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Title: Competitiveness of Cocoa Production Systems in Trinidad and Tobago

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COMPETITIVENESS OF COCOA PRODUCTION SYSTEMS IN TRINIDAD AND TOBAGO

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ABSTRACT

Trinidad and Tobago produces a fine flavour cocoa that attracts a premium price on the international market. The country has a long and distinguished record in agronomy and production of cocoa and is home to the Cocoa Research Unit, which attracts international notice and funding. However, cocoa production has been on a steady decline over the past few decades. The objective of this study is to assess the competitiveness and comparative advantage of cocoa production in Trinidad and Tobago and to understand the reasons for decline in output within the context of competitiveness. The analyses were conducted over three cocoa production systems – small farm traditional, large farm traditional, and large farm intensive cultivation. The methodology involved data collection and use of the framework of the Policy Analysis Matrix (PAM) to assess competitiveness and comparative advantage. The results indicate that all production systems are profitable, internationally competitive and have comparative advantage. However, the traditional small-farm production system has the least profitability, competitiveness and comparative advantage. The results suggest that the low levels of profitability per hectare for the small farms may underlie the declining area and output.

Keywords: Cocoa Production decline, Trinidad, Tobago, Policy Analysis Matrix

1.0 INTRODUCTION

Cocoa is an important agricultural commodity in the world economy. World production is in excess of 3 million tonnes with exports of the beans and semi-processed products valued at more than US $5 billion. The bulk of output is concentrated in West Africa (approximately 70%), Asia (17%) and Central and South America (13%). In fact, eight countries, of which 4 are in Africa, are responsible for 90% of world production. Although cocoa is largely produced in developing countries, it is mostly consumed in developed countries, with the USA, Germany, France and the UK leading. Thus, cocoa is a highly traded crop with heavy dependence on its contribution to economic and rural development in the developing countries, and heavy preference among consumers in the developed countries.

The Caribbean is held in high regard as a cocoa-producing region because most countries produce a fine or aromatic (against bulk) cocoa. Fine flavour cocoa accounts for only 5% of world production and is concentrated in a few countries. The International Cocoa Agreement, 1993, recognizes 17 countries as producers of fine flavour cocoa. Of these, eight (8) are classified as exclusive producers. These eight (8) include seven countries of the Caribbean Community (CARICOM) - Dominica, Grenada, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

There is a high demand for fine flavour cocoa beans. Due to the high quality flavour characteristics these beans are used to provide specific flavour or colour distinctions in fine chocolates in the European and US markets. Fine flavour cocoa beans from Trinidad and Tobago and other Caribbean islands, command a premium price on the international market.
Trinidad and Tobago has the advantage of being a leading center of cocoa germplasm research.

The range of cocoa material assembled in Trinidad is recognised as the most valuable collection in the world and is known as the International Cocoa Genebank, Trinidad (ICG,T). This collection is under the care of the Cocoa Research Unit (CRU), based at the St. Augustine campus of the University of the West Indies. The CRU is internationally recognized and attracts international funding. The ICG,T has well over 2000 accessions. The cocoa germplasm available in Trinidad and Tobago has the potential to produce yields of over 1500 kg/ha of flavour cocoa beans[1]

Despite these natural advantages, the cocoa industry in Trinidad and Tobago has been in decline. Production in 1979 was 2.6 million kgs; in 1989 it was 1.5 million kgs; and in 1999 it was 1.2 million kgs. In 1930 there was 81,000 hectares under cocoa. By 1982, area under cultivation had decreased 74% to 20,953 hectares.

Agricultural policy explains this decline as due to Dutch Disease effects consequent on a booming and dominant hydro-carbon sector. As a point of reference, in 2005 the hydrocarbon sector contributed an estimated 40.5% of Gross Domestic Product (GDP) compared to 0.7% for the agriculture sector[2]. Agricultural policy makes note of the changing global trade environment, but cocoa is an export crop little affected by trade liberalization.

