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FOOD SAFETY AND VALUE ADDED
PRODUCTION AND MARKETING
OF TROPICAL CROPS

Title: Assessing the Competitiveness of Jamaican Ackee in Light of the Challenges
Faced by Sugar and Bananas

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ASSESSING THE COMPETITIVENESS OF JAMAICAN ACKEE IN LIGHT OF THE CHALLENGES FACED BY SUGAR AND BANANAS

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ABSTRACT

Economic theory posits that the removal of impediments to trade should redound to improvement in the overall well-being of all nations. Unfortunately, for many developing countries, this has not been the case; upon significantly reducing their tariffs, they are yet to see any tangible benefits. On the contrary, they have experienced a decline in market share and in some instances significant erosion of trade preferences that they had previously enjoyed with their trading partners. The preferential market access, from which Jamaica and other ACP (African Caribbean and Pacific) states benefit, through exports of sugar and bananas to the EU (European Union), has been eroded as a result of recent rulings by the WTO. These rulings have already affected the banana industry severely; resulting in loss of jobs, reduction in foreign exchange earnings and area planted in bananas. The sugar industry is expected to be similarly affected with the pending phased reduction in the price per tonne, which the EU proposes to pay ACP sugar producers. In light of the above, there is on-going search for non-traditional commodities with good export potential and the ability to compete in the international market place. Ackee is a non-traditional crop that is considered to have excellent foreign exchange earning potential. This paper will examine the prospect of expanding the volume of ackees exported, particularly to the US market. It will also discuss the health concerns associated with the consumption of the fruit, as well as present scientific evidence to allay food safety concerns associated with it. Finally a policy analysis matrix (PAM) approach was used to assess the comparative advantage of ackee, relative to sugar and bananas. The results of the PAM indicate that whilst sugar cane and bananas enjoy some comparative advantage, ackee uses locally resources most efficiently. This suggests that some of the resources that are currently being employed in the production of sugar cane and bananas could probably be more efficiently employed in the production of ackees.

Keywords: SPS measures, Globalization, Competitiveness, Jamaica

INTRODUCTION

The process of globalization has impacted the Jamaican agricultural sector significantly. Sugar and bananas have over many years been very important to the Jamaican Agricultural Sector and by extension the overall economy as a result of their immense contribution to foreign exchange earnings and employment creation. These crops share a common history and a common future; they also face similar challenges due to similar reasons.

During the past two decades a number of significant global, political and economic events occurred. The General Agreement on Tariffs and Trade (GATT) Uruguay Round of negotiations concluded with the signing of the Marrakesh Agreement in 1994. This agreement established the World Trade Organization (WTO), which ushered in a significant period of global trade

and economic liberalization, commonly referred to as globalization. The WTO introduced for the first time into the world trading system a process of reform in the rules governing trade in agricultural products, which required the reduction of certain subsidies, the tariffication of quantitative restrictions and the binding and reduction of agricultural tariffs. This process is to be continued under the current Doha round, as the agricultural sectors, particularly in the developed countries remain heavily protected.

The process of globalization did not affect every nation in the same way; it presented severe challenges to the developing countries like Jamaica and other countries in the Caribbean.

Both sugar and bananas have enjoyed preferential trade arrangements that guaranteed prices above that which is obtained in the international market. In the case of bananas, a

special protocol of the Lomé Convention assures preferential treatment of Jamaican banana exports to the EU, being a “traditional ACP producer”. Sugar on the other hand enjoys the protection of preferential marketing arrangements under the Sugar Protocol of the Lomé Convention as well as the US Sugar Quota.

Recently, there have been a number of changes to these arrangements stemming from WTO rulings that resulted from a number of litigations brought before it by various interests groups.

Since the mid 1990's, the EU Banana Regime has faced a number of litigations, which were brought to the WTO by the US on behalf of its multinational companies that operate out of Latin America. During this period, the WTO consistently ruled against the EU banana import regime, resulting in the dismantling of the ACP preferential arrangement, discontinuation of the tariff rate quota for Most Favored Nation (MFN) suppliers, and the introduction of a tariff only system of 176 euros per tonne. ACP countries now have global quota of 775,000 tonnes which enter the market at zero rate.

