EU Preferential Partners in Search of New Policy Strategies for Agriculture: The Case of Citrus Sector in Trinidad and Tobago

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Abstract

The paper assesses the competitive position of T&T’s citrus industry and explains the declining productivity. It covers supply chain and agricultural trade policy issues and involves assembling two Policy Analysis Matrices, either with full cost of production or excluding establishment costs. Domestic and trade policy support shows significant for the sector. Production is internationally competitive, or possesses comparative advantage, only if costs of establishment are excluded. These results suggest that free trade agreements under the FTAA and the ACP-EU would work against the planting of new orchards and reinforce the decline of the sector.

Keywords: Competitiveness, Policy Analysis Matrix, Agricultural Trade Policy, Citrus Industry

JEL: Q12 - Q13 - F13

1. Introduction

Caribbean countries are fairly open economies, with agricultural performance (production, employment, foreign exchange earnings) heavily influenced by a few export commodities traditionally directed to the European Union (EU) and by trade protection (mainly tariff measures) of some domestic products. However, recent international trade developments - WTO liberalisation, EU domestic and trade policy regime changes - have fuelled efforts for agricultural diversification, as the performance and prospects of the traditional export commodities, such as sugar, bananas and rice, are declining.

Diversification strategies, however, must take account of multilateral liberalisation and new reciprocal deals potentially embodied in the Economic Partnership Agreements (EPAs) negotiations with the EU and Free Trade Area of Americas (FTAA) negotiations with North and South American countries. These developments can cast pressures on those agricultural commodities usually considered main avenues for diversification strategies targeting both domestic and export markets. Prospects for preserving the contributions of agriculture to regional development are then increasingly contingent on the agricultural sector becoming more efficient and competitive. This, in turn, often implies complex policy strategies, dealing with the peculiar characteristics of production, trade and marketing of Caribbean countries. These elements are to be considered when defining both national policies and contents of EU cooperation under EPAs framework.

From the mid ‘90s, the citrus sector in the Caribbean has been experiencing a significant expansion - mainly in Belize, Jamaica and the Dominican Republic. Such a growth has been supported by specific policies and by the expansion of the large scale private sector, encouraged by deregulation and liberalisation. Other Caribbean Island States, such as Trinidad and Tobago, are not major regional player in the citrus sector. However, also in these cases the sector is considered a traditional component of Caribbean agriculture, significant for its contribution to GDP, employment and exports (FAO, 2002) and gathers a relatively important policy effort.

The paper’s objectives are to provide an overview of key policy and marketing issues for the development of the citrus sector in Trinidad and Tobago (T&T), as well as an assessment, through a set of indicators, of the competitive position of orange production.
2. Trade and Marketing in the Citrus Sector of Trinidad and Tobago

The analyses of the international citrus marketing chain mainly focus on oranges and orange juice, given the outstanding weight of these products in the citrus fruits group. Harvested orange fruits may go to the fresh fruit market, in order to be consumed fresh, or squeezed freshly at home to be consumed as juice, or they may enter the processing industry, in order to obtain orange juice and other by-products. Competition is increasing in the sector, with restructuring and changes in the marketing chain, in a context of globalization. The market is increasingly consumer driven.

International trade in the fresh citrus fruits sector is characterized by a relatively lower degree of concentration of supply, with a multitude of small or medium-sized firms providing the fruit, although there is a certain trend towards concentration of producer groups as a response to buyers consolidation. There is also an important presence of cooperatives in this sector, which favor better price and marketing conditions for growers by improving their negotiating power and coordination.

World citrus trade has been boosted by the strong growth in production and consumption since the mid-'80s. Production of oranges, tangerines, and lemons and limes have all expanded rapidly. Even faster growth has been realized for processed citrus products as improvements in transportation and packaging have lowered costs and improved quality. In 2001, Brazil was the largest producer in Latin America but the third largest exporter, while Argentina was the third largest producer but the second largest exporter. The major citrus exporting countries in the region were Cuba, Dominican Republic and Jamaica, while T&T is just a negligible exporter of fresh citrus to neighboring islands, while it is a net importer of concentrated juice.