The objectives of agricultural strategy in Trinidad and Tobago are to increase farm incomes and create a more modern and internationally competitive agricultural sector. Cocoa is regarded as a key commodity in the strategy.

The objectives of this study are to assess the competitiveness and comparative advantage of cocoa production in Trinidad and Tobago and to offer an explanation for declining production. The study will examine 3 different cocoa production systems with a view to providing recommendations for further increasing the competitiveness and comparative advantage of this commodity.

[1] Tahal Consulting Engineers Ltd. and Agrocon Ltd. Basic Agricultural Studies: Final Report. Ministry of Agriculture Land and Marine Resources. 1992.

[2] Source: Central Statistical Office

2.0 COCOA CULTIVATION IN TRINIDAD AND TOBAGO

Two basic planting systems for cocoa cultivation in Trinidad and Tobago can be distinguished – low density inter-planted cultivation and high density pure stand cocoa cultivation. The low density cultivation used on the early cocoa estates had planting distances of 3.6m by 3.6m (12 feet x 12 feet) with shade trees such as Immortelle interspersed in a 20m x 20m spacing pattern. Today on small farms it is more common to find the cocoa at even wider spacing, still interspersed with shade trees, but also inter-cropped with bananas and a range of trees such as citrus, coffee, timber, mango, breadfruit and peewah. The high-density planting system uses a spacing of 1.8m x1.8m (6 feet x 6 feet) with cocoa in pure stand cultivation.

Small farmers utilize the large-spacing, inter-planted system and apply few if any purchased inputs. Small farmers place great emphasis on the companion crops, commonly bananas. Large farmers utilize better and improved agronomic practices (to small farmers). Large farmers tend to place less emphasis on companion cropping and efforts are concentrated on the productivity of the cocoa trees. Where intercropping is practiced, banana is the preferred choice. In this system, hired labour is generally used for all activities. Newer establishments concentrate on closer spacing technology (>1500 plants/ha). In the close spacing system field sanitation is emphasized with routine tree maintenance consisting of pruning, fertilizing, shade and drainage maintenance. Cultural practices contribute to lower incidence of the Blackpod disease and additional fungicidal sprays are applied.

Barker (2001) following a rapid rural appraisal of cocoa growing areas in Trinidad, reported that of a sample of 123 cocoa farmers only 3 were involved in pure stand cocoa cultivation. Of the remainder, 12% grew cocoa intercropped with coffee and bananas; 8% grew cocoa intercropped with coffee and citrus, while the majority cultivated cocoa in combination with an array of other crops. Barker (2001) identified 43 different combinations of cocoa with other crops.

Cocoa yields are greatly affected by plant densities and the age of trees. The Report on the Cocoa and Coffee Industry Board (CCIB) Needs Assessment (Texas A&M, 2000*),* noted that average yields in the Central, Eastern and

Northern regions of Trinidad were 178 kilograms per hectare (kg/ha), 370 kg/ha, and 170 kg/ha respectively on farm sizes that ranged from 1.6 – 16.2 hectares in the Central region, 1.0 – 30.4 hectares in the Eastern region, and 0.8 – 16.2 ha in the Southern region. Karima (1999)[3] reported that 20% of the trees were over 25 years old and 20% between 7 and 25 years old. Barker (2001) further reported that 20% of the trees were over 50 years old and 8% between 41 and 50 years old.

Most small farmers obtain yields of less than 500 kg /ha, with the majority revolving around 200 kg/ha. The plant population used by these farmers range from 770 to 1100 plants/hectare (spacing of 3m x 3m and 3.6m x 3.6m). Under better management, this plant population can provide yields of 600 to 1200 kilograms/hectare (kg/ha). Large farmers with these plant populations generally obtain yields between 600 to 1,000 kg/ha due to better management. One large farmer in East Trinidad with plant population of 3,000 plants/ha (1.8m x 1.8m spacing) obtains around 2,000 kg/ha. The close spacing technology fully supports this high yield situation.