These changes have been devastating to the Jamaican Banana Industry. Since 1995, the area under cultivation has declined by 58 %, employment in the industry has been reduced by 57 %, and most significantly, foreign exchange earnings have declined by 90 % over the period. The EU has committed itself to reforming its Common Agricultural Policy (CAP), the reform is considered necessary for two important reasons. The first is that the CAP takes up approximately half of the entire EU budget and inflates food prices for the EU consumer. The second is the need for the EU to prepare itself for the next round of WTO negotiations on the Agreement on agriculture. These reforms, as well as the recent rulings of the WTO against the EU Sugar Regime have placed the Sugar Industry in a precarious position. The WTO ruling was the result of a challenge to the EU Sugar Regime from Australia, Brazil and Thailand (ABT). The EU has since proposed a 36 per cent reduction in the price it pays to ACP producers starting in 2006; the reduction will be phased over a period of four years.

There is also the Everything But Arms (EBA) proposal, which provides for full duty-free access to the world's 48 least developed countries (LDC) into the EU markets and covers all goods except arms. Under the EBA full liberalization of LDC banana imports to the EU

commenced in 2006. In the case of sugar, duties will be gradually reduced, to be finally eliminated on July 1, 2009.

Given the impact of globalization on the Sugar and Banana Sectors, and the imminent decline in both foreign exchange earnings and employment creation, this paper will examine possible alternatives for sugar and bananas; special attention will be given to the ackee fruit, due to the potential it has as an export crop. A study of the ackee also fits well with the theme of the conference given the “food safety concerns” that are associated with it.

OVERVIEW OF THE JAMAICAN ECONOMY

The principal sectors of the Jamaican economy in terms of contribution to Gross Domestic Product (GDP) are Services, Manufacturing, Mining and Agriculture (including Forestry and Fisheries). During 2005, the Jamaican economy recorded real GDP growth of an estimated 1.4 per cent, with tourism, mining (bauxite) and financial services being major contributors. Tourism and mining are likely to remain key drivers for economic growth in the foreseeable future although the importance of remittances from Jamaicans living abroad is growing. While agriculture and fishing contribute only 5.2 per cent to GDP, they constitute 14 per cent of export earnings and are extremely important income source for rural communities. In some rural parishes, nearly 80 per cent of the population is involved in agriculture.

Sustained economic growth continues to be a major concern of the country's public and private sectors. Development challenges currently facing the local economy include the increasing competitive global market, high interest rates, declining productivity and an increasing balance of payment account. The combined effect of these multiple challenges has been extremely slow economic growth. Government's priority during the medium to long run will be to implement policies that will ensure sustained economic growth.

STRUCTURAL ADJUSTMENT PROGRAMMES (SAP) AND THEIR IMPACT ON THE AGRICULTURAL SECTOR

As a consequence of the negative developments during the 1970's, particularly the high inflation brought about by the drastic increase in oil prices and significant devaluation of the Jamaican currency, by 1980 GDP had declined

by 5.8 per cent. This has resulted in the formulation and implementation of Structural Adjustment Programmes (SAPS) which were supported by both the International Monetary Fund (IMF) and the World Bank. These programmes started in the early 1980's and lasted through to the mid 1990's. The principal aim of the programme was to improve the balance of payments. The strategy was to curtail domestic aggregate demand through the devaluation of the currency on the one hand, while fostering export growth principally through the diversification of the agricultural sector on the other hand.

The general objective of the SAP for the agricultural sector during this period was the transformation and modernization of the sector to become a net foreign exchange earner through increased production and export of traditional and non-traditional export crops, and the achievement of foreign exchange savings through import substitution.

REFORM OF THE AGRICULTURAL TRADE REGIME

The SAP resulted in a number of reforms within the Agricultural Sector. One such was the Agricultural Trade Regime. During the period of the early 1990's the government eliminated all quantitative import restrictions and reference prices which had been put in place to protect small farmers. A new tariff structure was put in place for the relevant commodities that provided initially an equivalent level of protection as under the old regime. At the same time, a time table for reducing the new tariff rates to the level of CARICOM's Common External Tariff (CET) was announced. The new schedule would reduce the tariff rates of most items over a five-year period to real CET levels (5% - 30%) over a period of 5 – 7 years.

The Government also rationalized food pricing by removing distortions such as subsidies, particularly in food imports. Under the Generalized Food Subsidy (GFS) programme, there was a system of cross subsidization through which basic foods were sold by the state to consumers at subsidized prices and price controls enforced. Under an Agricultural Sector Adjustment Loan (ASAL), which became effective in 1990, and which was co-financed by the Japan Overseas Economic Cooperation Fund, the IDB and the German Government, the Jamaican government terminated its monopoly of all foodstuffs and other commodities thereby

allowing the private sector to import these products subject to the corresponding tariffs. All GFS were eventually eliminated in 1991. It is of note that reforms under SAPs placed Jamaica and other developing countries ahead of the WTO agenda for trade in agricultural.