Orange juice trade is much more concentrated than trade in fresh fruits. The most representative stages of orange juice marketing chains at the international level are that of Brazil, as the major supplier of orange juice to the world, and Europe, as the major market for orange juice exports. A small number of companies that operate in Brazil and Florida dominate the market. Four major companies in the sector, Brazilian companies Citrusuco and Cutral, plus multinationals Cargill and Luis Dreyfous, hold around 70/75% of the market share in Brazil and 30/35% of the market share in Florida. These companies are highly vertically integrated, since size and scale are important competitive advantages, particularly in bulk transportation of the juice. Along with concentration and integration, the penetration of global beverages brands (e.g. Coca-Cola with Minute Maid and Pepsi-Cola with Tropicana) are among the major recent developments in the international orange juice marketing chain.

Trinidad and Tobago’s production and marketing system for oranges comprises of the 1,000 plus producers, several middlemen and the end users, comprising of consumers, supermarkets, hotels and restaurants, processors, the School Nutrition Programme (SNP) and the external market. The typical marketing transaction for fresh produce is characterized by many shippers selling to many middlemen – at the farm-gate or in terminal wholesale markets – or directly to consumers, using roadside stalls at the farm-gate or along busy roadways, or through sales in the retail market. In the sales to middlemen, generally farmers are responsible for harvesting the produce.

Middlemen purchase the produce from farmers and supply the end users (except for the processing plants which are supplied directly by farmers). Few middlemen are specialized in citrus fruits; while most are generally involved in the trade for fresh fruits and will include citrus during peak harvest periods. The operations of the middlemen may be relatively simple, involving purchasing from farmers and then retailing in markets or roadside stalls, or may be more complex, involving packing house operations of cleaning and sorting to fulfill contracts with supermarkets, hotels and restaurants, and the export market.

In Caribbean countries, and particularly in Trinidad and Tobago, the fresh fruit market is the primary sales outlet for most farms, since market prices are higher for fresh fruits. More precisely, as far as T&T is concerned, all fruits are consumed locally, except for a very small volume of exports to the neighbouring island of Barbados. The distribution of the harvest between marketing fresh or sale to the factory for processing is heavily influenced by the size of the harvest, which in turn determines prices on the fresh fruit market. In a good harvest as much as 60% may be directed to the processing plant. This figure can drop to 40% in a worse than average harvest. The price paid by the processing plant is fixed, while that in
the fresh fruit market is driven by the forces of domestic demand and supply, under the strong trade protection currently in place.

T&T is a net importer of concentrated juices, due both to processing plants, to supplement production, and to other importers for the retail and wholesale markets. As far as the juice market is concerned, it is estimated that the single processing facility - operated by the Co-operative Citrus Growers Association (CCGA) - is currently absorbing roughly 50% of citrus production. Supply to CCGA however tends to vary with domestic fresh fruit prices and weather conditions. Demand for citrus juices has been growing despite the decline in domestic production (sales from the CCGA increased from 162,000 cartons in 1994/1995 to 225,000 in 2002). In order to meet this increased demand, a substantial quantity of foreign concentrate of both orange and grapefruit juices are imported from CARICOM countries (particularly Belize), by both associate growers, for supplementing production of the processing plant, and other importers supplying to the wholesale and retail markets.

Summarizing, the citrus market still concentrates in a traditional supply chain that has scant vertical coordination, very limited requirements in terms of logistic and supply chain management and little involvement of the modern retail structures (supermarkets). The structure resemble the case of a perfectly competitive market with many independent transactions at the observable spot market price. There is great fragmentation on both the selling and buying sides with large numbers of local retail grocery stores rather than national chains with large store numbers and buying volumes per chain.