A wide gap exists between achieved yields and potential yield. Many small to medium farmers realize at most 25-30% of yield potential. Large farmers achieve around 45% productivity. The yield potential of cocoa can be exploited through the use of improved varieties, optimum plant population and improved management practices (Maharaj, 2005). The Trinidad Selected Hybrid (TSH) varieties namely TSH; 919, 1076, 1095, 1102, 1220 and 1188, which are widely supplied for planting can yield over 1500 kg/ha under optimum management given its large bean size of 1.0 g and large number of beans per pod (40-50).

There are other characteristics associated with cocoa production systems, the most outstanding of which is the age of farmers. The majority of cocoa farmers are old. Barker (2001) indicates that the largest percentage of farmers - 45%, were over 65 years of age, followed by 20% between 56 to 65 years. Annual incomes are not high. Barker (2001), reported that 20% of the farmers surveyed had gross annual incomes of $20,000 - $50,000, while 30% had incomes of $20,000 or less. Over 73% of the farmers in the Barker (2001) study expressed willingness to invest in rehabilitating their cocoa fields.

Farm Size Distribution

The 1982 Agricultural Census estimated 20,953 hectares under cocoa on 5,724 farms. Of the 5,724 farms, 85% were found to be less than 5 hectares and occupying 44% of the land utilized for cocoa cultivation. It is estimated that these smaller farms account for more than 70% of production. *Barker (2001)* [4] reports that of 123 farms surveyed 6 were larger than 20 ha and 104 were under 1 ha. Figures 1 and 2 provide information on the distribution of farms by farm-size categories and the distribution of land among farm-size categories. Farms over 50 hectares in area are classified as large, 5-50 hectares as medium and under 5 hectares as small.

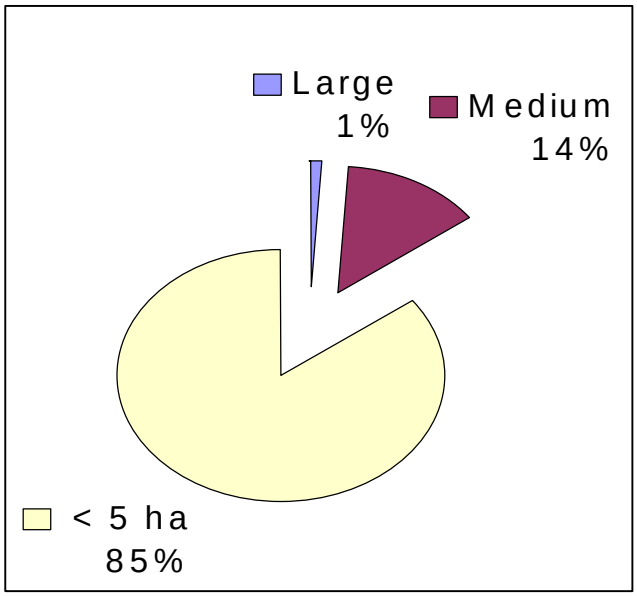
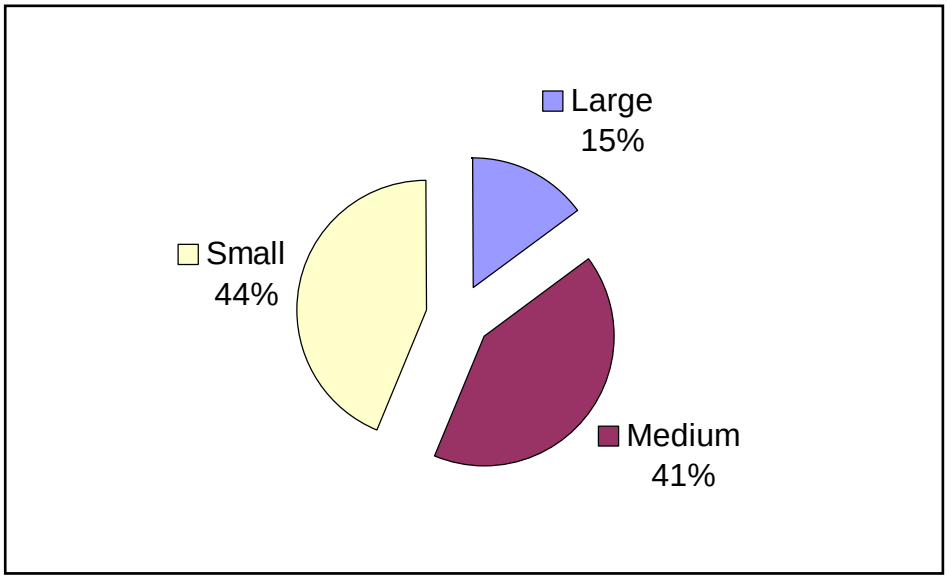