CURRENT STATE OF THE AGRICULTURAL SECTOR

There has been a gradual decline in agriculture's contribution to GDP since 1997. The sector's contribution to GDP in 1997 was 7.9 per cent compared to 5.5 per cent in 2005. This decline is attributable to a number of factors, chief among which is the impact of globalization. The liberalization of the Jamaican economy, and particularly the agricultural sector exposed local farmers to a level of competition for which they were totally unprepared. Local farmers were dealt a double blow, as, not only were agricultural subsidies discontinued, but duties on agricultural commodities were significantly reduced, resulting in a surge of imports. During the period 1990 – 1998, Jamaica's exports of agricultural products increased by 28 per cent (US\$61 m), during the same period there was a literal explosion of agricultural imports which increased by 134 per cent (US\$293 m), (Weis, 2002) . The livelihood of many small farmers was adversely affected, as they were unable to compete with cheaper agricultural imports. Production of some crops was discontinued, while for others production was significantly scaled down.

Other factors that caused a decline in production were weather conditions and praedial larceny. The last couple of years the weather has been quite severe, with long periods of drought followed by a very active hurricane seasons. The last two years in particular has been devastating with a number of major hurricanes causing damage to the sector amounting to billions of dollars. In some sectors production is yet to return to pre 2004 levels as a result of damage caused by Hurricane Ivan.

The Jamaica Agricultural Society (JAS) reported that the agricultural sector loses over \$4 billion annually to praedial thieves. Many farmers have therefore discontinued the production of some crops and livestock as they are unable to reap the benefits from them. Government has enacted legislation to try and stem this problem.

Notwithstanding the challenges that beset the sector and its seeming low contribution to

GDP, the agricultural sector is vital to the Jamaican economy. Its contribution in terms of food security, livelihood security and rural development are enormous. It is the third largest employer of labor, accounting for 18.1 per cent of the labor force (ESSJ, 2005); it also directly supports an estimated 150,000 rural families. It is inextricably linked to manufacturing (agro-processing) and services sector, both of which depend on the agricultural sector for significant portions of their raw material needs.

PERFORMANCE OF THE AGRICULTURAL EXPORT SECTOR

Export agriculture in Jamaica dates back to the Colonial period; in fact, the Sugar Industry is over 300 years old. The sector is classified as either traditional exports or non-traditional exports. Traditional exports are those crops that were the main exports to the EU during the Colonial period, these include, sugar, bananas, citrus, cocoa, pimento and coffee. Although the time line is unclear, the exports of non-traditional crops started some time after the Colonial period, these commodities include tubers, vegetables, fish, cut flowers etc.

Export agriculture is important to the Jamaican economy because of the foreign exchange that it earns. Foreign exchange earnings from export agriculture, particularly traditional exports have been on the decline.

Tables 1 & 2 (see appendix) show the volume and value respectively, of traditional exports over the period 2001 – 2005. The performance of the sector has been uneven over a protracted period, but the overall trend for both volume and value is clearly downward. The challenges associated with sugar and bananas are well known. Both sectors are currently being reformed as the preferential trading arrangement under which both commodities were exported to the EU was said to be in violation WTO rules. The WTO rulings have already begun to impact the banana trade in Jamaica, with significant reduction in volumes, which have declined from 40,000 tonnes in 2001 to under 12,000 tonnes in 2005. The decline in earnings is also significant moving from J\$18 M in 2001 to J\$4.6 M in 2005. The impact of the EU reform has not yet affected the Sugar Industry, however, with the proposed reduction in the price of sugar; it will only be a matter of time before this industry experiences a trend similar to that of the Banana Sector.

Blue Mountain Coffee, because of its unique flavor, has a niche market and attracts prices

way above the world market price. The decline in price and volume of the other commodities can be attributed to the gradual reduction of commodity prices worldwide, as well as higher production cost, many farmers therefore no longer have the incentive to continue producing them. The general performance of the traditional export sector has not been impressive, given the importance of foreign exchange to the Jamaican economy. It is with urgency, therefore, that alternative crop/s with good export potential be identified that can make up for the losses in foreign exchange earnings. These alternatives can only come from the non-traditional sector.

Table 3 (see appendix) summarizes the value of non-traditional exports over the period 2001 – 2005. The crops that were the major foreign exchange earners during the period were sweet potatoes, yams and ackee. Sweet potatoes and yams have done fairly well over many years, but show very little inclination for further growth. Ackees on the other hand, seem to be the crop with the greatest potential for growth. In a recent survey of the Agro-processing Sector (2001), it was revealed that “the product with the most potential in terms of present volume required and earnings is ackee”, (Survey of Agro Processing Sector, 2001).