Beyond the major role played by agricultural and trade policies, which greatly support agricultural production and the income of many producers and downstream operators, also the structure of the supply chain tends to shield producers from excessive market power in downstream stages and lowers the requirements for achieving an acceptable performance at production and post-harvesting stages (limited or no requests of food safety assurances, quality and packaging characteristics, volume commitments, promotional fees).

3. Agricultural and Trade Policies

The citrus industry in T&T is provided with substantial trade and domestic policy support.

Trade patterns and marketing strategies for citrus products in T&T are deeply affected by the significant trade protection provided by sanitary and phyto-sanitary (SPS) regulations, which guarantee an actual ban on import of fresh produce (plant quarantine restrictions). Moreover, a 40% Common External Tariff is operated in the framework of CARICOM for both oranges and orange juice, while T&T ceiling bindings in the WTO are 100% for both lines of products.

Producer support is also carried out through subsidies that are targeted particularly at the establishment phase of the crop (partial reimbursement of establishment costs and supply of planting materials at subsidised prices). However, this study estimates that 92% of the package of support provided to orange farmers result from trade-related restrictions (see Section 4).

It is expected that the high level of trade-related support will change over time due to ongoing changes in the whole trading environment. On one hand, it is not easy to ascertain how long restrictive SPS measures will survive the development of liberalization in the fresh fruit market, either in the WTO framework and/or above all in some of the main preferential schemes involving Trinidad and Tobago (Free Trade Area of Americas – FTAA – and CARICOM bi-laterals). On the other hand, the entire set of future trade agreements (WTO, ACP-EU EPAs, FTAA, and CARICOM bi-lateral agreements) are likely to challenge current tariff rates; and again, the major potential sources of changes should be considered the preferential deals, since the substantial amount of “water” in the bound tariffs and the opportunities related to the development of the concept of “special products” (the “Framework for Establishing Modalities in Agriculture”, July 31st 2004, states “Developing country Members will have the flexibility to designate an appropriate number of products as Special Products, based on criteria of food security, livelihood security and rural development needs. These products will be eligible for more flexible treatment”) could provide room enough in the multilateral system of trade rules for keeping tariff protection unchanged.
The FTAA, which should be initiated by 2006, would include Brazil and the US, with a combined output of more than 85 percent of the world’s orange juice. At the FTAA T&T will be negotiating from the current bound rate, with oranges and orange juice placed in the tariff elimination time schedule of more than ten years, thus enabling liberalization of trade in these items to begin after 2015. However, during the negotiations, it is possible that requests for more favourable concessions could be made from producers of FTAA partners. T&T is also part of the CARICOM/ Cuba and CARICOM/ Dominican Republic free trade agreements. Under these agreements, fresh citrus will probably trade under special arrangements.

4. Citrus production in Trinidad and Tobago

The Caribbean accounts for 1.4% of world citrus production. In the Caribbean, production ranged between 1,000 and 1,200 thousand tonnes over the period 1995/1996 to 2000/2001. Main regional suppliers in 2001 were Cuba (66%), Jamaica (13%), Dominican Republic (12%). Also in Trinidad and Tobago, after some decades of stagnation, citrus production witnessed a season of resurgence by the early ‘90s (tab.1). This was largely due to the planting of about 1200 ha of citrus by a public firm (Caroni (1975) Ltd.) that boosted citrus production in order to strengthen domestic supply to the processing sector.

