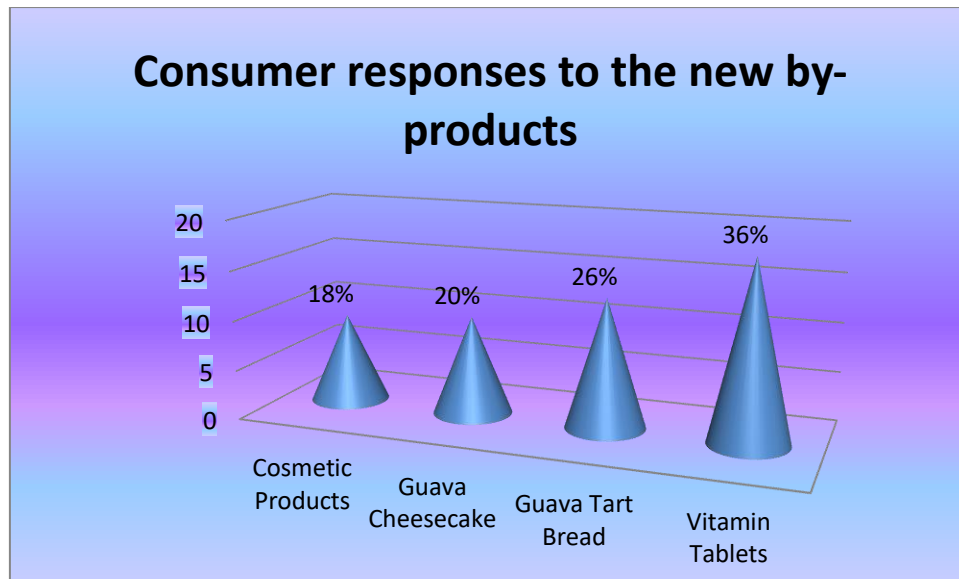


Figure 4. Shows consumers responses for the creation of new by-products from Guava. 36% of the respondents are intrigued by the creation of vitamin tablets due to the fact that Guava contains all the vitamins, with vitamin C being five times more than that found in citrus, and it also contains other nutrients. Guava Tart Bread (26%), Guava Cheesecake (20%) and cosmetic products (18%), respectively

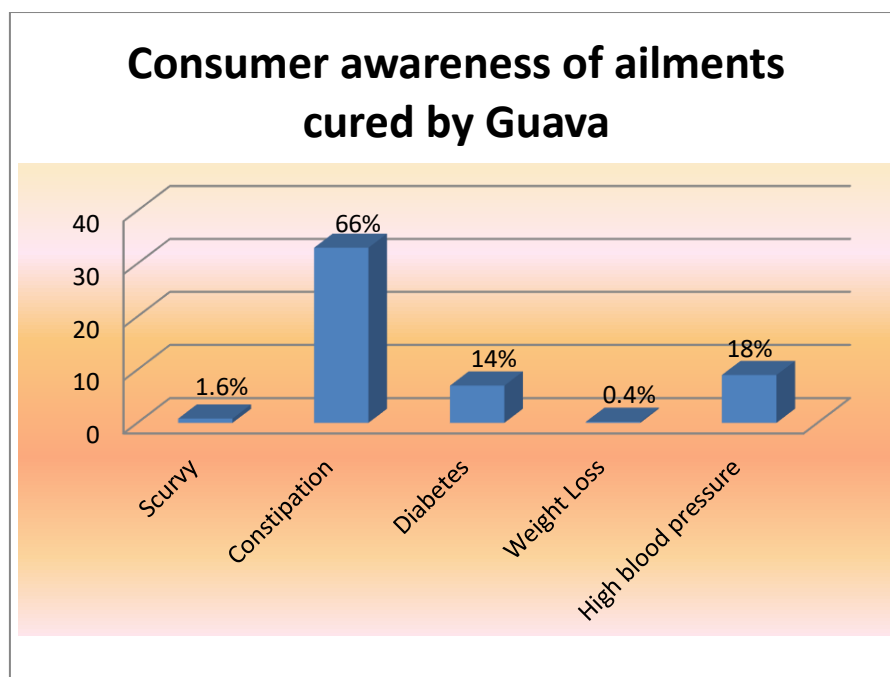


Figure 5. Shows the consumer responses to the ailments that can be cured by regular consumption of Guava. Most consumers were aware that Guava can be eaten for Constipation. 66% of the respondents proved this, while others are aware of guava curing high blood pressure (18%), diabetes (14%), scurvy (1.6%) and weight loss (0.4%) respectively