EXPLORING THE POTENTIAL OF ACKEE AS AN EXPORT CROP

BRIEF HISTORY OF CROP

The ackee tree *Blighia sapida* comes originally from the Ivory Coast and Ghana. The tree is planted there for shade and for its wood. In West Africa the green fruits are used for soap (they contain oil). The tree is resistant to termites. The plant was originally introduced to Jamaica in 1778 by Captain Bligh as food for the slaves. From Jamaica the tree was introduced to other islands in the Caribbean, these include Haiti, Trinidad and Tobago, the Bahamas, the Antilles, Central America, various South American countries, Florida and the Philippines. Due to its toxicity the importation of the fruit into the United States America (USA) was forbidden for a long while by the American Food and Drug Administration.

DESCRIPTION

The ackee fruit is a leathery, pear-shaped, three-lobed capsule that is up to 10 centimeters long; it is green when immature and becomes creamy, yellow or bright scarlet when mature, depending on the type of cultivar. When fully

mature, the fruit splits open, revealing three cream/yellow colored, glossy, crisp arils attached to the large, black, nearly round, smooth, hard shiny seeds (normally three, but sometimes four). The base of each aril is attached to the inside of the stem-end of the capsule by pinkish red membranes, sometimes referred to as the raphe. (Hertford, 2001)



Figure 1: The ackee fruit

PRODUCTION AND DOMESTIC DEMAND

Estimates of production area in ackee vary widely; as for decades this crop grew mainly in the wild and no official statistic regarding its production and distribution were available. On discovering its export potential, private initiatives have resulted in the establishment of a number of ackee orchards in selected areas of the island. The Ministry of Agriculture in March, 2000 established the Fruit Tree Crop Project, from which 800 hectares of ackee was targeted to be established over a period of three years. To date this project has established only 226 hectares, however, together with smaller holdings and scattered trees in mixed stands, it is estimated that some 1,200 to 1,500 hectares of ackee are currently under cultivation.

No official statistics on the local demand for ackee are available; anecdotal evidence, however, suggest that local demand for the fruit is high. The fact is that it is a relatively cheap source of protein, it is tasty and has attained a high degree of popularity among Jamaicans in that it is a basic ingredient of the national dish “ackee and saltfish”.

THE EXPORTS MARKET FOR CANNED ACKEES

Canned ackee exports are a significant earner of foreign exchange. The exports of canned ackee arils started as early as 1956, when a cottage industry project, sponsored by the Jamaica Federation of Women, produced canned ackees for export to the US. However, in 1972 the Food and Drug Administration (FDA) effectively banned the import of canned ackee to the United States, by imposing an import alert. In 1993, the import alert was extended to include ackee in all forms, thus effectively precluding the export of frozen ackee as well. Since imposition of the ban, efforts were continuously made to have the case reviewed and the ban lifted.

On July 6, 2000, the ban was lifted on all ackee imports. This breakthrough resulted from collaboration between a number of government agencies and the private sector in developing a processing protocol that was acceptable to the US authorities. The lifting of the ban led to high hopes for a significant expansion of ackee exports, benefiting both domestic farmers as well as processors. There have also been calls for significant increase of the area under production to meet the expected increase in demand. The table below summarizes ackee export by destination, for selected countries (volume and value) for the period 2002 – 2004.

Table 4: Ackee Exports by Destination 2002 - 2004

DESTINATION	2002		2003		2004	
	Volume (kg)	Value (J\$'000)	Volume (kg)	Value (J\$'000)	Volume (kg)	Value (J\$'
UK	309,156	68,304	483,896	126,698	5,252,733	100,210
Canada	354,620	68,502	284,960	68,632	67,182	18,806
US	762,262	210,082	935,657	286,119	877,739	240,955
Bahamas	8,982	2,058	2,129	374,667	5,279	1,714
Barbados	4,824	1,375	3,996	1,392	3,445	1,371
Bermuda	11,150	3,182	10,871	4,114	7,330	2,916
Japan	2,079	389	389	140	1,892	821

Source: Statistical Institute of Jamaica (STATIN)

Although only seven countries are represented in the table, Jamaica currently exports ackees to over 31 countries (STATIN), inclusive of France, Germany, Switzerland, the Netherlands, Armenia and the rest of the English speaking Caribbean. The UK, Canada and the US are the main export markets accounting for over 90 per cent of the total export volume for the three years reported. Total volume exported for the stated period were 1.49 million kg, 1.77 million kg and 6.24 million kg respectively; while earnings for the corresponding period were J\$352 million, J\$502 million and J\$378 million respectively.