Table 1. Citrus production in T&T (metric tons)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oranges</td>
<td>7,500</td>
<td>14,044</td>
<td>6,039</td>
<td>3,907</td>
<td>5,029</td>
</tr>
<tr>
<td>Grapefruit and Pomelos</td>
<td>4,084</td>
<td>6,307</td>
<td>3,930</td>
<td>3,416</td>
<td>2,586</td>
</tr>
<tr>
<td>Citrus Fruit, Total</td>
<td>16,584</td>
<td>25,350</td>
<td>14,969</td>
<td>12,467</td>
<td>13,042</td>
</tr>
</tbody>
</table>

Source: FAO

In the year 2000 there were 1,124 citrus farmers in Trinidad and 16 in Tobago and the majority of farms (94.1%) can be classified as small-scale with land holdings of less than 10 ha (MALMR, 2000). Only 4.9% of farmers have holdings of 11-40 ha, and 1% have holdings greater than 100ha. Approximately 5,275 ha. of the 11,360 ha of land occupied by citrus farmers are cultivated in citrus. Of the 5,275 ha cultivated in citrus, Caroni (1975) Ltd. has approximately 1200 ha and small farmers have 2700ha. The majority of citrus cultivation takes place in the counties of St. Patrick (40.5%); St. George (14.5%); Caroni (13.1 %); St. Andrew (12.5%); Nariva (8%) and St. David (2.4%). Only 1.4% of citrus farmers are found in Tobago.

There are two basic farming systems in citrus production – pure stand and mixed. The survey of the citrus industry found that 52.4% of farmers cultivate citrus as pure stand orchards, 40.5% as mixed and 7.1 % have both pure stand and mixed stands. County St. Andrew and county St. David have respectively about ninety percent (90.4%) and one hundred percent (100%) percent of farmers engaged in pure stand cultivation. The other counties have between 30% and 63% farmers cultivating pure stand (Table 2).

Table 2. Distribution of citrus farmers by type of cultivation and county

<table>
<thead>
<tr>
<th></th>
<th>St. George</th>
<th>Caroni</th>
<th>St. Patrick</th>
<th>Nariva</th>
<th>Mayaro</th>
<th>Victoria</th>
<th>St. Andrew</th>
<th>St. David</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Stand</td>
<td>38.7</td>
<td>54.4</td>
<td>44.1</td>
<td>62.4</td>
<td>29.6</td>
<td>52.4</td>
<td>90.4</td>
<td>100</td>
</tr>
<tr>
<td>Mixed</td>
<td>43.5</td>
<td>28.6</td>
<td>53.0</td>
<td>37.6</td>
<td>55.6</td>
<td>35.7</td>
<td>9.6</td>
<td>-</td>
</tr>
<tr>
<td>Both</td>
<td>17.8</td>
<td>17.0</td>
<td>2.9</td>
<td>-</td>
<td>14.8</td>
<td>11.9</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

With the coming on stream of production from the groves of Caroni Ltd., deliveries to the processing plant peaked to over 12,000 tons in 1996/1997. Since then, however, there has been a steady decline to some 4,200 tons in 2000/2001, about the same amount delivered to the marketing channels for fresh produce. This reduction in production is mainly attributed to infestations (Citrus Leaf Miner, Citrus Black Fly, Citrus Tristeza Virus, foot rot diseases) now affecting groves planted prior to 1994 and developed on Sour Orange Rootstock. More generally, improvements are needed also for plant quality, replacement of old trees, agronomic practices, credit terms, technical backstopping and reductions in praedial larceny, if the industry is to survive.

In particular, with the exception of the orchards of Caroni Ltd, most citrus fields are old, minimally maintained or abandoned. Some growers apply agro-techniques to enhance yields and the Ministry’s attempts to mitigate against some diseases through the provision of virus-free budwood and the introduction of exotic parasitoids against specific targeted pests (e.g. mealy bug) are having some impact.