Final Review of the proposed study

Analysis of research findings

It can be concluded from the findings that the majority of farmers in Manchester and St. Elizabeth have never thought of the possibility of producing guava on a large scale to make additional income. However, in St. Thomas most of the farmers who were briefly interviewed stated that their main source of income came from being banana farmers, but they soon turn to Guava when the banana market

became stiff, they realize that companies such as CANCO Ltd were willing to purchase their Guavas to produce by-products such as jam and also other Juice companies in Jamaica such as Tru Juice. The Women's Resource Outreach Centre (WROC) also obtains their guava to make the beechwood brand Guava sauce product from farmers in St. Thomas. The farmers also stated that their additional income has been favorable. Majority of the farmers were not aware of the many health benefits that they can be obtain from the fruit, the leaves, or the bark of the Guava tree. After speaking with Mr. Trevor Peart, a retired agricultural engineer and champion farmer, it is evident that Guava has potential to add to the enhancement of the economy. Although Guava is known to have two seasons, Mr. Peart added that Guava can be sustained year-round in Jamaica, depending on the amount of water being used and no chemicals, just organic fertilizer. He also stated that if farmers want sustainability when growing certain crops like Guava, they should practice agronomy, using the fallen leaves from the trees to make mulch. Additionally, the Guava tree unlike other fruit trees is very flexible; therefore, it would be able to bend towards the wind if there is a natural disaster such as a hurricane. According to Mr. Peart, Jamaica imports Guava jelly and jam from Mexico, so there is a market if farmers start Guava farming. It was shown that consumers eat Guava as a mere fruit, using the jam on bread or biscuits or just drinking the juice, however majority of the consumers surveyed consume guava juice more than any other by-products. Some consumers agreed that they would consume Guava as dietary supplements or as a vitamin tablet since it has five times more vitamin C than citrus. Consumers also agreed to use cosmetic products made from the Guava. Due to this result it can be deduced that proposing that the cultivation of Guava be increase here Jamaica to be used in agro-processing products is feasible as consumers are embracing the idea.

It is evident that the only health benefit that most people were aware that the Guava could provide is the relief from constipation. Since conducting the surveys most consumers are now intrigue by the fact that Guava has so many other health benefits and consumers are readily accepting it as a fruit that Jamaica can export. Base on this research the researchers understand that there is a market for Guavas internationally and that many Jamaican farmers are not producing Guava on a large scale. Thus, the researchers hereby proposed that farmers increase the production of Guava and that manufacturers in Jamaica should explore the many benefits of the fruit and seek to introduce new products from the fruit to supply the local and international markets. Cosmetic companies should also capitalize on the skin care products that can be by-products of Guava to meet the demands of customers and enhance the country's economy.

Discussion and Recommendations

Discussion

The Researcher now believes that the demand for Guava is present internationally. Since local farmers weren't aware of the possibility of Guava farming providing additional income, the researcher also proposes that a research of this magnitude will help to inform the farmers about the benefit of Guava farming. The researcher also can conclude that a large-scale production of Guava means that there will be many by- products; as a result, the production of Guava will generate sales and revenue for the Jamaican economy. This will be a significant contribution to Gross Domestic Product (GDP) as investment spending increases; when investment spending increases businesses, manufacturing, and the agricultural sector will expand giving rise to additional income and employment. A decrease in the unemployment rate will increase consumer spending. If more people become employed, the standard of living will also rise. The Psidium Guajava and its by-product will be exported. Thus, the market will expand through exports by the generation of revenue through foreign exchange.