THE US MARKET FOR CANNED ACKEE

In February 2001, the JEA, through Fintrac¹ conducted a telephone survey of retailers in the metropolitan areas of Washington DC (including suburban Maryland), Miami/South Florida (Dade and Broward counties), and New York (including Connecticut). Restaurants and wholesalers were also contacted to verify consumption trends. Businesses included in the survey were in areas that are known to have sizeable Jamaican immigrant populations. Over 100 businesses were interviewed to determine whether they carried canned ackee in the three metropolitan markets. Of the 100 interviewed 26 reported regular stocking of canned ackee.

The sales outlets for ackee are generally small ethnic groceries located within West Indian immigrant neighborhoods. Not all ethnic markets in the survey areas sold ackee, however, with the lifting of the ban this presented a very good opportunity for expanding availability and sales.

Jamaicans are the primary purchasers of ackee in the US; however, there is a large contingent of West Indian immigrants residing in the New York and Miami/Fort Lauderdale metropolitan area, with smaller yet significant populations in the Washington DC and Maryland suburbs. A 1990 estimate put the number of West Indian immigrants in these areas at 21,762,611 (1990 US Census data)². With

¹ Fintrac provides market led production, post harvest, processing and quality assurance support for the Agri-business Sector worldwide with special focus on developing countries. Fintrac is a company, which has been in operation since 1975 and has core offices in the US Virgin Islands and Washington DC.

² Obtained from the JEA's Ackee Commercialization Bulletin, prepared by Fintrac

careful planning, sales of ackee can be significantly increased within these areas.

HEALTH CONCERNS ASSOCIATED WITH ACKEE CONSUMPTION

Every country has a responsibility to safeguard the health of its citizens, as such numerous sanitary and phytosanitary (SPS) measures have, over time, been instituted to ensure that goods imported into a country's market satisfy the most stringent of health standards. As previously mentioned, the export of canned ackee to the US was effectively banned for 27 years, by the imposition of an import alert. Imposition of the alert is related to the presence of a naturally occurring toxin, hypoglycin A, which is present mainly in the aril of the ackee and is responsible for the illness called "Jamaican vomiting sickness" (hypoglycemia). Concentrations of this toxin are highest in the unopened / unripe fruit, and guidelines for preparation of the product indicate that such fruit should not be consumed.

The effects of ackee poisoning include nausea and acute vomiting without diarrhea, dizziness, fever and convulsions. The symptoms usually begin 2 - 3 hours after the meal, and could result in death if not treated within 12 hours.

STEPS TAKEN TO DEMONSTRATE THAT ACKEE IS A "SAFE" FOOD

One of the conditions for lifting the ban imposed on canned ackees by the US in 1972 was that "importers prove by very expensive toxicological studies that the product was safe or that it had been imported to the USA in commercial quantities prior to 1958", (JBS, Ackee Symposium, October 2000).

In order to supply the required information to the FDA, the JBS (Jamaica Bureau of Standards) developed a project consisting of three phases:

- the development of a reliable method for the chemical analysis of hypoglycin A in aril and brine
- A toxicological evaluation of the ackee involving feeding studies using three animal species
- The development of processing techniques designed to produce a toxin free product

Funding was provided by USAID; and a number of local and international institutions assisted in the project, they include:

- The Post Harvest Institute of Perishables (PIP), University of Idaho
- The University of Florida
- Biochemistry Department, UWI
- Jamaica Bureau of Standards (JBS)
- Food Technology Institute of Jamaica (FTI)

All the tests conducted concluded that once the hypoglycin level is kept below a prescribed minimum the fruit is safe to consume, and most importantly, the test also indicated that the hypoglycin levels in the fruit were directly related to its maturity. The hypoglycin levels in green, unopened fruit is extremely high, therefore at that stage the fruit should not be consumed. To ensure that ackee is consumed at the right level of maturity, the JBS recently developed an *Ackee Maturity Index Chart* to illustrate the ripening process of the ackee and to indicate when it is ready for reaping.