The data suggest high rates of loss of plants planted by citrus farmers. Approximately 1.565 million citrus plants were sold to farmers during the ten-year period, 1985-1994 - 1.304 million were sold by the Ministry of Agriculture and 0.261 million by private nurserymen. Even with a 20% rate of loss that number of plants should have resulted in the establishment of 4,000 ha of citrus planted pure stand at a spacing of 5.4m x 5.4m (18 ft x 18 ft). Given that there existed 5,275 ha of citrus in mostly old and aging groves in the year 2000, the data suggests an exceedingly high rate of loss of citrus plants during the establishment phase. This could be attributed to:

1. Poor quality and disease infected plants supplied to farmers
2. Planting in poor soil conditions – e.g., poorly drained soils
3. Fires
4. Inadequate management and neglect after planting
5. Damage by insect (primarily bachacs) and other pests

The establishment of a citrus orchard is a long term, costly investment, therefore, the production of high quality plants must be integral to the rehabilitation of the industry. Consequently, the future of the industry depends on resolving this quality issue through, for example, the establishment of a mandatory health certification scheme for citrus plants.

Citrus performs best under sub tropical conditions on deep, slightly acidic well drained and well-aerated soils. However, a substantial amount of the orchards in T&T are situated on heavy acidic clays with impeded internal drainage.

Most citrus orchards in T&T are poorly managed and maintained. In many cases maintenance of orchards is carried out as a prelude for harvesting rather than as part of the management regime required to obtain good yields. Poor husbandry practices, as they relate to fertilizer application rates and the use of pesticides, is minimal and further influence premature ageing of trees and low yields.

The recommendations for orchard management in T&T emphasize the following practices:

1. Proper drainage, for orchards planted on heavy clays on flat land. Drainage of channels should be established on either side of a row of trees to increase soil aeration, decrease excessive humidity of the fields and prevent foot and root rot and other diseases and/or planted on cambered beds.
2. Adequate weed control since excessive weeds prevent the quick run off of water from the fields, compete for soil nutrients and harbour pest and disease organisms.
3. Application of fertilizers with the specific formulation dependent on the nutrient profile of the soil and other soil characteristics. It has been found that, while 62% of
farmers fertilize their groves, the majority of them fertilize haphazardly and inadequately with resultant low impact on yield.

4. Regular tree management and maintenance activities for high yield and sustained production. All trees must be cleaned removing birdvine, epiphytes, ants, termites and dead and decaying branches at the end of harvest and before they begin to flush.

5. Competitiveness of orange production

5.1. Methodology used in this study

This assessment of the competitiveness and comparative advantage of orange production utilized a methodology that comprised of understanding the production and marketing systems by combining the information from knowledgeable persons operating in the field (researchers, extension personnel, and personnel from the processing industry) with information sourced from prior studies of this commodity system. The major prior study used in this work was completed by staff of the Ministry of Agriculture comprising Hyacinth-Ash; Davidson; Carter, Yearwood, Baksh, and Clarke, with support from the FAO consultant Jacque. This study was completed in 2003. Cost of production data and the social prices were obtained from this 2003 study.

A subsequent aspect of the methodology comprised of data collection and analysis to determine the competitiveness and comparative advantage of citrus production at the farm gate level. The analysis of competitiveness and comparative advantage is conducted utilizing the framework of the policy analysis matrix (PAM) that allows the estimation of indicators of policy effects, competitiveness and comparative advantage (see Annex I).

5.2. Policy Analysis Matrix and indicators for orange production

The assessment of the competitiveness and comparative advantage of orange production at farm gate level was undertaken using cost of production data from which was assembled two policy analysis matrices (PAMs) with a set of derived indicators.

Table 3 provides information on the revenues and costs used in constructing the PAMs and calculating the measures of policy effects and comparative advantage.

The revenue and cost for orange production were calculated on a per hectare basis. The farm-gate was used as the location for comparing the market and efficiency prices for the commodity (oranges) evaluated in this study. For the purposes of this study, the farm-gate is regarded as being located in the central part of the country and therefore this is reflected in the adjustments to transport charges.