Figure 1: Distribution of Farms by Farm-Size Categories

[3] Karimu, A. Abdul. 1999. Farmers' Perception of Cocoa Planting Material In Trinidad and Factors Affecting Output from Cocoa Estates. Unpublished. Cocoa Research Unit, UWI, St. Augustine.

[4] Barker, St.Clair P. Report of a Field Survey Among cocoa Farmers in Trinidad. Ministry of Agricuture, Land and Marine Resources. 2001.



Source: CSO, 1986

Figure 2: Distribution of Cocoa Land Among Farm-Size Categories

Pricing Mechanism

The Pricing Mechanism for cocoa is comprised of an interim price and a cess. The interim price is set by the Cocoa and Coffee Industry Board (CCIB) and paid to farmers immediately upon delivery to CCIB or upon sale to the buying agents. The cess is paid out to farmers at the end of the crop year. Together, the interim price and the cess, forms government's guaranteed price. If the price received in the international market is more than sufficient to cover all of CCIB's costs of marketing, the farmer may receive a bonus payment however this has not been in effect for the past two decades[5]. The current guaranteed price paid to cocoa farmers is $14.00 and $8.40 per kg for plantation and estate grade respectively.

3. DATA COLLECTION AND METHODOLOGY

The farm-gate was used as the location for comparing the market and efficiency prices for the commodities 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.

Cost of production and marketing data are required for use in the Policy Analysis Matrix to allow calculation of the indicators of policy effects, competitiveness and comparative advantage. Cost of production and marketing data for the three farming systems were assembled and compiled into a study report in 2003 by a team comprised of staff of the Ministry of Agriculture, Land and Marine Resources. The Members of the team were: Neptune, Lueandra; Gaynell Andrews; Peggy Baptiste; Roma Collymore; Kamaldeo Maharaj; Elbert Johnson; Merle Seedial–Ramjit; Andrew Jacque. The team collected data on CIF prices and the applicable landing and transport charges for tradable items, such as fertilisers and insecticides from the Customs and Excise Division, Customs brokers, farmers, and importers and wholesalers. Information on the world market price for fine flavoured cocoa was obtained from the CCIB. It was assumed that the floating exchange rate was correctly priced. Data for calculating the efficiency prices of non-tradable items, such as labour and transportation, were obtained from farmers and statistics of the Central Statistical Office (CSO).

[5] CCIB officials indicated that attempts are being made to treat with this anomaly

This study benefits tremendously from the work of the 2003 study team.

The analyses were conducted within the framework of the Policy Analysis Matrix (PAM). The PAM utilizes cost of production and revenue data to construct 2 budgets, one valued in private/market prices and the other valued in economic prices. Differences between values in the market/private priced budget and the economic priced budget provide an estimate of the effects of policy on the price of items. The PAM allows for calculation of the indicators of policy effects, competitiveness and comparative advantage. Indicators of the effects of policies on the farm system include the Nominal Protection Coefficient (NPC), the Effective Protection Coefficient (EPC) and the Producer Subsidy Equivalent (PSE). The NPC measures the impact of policies on output prices. The EPC measures the effects of policies on valued added; the PSE measures the net contribution of policies to farm revenues. Private profit is the indicator of international competitiveness while economic profits and the domestic resource cost (DRC) is a measure of comparative advantage.