Whilst, Jamaicans consume ackee in its natural state (unprocessed), ackees for the export market are processed and sealed in cans, a brief description of the process is described below:

- Harvested fruits are inspected to ensure conformity to specification;
- Fruits are graded with unopened fruits placed on sun racks, while open pods are sent for immediate processing;
- The seed and membrane of ripe fruit are manually removed and the fruit inspected for defects;
- The cleaned fruit is washed in successive, alternating brine clean water;
- Cans are filled with hot, brine cleaned water and fruit to required weight;
- Cans are then sealed and coded;
- Sealed cans are then loaded into baskets and placed in retorts for cooking in accordance with standard international and established practices;
- After cooking, the cans are cooled in chlorinated water at 40 degrees Celsius and air dried; they are then removed to the packing area, for labeling;

Currently, there are 18 processors who supply ackees to the export market, 6 are HACCP certified; only the HACCP certified processors are allowed to export to the US. The other processors can export to the UK and Canada, and other overseas destination but, only after their produce are approved by one of three HACCP certified labs. No effort has therefore

been spared to put the proper sanitary and phytosanitary measures in place to ensure that ackees that leave Jamaica's shores for the export market satisfy the most stringent of international standards.

Jamaicans through centuries of collective experience are able to visually detect when the fruit is ripe and mature. Unlike fruit for the export market, that for local consumption is not processed. Preparation for local consumption involves removing the seed and membrane and then washing thoroughly before cooking. The cooked fruit can then be used to prepare one's favorite dish, usually ackee with cod (salted fish), which is Jamaica's national dish. Because of the way most Jamaicans consume the fruit there is the risk of consuming unripe, immature fruit. This usually happens when children take it on themselves to pick and prepare the fruit unsupervised. Checks with Jamaica's Ministry of Health revealed that over the last five years there have been only 11 reported cases of ackee related illnesses, none of which were severe. There were no reported cases of death as a result of ackee poisoning over the said period.

THE POLICY ANALYSIS MATRIX AND MEASURES OF COMPARATIVE ADVANTAGE AND PROTECTION

The Policy Analysis Framework (PAM) developed by Monke and Pearson (1987), will be used to examine the relative comparative advantage of Ackee, Banana and Sugar Cane. The focus of the analysis will be to determine which crop utilizes local resources most efficiently.

The PAM framework involves the derivation of several important indicators of protection and comparative advantage. As shown in Table 5 below, the PAM is a product of two accounting identities. The first one defines profit as the difference between revenues and costs, measured in private and social terms. The second identity measures the effects of distortions (distorting policies and / or market failures) as the difference between observed values and social values as indicated by the divergence row in the PAM. These divergences are approximations because social values are evaluated at the initial distorted levels of outputs and inputs (Monke and Pearson, 1987). Hence the PAM provides guidance for the incremental changes rather than wholesale ones.

Table 5: Policy Analysis Matrix

	Costs			
	Revenues	Tradable Inputs	Domestic Factors	Profits
Valued at private prices	A	B	C	D
Valued at social prices	E	F	G	H
Divergences	I	J	K	L

Source: Monke and Pearson (1998)

Private profits $D = A - (B + C)$

Social profits $H = E - (F + G)$

Output transfers $I = A - E$

Input transfers $J = B - F$

Factor transfers $K = C - G$

Net Policy transfers $L = D - H$

The data in the first row provide a measure of private profitability (D), defined as the difference between observed revenues (A) and costs (B+C) valued at actual market prices. Measures A, B, C and D reflect transfers and taxes. They show the competitiveness of the agricultural system, given current technologies, output values, input costs and policy transfers. The second row in the table calculates social profitability measured at "social" prices that reflect social opportunity costs. Efficient outcomes are achieved when an economy aligns its private price signals to social prices. Social profits measure efficiency and provide a measure of comparative advantage. At the margin, a positive social profit indicates that the system uses scarce resources efficiently and the commodity has a static comparative advantage. When social profits are negative, a sector cannot sustain its current output without assistance from the government, in such cases the cost of domestic production exceeds the cost of importing at the margin (Monke, Pearson 1987).

Three coefficients are used to compare the extent of policy transfer incentives between agricultural commodities. The Nominal Protection Coefficient (NPC) is a ratio that contrasts an observed (private) price with a comparable world (social) price. This ratio indicates the impact of policy on divergence between the two prices for output (NPCO) and

tradable inputs (NPCI). Subsidies to output are indicated by a NPCO larger than one, and input subsidies lead to an NPCI smaller than one. The Effective Protection Coefficient (EPC) is a ratio of value added in private prices (A-B) to value added in world prices (E-F). This coefficient indicates the degree of policy transfer from output and tradable input distortions. A value greater than one indicates a net subsidy to value added.