Data is presented in terms of revenue, costs and profits for an average year in the life of the orchards. It was assumed that trees/orchards have a fifteen-year life of which the first five are considered as an establishment phase (no yields but investment and operational costs) and the last ten as a productive phase giving commercial yields and having operational costs. In order to present information on the average year, costs incurred in the establishment phase are treated as a loan at 10% interest with interest capitalized during the establishment phase and repayment during the ten-year productive life of the tree/orchard. Private Revenue is calculated based on the assumption that 50% of the harvest is sold on the fresh fruit market at a price of TT$1.30 per kg and 50% to the processing plant at a price of TT$0.65 per kg. This 50/50 split is the market distribution position for the total output in the country. Of course there are several (in particular small) farms that sell 100% of output on the fresh fruit market.

The social revenue for fresh orange fruits (the output of farms) was calculated as a derived value from the import of concentrate juice. Fresh orange fruits are not imported into Trinidad and Tobago due to plant quarantine restrictions. Therefore the social price of fresh oranges was calculated from the CIF (cost insurance freight) price of concentrate orange juice, which is imported into the country. The price of oranges was calculated at TT$0.66 per kg at the factory gate given this social calculation of the import parity price.
The orchard modeled in this study uses a spacing of 18ft. x 18ft. which is equivalent to 130 plants per acre. However at the planting stage 150 plants are required per acre to cater for plants that die. 1 box of fruit weighs 40 kg. National Average Yield is 1.5 boxes per tree; Returns per box is $26 (at the factory) which is equivalent to $0.65 per kg; It is assumed that 50% of production is sold to the factory and the other 50% is sold on the fresh fruit market at double the factory price; Transport cost from roadway to factory/market is $3.00 per box.

Table 3. Revenue and Cost of Production Data (TT$ per Hectare) Used in Constructing the PAM for Orange Production in T&T

<table>
<thead>
<tr>
<th>Items</th>
<th>Budget-Full Costs</th>
<th>Budget -- Establishment Costs Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private Price</td>
<td>Social Price</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>11,564</td>
<td>8,162</td>
</tr>
<tr>
<td>Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Preparation</td>
<td>3,095</td>
<td>3,924</td>
</tr>
<tr>
<td>Planting Materials</td>
<td>872</td>
<td>1,457</td>
</tr>
<tr>
<td>Tree Management cost</td>
<td>1,201</td>
<td>1,439</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>753</td>
<td>648</td>
</tr>
<tr>
<td>Weed Control</td>
<td>2,017</td>
<td>2,644</td>
</tr>
<tr>
<td>Pest and Disease</td>
<td>1,131</td>
<td>984</td>
</tr>
<tr>
<td>Harvesting</td>
<td>1,686</td>
<td>1,310</td>
</tr>
<tr>
<td>Labour for application of fertilizer</td>
<td>162</td>
<td>185</td>
</tr>
<tr>
<td>Land</td>
<td>1,345</td>
<td>1,293</td>
</tr>
<tr>
<td>Equipment</td>
<td>1,443</td>
<td>1,218</td>
</tr>
<tr>
<td>Total cost</td>
<td>13,705</td>
<td>15,103</td>
</tr>
<tr>
<td>Profits</td>
<td>(2,141)</td>
<td>(6,941)</td>
</tr>
</tbody>
</table>

The two PAMs (Table 4) differ in that the first considers the full cost of orange production while the second considers the scenario of production that does not take account of the costs of establishment. Table 5 provides some indicators derived from the two PAMs. It was expected that differences between these two scenarios would help to explain observations of declining production, hectarage under cultivation and increasing age of trees.

The results indicate that orange production is not competitive (profitable) when full costs are considered (-$2,141 private profit is realised). However, production is competitive when establishment costs are excluded (+ $5,981 private profit is achieved). This suggests that farmers are acting rationally by not planting new groves and instead simply managing and harvesting existing trees.