This study examined three cocoa production systems in use in Trinidad and Tobago – (i) small farmer, (ii) large farmer, and (iii) intensive.

In the case of the small farms, this study used an average yield of 200 kgs/ha and assumed that cocoa trees were 15 years old and therefore zero for the repayment of establishment costs. The production system involved cocoa inter-planted with bananas, which comprised of 190 banana stools per hectare producing190 bunches of bananas per year at an average weight of 10.5 kgs per bunch. On the cost side estimations of labour costs include compensation to farmers for family and own labour. In the small farm production system under study farmers do not apply fertilisers or chemicals. Farmers sell the cocoa beans to the CCIB, which then exports. In converting to social prices a number of adjustments were made to revenues and the production and marketing costs in this small farm production system. On the revenue side, farmers receive a guaranteed price of TT$12 per kg for Grade I cocoa. The social price was calculated as the world price for fine flavour cocoa, i.e., TT$16.63/kg (2003, CCIB), less $2.59 for transport, handling and commissions. Thus, the social price for cocoa beans is calculated as TT$14.04 per kg. The social price for bananas is equal to the private price of $.88 since duties are not levied on imports and there are no distortions in the output market.

The production system on most large farms is similar to that found on small farms, but these farmers apply purchased inputs, such as fertilisers and fungicides, use hired labour and carry out improved agronomic practices. The analyses of the large farm uses an average yield of 400 kg/ha of cocoa from a 3.6m x 3.6m planted system (plant density of 761 trees/ha). It is assumed that the cocoa trees are 15 years old and therefore establishment costs are not factored into the calculation of farm profit. Intercropping is with mainly the Gros Michel variety of bananas. Labour costs include farmer, family labour and hired labour. The calculations assume 190 banana stools would produce 190 bunches of bananas per year at an average weight of 15 kgs. Farmers sell bananas for $1.10 per kg at the farm gate. This analysis assumes that the large farm is a private exporter undertaking international sales and delivery to the market in Europe. Private exporters obtain a price of US$3000 per tonne for cocoa beans (which is equivalent to TT $18.90/kg) in the foreign market. The costs (transport, handling and commission costs) of delivering the cocoa to the foreign market are estimated at $0.81 per kg. Thus, the farm gate price received by farmers who export is TT$18.09 per kg.

The intensive production system involves pure stand cocoa planted at close spaces (6 feet x 6 feet or 1.97m x1.97m). Plant density in this system is 3000 trees per hectare. The plants are not planted with shade trees. There is relatively high use of purchased inputs of fertilisers and fungicides and hired labour. The intensive system is high input-high output. The cost of production data used in this analysis is based on an average yield of 1800 kg/ha of cocoa from 10-year old cocoa trees. Production levels will peak at 2200 kgs per hectare (ha) by year 12. Establishment costs are treated as a loan, which is amortised and repaid over fifteen years with the annual payment value being included in the cost of production table. It is assumed that these farmers are private exporters who obtain a price of US$3000/tonne for cocoa beans in the foreign market. The costs (transport, handling and commission costs) of delivering the cocoa to the foreign market are estimated at $0.88 per kg. Thus, the farm gate price received by farmers who export is TT$18.02 per kg.

In all three production systems calculations of the social price of unskilled labour had a value of TT$70 per man-day, which is equal to the wage in the construction sector less the cost of transportation and lunch. The wage rate in cocoa production is $50 per man day (i.e., the private price) except for pruning where it is $60 per man day; (ii) the social price for transport was obtained by applying a conversion factor of 0.915. This conversion factor is calculated and used in the Maxwell Stamp Study; and (iii) the social price of land is regarded as the rental rate for land, which is $250 per ha. Social pricing of tradables started with the C.I.F price and includes a 20% marketing margin. Conversion Factors from the Maxwell Stamp Study were used in the social pricing of transport costs (0.915), vehicle and machinery maintenance (0.925) and fuel and power costs (1.00).