The Domestic Resource Cost (DRC) is used to compare the relative efficiency or comparative advantage between agricultural commodities. The DRC is defined as $G/(E-F)$ and indicates whether the use of domestic resource is socially profitable, in which case $DRC < 1$, otherwise $DRC > 1$. Given the definition of the DRC it may be biased towards activities that rely heavily on non-traded factors such as land and some aspects of labor which in this study will be land.

DATA SOURCES, MODELING ASSUMPTIONS AND RESULTS

The basic information required for compiling the PAM are yields, input requirements, market prices and social prices. The 2005 cost of production (COP) data for the three crops being considered was obtained and used in the study. The ackee COP was obtained from the Ministry of Agriculture's Fruit Tree Crop Project, while those for sugar and banana were obtained from the Sugar Research Institute and the Banana

Export Company (BECO) respectively. Other sources of information include CIF prices for tradables and applied duties; these were obtained from the Customs Department. Information was also gathered from interviews with farmers, Ministry of Agriculture officials, and various other stakeholders such as the Jamaica Bureau of Standards, the Scientific Research Council, the Private Sector Organization of Jamaica, the Ministry Commerce, Science and Technology as well as from various publications. Estimating social prices for inputs and output is usually the most challenging analytical task in constructing the PAM. Social prices (world prices) can be estimated indirectly by removing the effects of distorting domestic policies. To find world prices indirectly, one starts with the private prices of tradables and then estimate the quantitative impact of policies affecting the commodities (Monke and Pearson, 1987). This process results in an implicit world price, estimated to exist if the distorting effects of policies were removed. This is the procedure that was adopted in this study. This technique is particularly useful in Jamaica's case as the country has undergone a series of structural adjustments resulting in a fairly liberalized economy. In fact, the Jamaican economy at present is probably one of the most open, liberalization has seen to the removal of all subsidies to farmers, and for significant reduction in duties on most agricultural outputs. Presently, all agricultural inputs are imported duty free, except for a 2 per cent cess on the CIF, which was applied by the government budgetary support. Estimating the social prices for tradables amounted to removal of the 2 % cess which was the only source of distortion, transportation and internal marketing cost are then added.

Monke and Pearson posited that when the labor market completely ignores a legislated minimum wage rate, then the private wage is equal to the social wage. Annual cost of production surveys conducted by the Ministry of Agriculture revealed that on average Jamaican farmers are paid above the minimum wage.

Agricultural workers are not encumbered with social security payments and taxes, social and private wages were therefore considered equal for this study.

The social value of land was derived by subtracting the land tax from the market or rental value of the land.

Sugar cane is an input for the production of sugar and as such is not a traded commodity. The challenge was to find an estimate for its social price. The cost of production of sugar cane in Guyana was used as a proxy for the world price, since Guyana is the most efficient producer of sugar in CARICOM. The freight rate for paddy rice from Guyana to Jamaica was used as a proxy for the transportation cost for sugar cane from Georgetown to Kingston; local marketing and transportation cost were then added to get an estimate of the social price of sugar cane.

Eurostat provided reference price for banana as well as the freight charges from the EU to the Caribbean.

Estimating the social price for ackee had its own set own set of challenges. This is a fruit that is exported by a few other countries apart from Jamaica; these include some Latin American and African countries. However, information regarding export volume and value for these countries are not available. The FOB price minus port handling, transportation and marketing charges was therefore used as a proxy for the world price.

The next step in the analysis involves the disaggregation of non-traded and traded inputs. This step is necessary to permit identification of tradable inputs and domestic factor divergences. The total private and total social costs are decomposed into their domestic factor and tradable input components. Decomposing all input costs into their exact domestic factor and tradable input components is a tedious task, which often only has a trivial effect on the results (Monke and Pearson, 1987). Labor, land and capital are assumed to be totally nontraded.

RESULTS AND INTERPRETATION OF PAM INDICATORS

Table: 5 Summary Results of the coefficients from the PAM

Crops	NPCO	NPCI	EPC	DRC
Ackee	0.75	1.02	0.75	0.10
Banana	1.30	1.03	1.4	0.68
Sugar Cane	0.76	1.02	0.7	0.65

Table 5 summarizes the results of the PAM. The NPCO for bananas is 1.30 and indicates that its domestic price is above the corresponding international reference price, the opposite is true for ackee and sugar cane with NPCO values of 0.75 and 0.76 respectively. The banana sector with considerable assistance from the EU, through the EU Banana Support Project, is currently being restructured with a view to improving its efficiency. Government policy, through imposition of a tariff also provides some protection from lower cost imported bananas. An NPCO >1 for bananas was therefore not surprising. An NPCO of 0.76 for sugar cane is a reflection of its non-traded status, in that transportation and other cost associated with importing the commodity is large relative to its price; local prices will therefore be below their corresponding international "reference prices". Ackee, with an NPCO of 0.75 is a traded commodity, it however faces, minimal external competition and is not at this time threatened by imports, on the contrary the relatively strong external demand for the fruit, results in the FOB price (social price), exceeding the domestic price hence NPCO <1. Since there are no current threats from imports, there is no need to implement any policies for protecting the sector at this time.