The NPC of 142 suggests that current policies affecting the output market (orange fruits) favour producers, since they obtain a price on the output that is 42% higher than what would prevail in a free trade scenario. The EPC greater than 1 (1.62 for full costs and 1.48 for exclusion of establishment costs) indicates that the combined effect of policies in the output and the tradable input markets substantially protect farmers (i.e., by 62% and 48% respectively on value added). The PSE greater than zero (42% for full cost and 27% for exclusion of establishment costs) indicates that trade and domestic policies on net contribute positively (42% and 27% respectively) to farm incomes. The negative social profits and DRC of 2.47 for full cost production indicates that orange production lacks comparative advantage and
therefore would be unable to compete against fresh fruit imports (when all costs included). However, the positive profitability and DRC of 0.57 (for orange production that does not include the costs of establishment) suggests that the impact of imports may exaggerate the trend towards simply harvesting trees until death.

Table 4. Policy Analysis Matrix for orange production (value in TTS)

<table>
<thead>
<tr>
<th></th>
<th>PAM- Full Costs</th>
<th></th>
<th>PAM -- Establishment Costs Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue</td>
<td>Tradable</td>
<td>Non- Tradable</td>
</tr>
<tr>
<td>Private Prices</td>
<td>11,564</td>
<td>3,664</td>
<td>10,042</td>
</tr>
<tr>
<td>Social Prices</td>
<td>8,162</td>
<td>3,271</td>
<td>11,832</td>
</tr>
<tr>
<td>Divergences</td>
<td>3,402</td>
<td>393</td>
<td>(1,791)</td>
</tr>
</tbody>
</table>

Note: since orange fruits are not imported into T&T, world price was obtained by using the adjusted converted price for orange juice imported from Belize.

Table 5. Indicators of Policy Effects and Comparative Advantage for Oranges (% or TTS)

<table>
<thead>
<tr>
<th>Indicators</th>
<th>PAM - Full Costs</th>
<th>PAM - Establishment Costs Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Protection Coefficient (NPC)</td>
<td>1.42</td>
<td>1.42</td>
</tr>
<tr>
<td>Effective Protection Coefficient (EPC)</td>
<td>1.62</td>
<td>1.48</td>
</tr>
<tr>
<td>Private Profits</td>
<td>-$2,141</td>
<td>$5,981</td>
</tr>
<tr>
<td>Producer Subsidy Equivalent (PSE)</td>
<td>0.42</td>
<td>0.27</td>
</tr>
<tr>
<td>Domestic Resource Cost (DRC)</td>
<td>2.42</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Note: since orange fruits are not imported into T&T, world price was obtained by using the adjusted converted price for orange juice imported from Belize.

6. Conclusions and recommendations

The existing policy regime provides producers with restrictions on the importation of fresh fruits and juice products and subsidies given in the establishment phase of the crop. Even under such favourable policy regimes production and hectarage under cultivation is declining. This study has identified that farmers are acting rationally since under the current conditions it is not profitable to establish new grooves (requiring significant investments and a 5-year delay on returns). Profitability is achieved by managing and harvesting existing trees.

The results suggest that orange production will further decline and disappear if the existing trade-related protection and subsidies are reduced or removed. On the contrary, the recommendations for building a competitive citrus sector would include:

- Reinforcing support to farmers to reduce costs in the establishment phase of the crop and encourage planting of new grooves. This may be accomplished with enhanced subsidies and concessionary financing.
- Improving productivity to enable higher levels of profitability per hectare and thereby higher levels of earnings for farmers. This requires significant input from the research, extension and plant protection services and more effective husbandry and management techniques, farmer support services and resolutions to praedial larceny and pest and disease constraints. Increased yields also will
require increased farm sizes to enable productivity enhancing methodologies. Increasing productivity and farm size would also strengthen the position of the orange industry for increased trade liberalization from 2006 by way of the FTAA.

- improving post-harvesting practices, marketing practices and vertical coordination with the retail sector could help build entry-barriers capable to shield domestic production for the fresh market once the ban on import should be removed and the FTAA is operational.