It my intention to continue investigation into Guava farming and to use this project to inform local farmers of the benefits and potential gains associated with exporting Guavas internationally and selling locally to manufacturing companies. This will ultimately improve the country's overall economic growth and development by providing employment and strengthening the country's GDP.

Recommendations

The researcher recommends that farmers participate in large scale farming of Guava and manufacturing companies should use guava from these local farmers to create by-products thereby contributing to the development of the nation.

According to the research carried out the researcher realized that most persons know the Guava fruit but are not aware of most the health and economic benefits it has; this is a result of the fact that many farmers along with the Rural Agricultural Development Authority (RADA) does not embrace the health or economic benefits of Guava. The Guava is a valuable and exquisite fruit that can be used to boost the agricultural sector. I am therefore recommending that RADA capitalize on this opportunity to extensively educate the Jamaican population about cultivating Guava on a large scale and exploring the health benefits to improve the vigor of our people and increase the standard of living in the country.

Guava and its by-products are demanded and Jamaica has the opportunity to create means and ways to meet the demands of our people and the international market. The researcher gathered that persons are willing to consume guava by-products and are willing to buy products made from the fruit; therefore, it is recommended that Guava farming be done on a large scale, and be made into supplements, cosmetic products and food items. This will aid the country's development since Jamaica has the right resources to plant Guava trees in abundance. The production of Guava can be done not only for the local market but also for the international market; this will bring foreign currency into the country, bridge trade cap, adds to Jamaica's GDP and eventually enhance the country's economic growth and development.

It has already been proven that Jamaica has the resources to plant Guava on a large scale; resources are available in terms of land, water, man power and encouraging climatic conditions. Nation building will be accomplished with the implementation of this proposal. Jamaica needs to take advantage of existing resources in order to take the country out of its current economic situation.

Summary and Conclusion

Jamaica has been a predominantly an agrarian economy since time immemorial. However, agriculture continues to be the mainstay of our economy even today, as it contributes 5.8 per cent of the gross domestic product (GDP) (world facts book) and providing nearly a quarter of the country's employment (Encyclopedia of Nations). Therefore, this research proposal is aimed to give individuals a new perspective on tropical fruits such as Guava. It will demonstrate how Jamaica can capitalize on existing resources and use inactive farm lands for large scale production of guava for the purpose of exports and to support the domestic market. The researchers understand that guava and its by-products are not being exported from Jamaica and barely sold on the local market. That's why the researcher has decided that the farming of guava on a large scale is needed to provide a consistent supply to the local market and also to the export markets which in return will be very beneficial to Jamaica's economy.

Jamaica is already well known for its diversity of soils and tropical climate. Therefore, the island is advantageously placed for producing practically all variety of tropical and sub-tropical fruits. Guava (*Psidium guajava*) is one of these fruits. It belongs to the family myrtaceae. As mentioned before, the fruit is richer in many respects like protein, vitamins, carbohydrates and minerals etc. The researcher believes that guava can be made available throughout the year. In Jamaica it is predominantly grown in all parishes; however, the researchers believe that parishes such as Manchester (Bellfield), St Elizabeth (Braes River), and St Thomas is more susceptible to guava cultivation.

In conclusion, the proposed research aims to educate farmers, manufacturers and consumers that many possibilities exist by undertaking the production of Guava on a large scale. Producing Guavas for fresh fruit consumption, jam, jelly and juice is insufficient, due to the fact that this is already being done and especially since Guava has the potential of creating far more by-products. Therefore, the researcher proposes that a large-scale production of Guava will target local and international markets for its remedial purposes and to create awareness and popularity of guava farming which would increase consumption of guava. Investing in the large-scale farming of Guava in Jamaica would be profitable. It would contribute meaningfully to the Jamaica's economic development and growth, adding significantly to the GDP, increasing employment, increasing exports, reducing Jamaica's import bill and allowing the country to be more competitive.

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