All the NPCI values are marginally greater than one (NPCI >1) indicating that government policies are increasing (marginally) input cost to these commodities and in general to the agricultural sector.

The EPC nets out the impact of protection on inputs and outputs, and revealed the degree of protection accorded to the value addition process in the production activity of the relevant commodity. The EPC for the three commodities reinforces the NPCO values, indicating reasonable protection in the case of bananas and minimal protection for ackee and sugar cane.

The DRC values for all three commodities are less than one (DRC <1). This suggests that the three crops enjoy some degree of comparative advantage; however, ackee with a DRC of 0.10 utilizes local resources more efficiently than sugar cane and bananas with DRC of 0.65 and 0.68 respectively.

SUMMARY AND CONCLUSION

Notwithstanding the current challenges, the sugar and banana sectors continue to make

important contributions to the Jamaican economy. Jamaica, being a net food importer is heavily dependent on foreign exchange; therefore any reduction is cause for concern. Already there have been significant loss of earning from the export banana sector, whilst plans are currently being crafted to avert a similar crisis in the sugar sector. There have also been marked decline in all the other traditional export crops except coffee. Given the general decline in earnings from traditional export crops, there was an urgent need to identify non-traditional commodities with good export potential to prevent a worsening of the countries balance of trade problem.

Indications are that amongst the non-traditional crops ackee shows the greatest potential for growth as an export crop. Surveys that were conducted in the US suggest that there is substantial demand for the crop, particularly among Jamaicans residing there. The FDA, convinced that ackee is safe to consume once proper preparation procedures are observed, has lifted the ban on the product.

This has created a huge opportunity to significantly increase the volume of export to this market. There are reports of other countries producing and exporting ackee to the US, but, there is no data to substantiate this.

The results of the PAM strongly suggest that ackee enjoys significant comparative advantage over sugar cane and bananas. It also cost significantly less to establish and maintain a unit of ackee relative to sugar cane and banana. The NPC and EPC for ackee indicate that that the fruit receives minimal protection, as it currently face no competition from exports in the local market place.

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Table 1: Volume of Traditional Exports 2001 – 2005 – Tonnes

CROPS	YEARS				
	2001	2002	2003	2004	2005
Sugar	156,907	138,145	128,540	159,908	112,929
Bananas	43,052	39,986	39,936	27,657	11,560
Citrus	7,728	4,695	5,483	3,713	2,375
Pimento	650	600	450	500	500
Cocoa	845	685	675	670	200
Coffee	845	685	675	670	200

Source: Economic and Social Survey of Jamaica (ESSJ)

Table 2: Value of Traditional Exports 2001- 2005 – (US\$'000)

CROPS	YEARS				
	2001	2002	2003	2004	2005
Sugar	71,500	66,800	74,400	98,700	74,700
Bananas	18,271	17,559	18,844	12,814	4,692
Citrus	4,032	1,954	3,160	2,057	1,480
Pimento	3,485	2,600	2,764	2,164	2,856
Cocoa	1,150	938	2,245	910	318
Coffee	29,895	32,032	28,919	38,683	16,334

Source: ESSJ

Table 3: Value of Non Traditional Exports 2001 – 2005 – (US\$'000)

COMMODITY	YEARS				
	2001	2002	2003	2004	2005
Cucumbers	70	8	10	12	10
Pumpkins	755	556	647	427	273
Dasheens	1,201	952	1,164	1,079	742
Sweet Potatoes	1,677	1,531	1,816	1,524	1,952
Yams	14,072	13,157	14,168	15,232	15,258
Avocados	1,031	0	0	0	0
Mangoes	3,832	548	854	825	921
Papayas	9,093	4,234	2,677	2,066	2,044
Ackee	5,629	7,181	8,756	6,188	9,064
Fish, Crustaceans & Molluscs	11,801	5,464	7,854	7,222	9,862
Cut Flowers	173	90	63	41	3
Foliage & other live plants	92	38	48	11	53
Other Food Exports	51,167	49,157	56,460	55,778	47,824

Source: ES