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Annex I

The Policy Analysis Matrix (PAM)

Simply defined a policy analysis matrix is a tool that allows us to examine the impact of policy by constructing two enterprise budgets—one valued at market prices, the other valued at social prices. The impact of policy is then assessed as the divergence between the private and social values. The PAM, once assembled, provides a convenient method of calculating the measures of policy effects and the measures of competitiveness and comparative advantage.

The enterprise budgets used to construct the PAM comprise revenue and cost data for the production and marketing of a specific commodity. The PAM uses two accounting identities. One accounting identity calculates profit as the difference between revenues and cost. The other accounting identity calculates the value of the divergence (distortion) induced by policy as the difference between social and market values.

The PAM (see Table A1) is a matrix comprised of columns and rows. This structure allows the two accounting identities to be easily laid out and therefore the profits and divergences to be easily calculated. The first column in the PAM records data on revenue. The next two columns separate the cost items into tradable and non-tradable components. In each column value is a product of the quantity and the price. Thus, in constructing the PAM intermediate inputs such as seeds, fertilizers, pesticides, and transportation are separated into tradable and non-tradable components. The final column is calculated as a result of the following identity, viz., Profits = Total Revenue - Total Costs. Thus, the final column of the PAM measures profitability as the difference between revenues and costs.

The first two rows of the PAM value the revenues and costs (and thereby the profits) using different valuation methods. The first row of the PAM values the revenues and costs using market prices. The effects of policies (distortions) are captured in the market prices. The second row of the PAM values the revenues and costs using social prices. Social prices are the efficiency prices, thus these represent values that are devoid of policy-induced distortions. The final row in the table enforces the second identity used in the PAM, viz., Distortion = Market Price - Social Price. Thus, the third row calculates the distortion (or divergence) in revenues, costs, and profits.

Table A1. The Policy Analysis Matrix

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross revenue</td>
<td>Tradable Inputs</td>
</tr>
<tr>
<td><strong>Budget at: Market prices</strong></td>
<td></td>
</tr>
<tr>
<td>A = $P_{id}$ * $Q_i$</td>
<td>B = $P_{jd}$ * $Q_j$</td>
</tr>
<tr>
<td><strong>Budget at: Social Prices</strong></td>
<td></td>
</tr>
<tr>
<td>E = $P_{ib}$ * $Q_i$</td>
<td>F = $P_{jb}$ * $Q_j$</td>
</tr>
<tr>
<td><strong>Divergences</strong></td>
<td>I</td>
</tr>
</tbody>
</table>

Where:

- $P_{id}$ = domestic price of output i
- $P_{jd}$ = domestic price of tradable input j
- $P_{ib}$ = border price of output i
- $P_{jb}$ = border price of tradable input j
- $P_{nd}$ = market price of non-tradable input n
- $P_{ns}$ = shadow price of tradable input n
- $Q_i$ = quantity of output
- $Q_j$ = quantity of tradable input.
- $Q_n$ = quantity of non-tradable input.
We can see, from Table A1, that the PAM provides a visually appealing way of capturing and presenting the data on divergences and the profits, which can be labelled as follows:

- **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 Transfers:** \( L = D - H; \) or \( L = I - J - K \)

The measures of policy effects, competitiveness and comparative advantage can be easily calculated from the PAM as follows:

- **Nominal Coefficient Protection (NPC)** = \( A/E \)
- **Effective Coefficient Protection (EPC)** = \( (A-B)/(E-F) \)
- **Producer Subsidy Equivalent (PSE)** = \( (L/A) \)
- **Private Profits** = \( D = (A - B - C) \)
- **Social Profits** = \( H = (E - F - G) \)
- **Domestic Resource Cost Ratio (DRC)** = \( G/(E-F) \)

The major limitation of the indicators (NPC, EPC, PSE, DRC) and the PAM is that they typically use fixed input-output coefficients. As a result, the indicators or the PAM cannot indicate producer or consumer responses to policy changes that reduce distortion.