4. RESULTS

The policy analysis matrices for the three production systems are provided in Tables 1, 2 and 3. Table 4 presents the indicators of policy effects, competitiveness and comparative advantage.

Table 1:Policy Analysis Matrix for the Small Farm Production System (TT$ per ha)

		Costs		
	Gross Revenue	**Traded**	**Non-Traded**	**Net Profit**
Budget at Market Prices	4,160.00	153.50	1,626.21	2,380.29
Budget at Economic Prices	4,568.00	150.65	2,300.10	2,117.25
Divergences	-408.00	2.85	-673.89	263.04

Table 2: Policy Analysis Matrix for the Large Farm Production System (TT$ per ha)

		Costs		
	Gross Revenue	**Traded**	**Non-Traded**	**Net Profit**
Budget at Market Prices	10,339.80	2,496.78	3,914.33	3,928.70
Budget at Economic Prices	10,339.80	2,095.52	4,819.56	3,424.72
Divergences	0.00	401.25	-905.23	503.97

Table 3: Policy Analysis Matrix for the Intensive Farm Production System (TT$/ha)

		Costs		
	Gross Revenue	**Traded**	**Non-Traded**	**Net Profit**
Budget at Market Prices	32,418.00	6,130.69	10,450.66	15,836.65
Budget at Economic Prices	32,418.00	5,976.93	12,442.62	13,998.45
Divergences	0.00	153.76	-1,991.96	1,838.20

Table 4: Indicators of Policy Effects and Comparative Advantage

Indicator	**Small Farm**	**Large Farm**	**6x6**
Nominal Protection Coefficient (NPC)	0.91	1.00	1.00
Effective Protection Coefficient (EPC)	0.91	0.95	0.99
Producer Subsidy Equivalent (PSE)	0.06	0.05	0.06
Private Profitability (TT$)	2,380.29	3,928.70	15,836.65
Social Profitability (TT$)	2,117.25	3,424.72	13,998.45
Domestic Resource Cost (DRC)	0.52	0.58	0.47

The results indicate that all three cocoa production systems are internationally competitive under the existing array of policies since private profits are positive in all cases. Private profits per hectare are lowest in the small farm system ($2,380.29) and highest in the 6'x6' system ($15,836.65). In all three systems, private profits are higher than economic profits, mainly as a result of the impact of the higher social price of labour.

The NPC of small farms is 0.91, indicating that farmers receive a payment for cocoa beans that is lower than what they could receive through direct sales to the international market. In effect policies in place on the output of cocoa beans produced by small farms did not favour farmers and in fact cause farmers to obtain 9% less revenue than would be the case without these policies in place. This penalty being borne by farmers result from the CCIB not passing on to farmers the full price it obtains on the international market. Farmers are paid the Government guaranteed price of $12.00 per kg. However, the CCIB obtains a higher price on the export sales. The NPC value for the large farm and 6'x 6' systems are equal to 1.0, indicating no difference between the private and social prices of the outputs.

The value of the EPC in the small farm system is equal to 1.0, while in the other 2 production systems it is less than 1.0. A value of less than 1.0 for the EPC indicates that farmers are receiving a lower value added with policies in place. The EPC of 0.95 indicates that farmers pay a slightly higher price for traded inputs than would be the case in an undistorted market. The EPC of 0.99 indicates that farmers in the large cocoa system face very little distortion in the purchase of traded inputs. This is in part due to bulk buying of fertiliser inputs from a local fertiliser blending company. In this instant, the cause is the taxes applied on imported inputs. The PSE provides an estimation of the value of the policy support received by farmers as a proportion of farm revenues. The PSE values indicate that 6% of farm revenues of the small farms and 6'x 6' farms and 5% of large farms are a consequence of policy effects. The positive PSE values are largely a consequence of the distortions in the labour markets that enable lower wages in the farm sector. However, it must be noted that this distortion in the national labour market is not easily under the influence of agricultural sector policies.

The positive social profits and DRC values of less than 1.0 indicate comparative advantage for all production systems. Simply stated, comparative advantage implies that the industry would be able to compete against imports if all policies were removed. Currently there is no importation of cocoa beans.

5. DISCUSSION AND RECOMMENDATIONS

There are some important considerations in coming to conclusions and recommendations for the production systems. In the small farm production system cocoa accounts for 58% of farm revenue; bananas account for the other 42%. Cocoa yields are low (200 kg per hectare) based on a system of production that does not use traded inputs. Profitability of $2,760 per hectare per year is low given the small size of these farms (5 or less hectares) with implications for farm income. Value-added (profits plus labour and other non-traded costs) of $4,160 per hectare is also low. Given a 5 hectare farm size the value added translates into annual values of $20,800 per year compared to per capita GDP of TT$55,00 per year. The level of profits and value-added would be even lower if establishment costs are taken into account. Establishment costs are estimated at $800 per hectare per year (amortised value of a loan repaid over 15 years at 12% interest). This low profitability may explain the decline of cocoa production, which is based largely on small farm production.

Cocoa production in Trinidad and Tobago is profitable, competitive and has comparative advantage. However, a major issue is the level of profitability for the small farm production system, given that annual income on a 5 ha farm is just 37% of the per-capita GDP for the country. The profitability of the small farms is affected by factors of productivity (caused in part by the age of trees and by poor agronomic management practices, including little use of fertilizers and other traded inputs). The profitability of small farms also is affected by the strategy of the CCIB, the state agency that undertakes international sales.

There are three obvious points brought to the fore, in respect of the CCIB. *First* is that the CCIB obtains a lower price on the international market than the private exporters with consequent effect on farm revenues. This disparity indicates that there is a need for the

CCIB to review and reassess its methods of negotiating on the international market. The *second* point is that the CCIB does not pass the entire world price it obtains to the farmers. The CCIB receives a world price of $16.63 per kg from which it deducts $2.59 in transport, handling and commissions leaving a net sum of $14.40. The CCIB passes $12.00, the government guaranteed price, to the farmers. *Third* the CCIB has a much larger payout for transport, handling and commission than the private exporters – compare the CCIB $2.59 to the private exporters $0.88. It should be noted that the price differential between the CCIB world price and private exporters world price is TT$3.60 per kg.

Replanting to reduce the age of trees and increase plant density per hectare is another major avenue for revival of the cocoa industry in Trinidad and Tobago. It is our view that providing incentives to farmers in the form of increased revenue (output price) should be a primary strategy for revitalisation of the cocoa industry. The small farm system has the lowest average yield per tree of 0.35, even with the same number of trees as the large system. It is recommended therefore that some form of incentive be offered to small farmers to adopt new and improved agronomic practices such as fertilising, and black pod disease control measures. More importantly, is a need for farmers to adopt the 6x6 production system, which would offer farmers with lower acreages to produce sufficient value-added to provide adequate farm family income.

It is noted that Trinidad and Tobago has a comparative advantage in the production of cocoa. This commodity therefore is a good earner of foreign exchange and it is recommended that expansion of the production base in cocoa be encouraged in addition to increased investment in the industry. Further recommendations of this study are for the CCIB to pass on to farmers the entire value of the price received on the international market. This would help encourage planting and re-planting efforts. Incentives for cocoa production should focus on improving productivity (e.g., improving public and farm infrastructure) reducing the establishment costs and efforts should be made to reduce input prices as could occur with the formation of cooperatives.

An additional area of recommendations is for farmers and the CCIB to pursue strategies to increase the prices and value-added received from cocoa. Better prices could be obtained from fair trade agreements or organic cocoa (of which already a substantial amount is produced). Farmers and the CCIB should explore the possibility of using some of the crop to produce high quality dark chocolates for sale locally to the tourist industry and in Europe.

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