



The Sugar Industry in Belize

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The Sugar Industry in Belize**Contents**

Chapter	page #
1 The International Sugar Industry and Markets	3
2 Overview of the Domestic Sugar Industry	12
2.1 History of Production	12
2.2 The Role of the Sugar Industry in the Economy of Belize	17
3 Sugarcane Farming	21
3.1 Distribution of Sugarcane licenses	22
3.2 The Economics of Cane farming	24
a: Costs of Production	24
b: Financing of Production	34
3.3 Non Sugar Occupations and Alternative Crops	37
3.4 Current Problems Areas in the Sugarcane Industry	39
4 Petrojam	45
5 Prospects for the Future of the Sugar Industry	51

List of Tables

Table #		page #
1	World Market Sugar Prices	54
2	World Production and Consumption of Sugar	55
3	US Sugar Quota Allocation	56
4	Belize Sugarcane Production	57
5	Belize Sugar and Molasses Production	58
6	Belize Sugar and Molasses Exports	59
7	Sugarcane Prices	60
8	Size Distribution of Licenses and Deliveries 1987	61
9	Sugarcane Production Costs: Replanting	62
10	Sugarcane Production Costs: Ratoon Cultivation	63
11	Sugarcane Production costs: Harvesting	64
12	Commercial Bank Lending for Sugarcane Farming	65
13	Development Finance Corporation Lending for Sugarcane Farming	66

The International Sugar Industry and Markets

International sugar markets are characterised by both a highly volatile world market in which prices are determined by the prevailing supply and demand conditions and a number of segmented national markets in which prices are administered with a variety of producer subsidies and import barriers. The latter include the markets of the largest sugar consuming countries and trading blocks in the world, including the EC, US, USSR, India, China and Japan.

The regulation and protection of some of the largest national sugar markets in the world has had a profound effect on the structure of world trade, production and prices. In particular, subsidies and protection have constrained world trade in sugar and have insulated often relatively high cost producers (mainly but not exclusively in the industrialised countries) from the steep fall in world market prices during the 1980s. This has served to restrict export opportunities for many developing country sugar producers and to depress prices on an often saturated free market.

Internationally traded sugar amounted to only 27% of world production in 1987. Of the 27.9 million tons of total world sugar exports in 1987 only around two thirds was traded on the free market. The remainder was exported under a variety

of bilateral and multilateral trading arrangements such as the EC's sugar protocol, the quota allocations of the US and the barter arrangements between the USSR and Cuba. Under these trading arrangements the importing countries pay on average higher than world market prices for limited volumes of sugar from specific countries, especially those with which the importing country has close economic, political or historical connections.

Two of the major regulated markets - those of the EC and the US - are of particular importance to the Belizean sugar industry. During 1989 Belize will sell approximately two thirds of its total sugar exports to these two markets, with the remaining third being sold on competitive world markets. The nature of the EC and US sugar markets are examined in more detail below.

The EC Sugar Market

The EC sugar market has been structured to protect the interests of domestic sugar producers, largely for political reasons, while at the same time providing some degree of support to sugar exporters in the African, Caribbean and Pacific (ACP) group of former colonies of the EC countries. Domestic producers and the ACP countries are given quotas to supply specific amounts of sugar for which they are paid a guaranteed price.

The EC consumed approximately 11.5 million raw tons of sugar per annum over the last five years, while EC farmers have produced on average 14.1 million raw tons (most but not all of which is produced under the quota system).¹ In addition the EC has imported 1.4 million raw tons per annum from the ACP countries. The surplus, which amounts to about 4 million raw tons per annum, must either be stored or exported to the world market.

Sugar prices within the EC are maintained by means of intervention purchases by the EC, variable levies imposed on all imports from non ACP countries which effectively exclude them from the EC market, and subsidised exports to the competitive world market of sugar which is surplus to EC domestic consumption. As a result EC sugar prices have been

1 One raw ton of sugar = 0.92 white tons.

maintained at between US\$0.16 and US\$0.22 per pound since 1979.² EC prices were more than three times the prevailing world market prices between 1984 and 1987, and despite the rise in the latter over the last two years, EC prices were still more than 50% higher than world market prices in 1989.

The ACP countries have had a combined quota allocation of 1.4 million raw tons since the 1982/83 crop season, with the quota allocation divided between 19 ACP countries. The largest allocations are those of Mauritius (37.6% of the total allocation), Fiji (12.7%), Guyana (12.3%), Jamaica (9.1%) and Swaziland (9.0%). Belize has a quota amounting to 43,900 raw tons (3.1% of the total ACP quota), which at the current level of EC sugar prices is worth almost \$40 million in export receipts. This is the single most important market for Belizean sugar exports, accounting for almost half of Belizean exports by volume and more than half by value.

² EC prices are determined in European Currency Units (ECUs). The US\$/ECU exchange rate therefore influences the EC price expressed in US\$ terms. The fall in the value of the US\$ between early 1985 and 1987 led to an increase in EC sugar prices expressed in US\$ terms.

The US Sugar Market

US output of sugar has been rising during the 1980s in response to a regime of farm price supports which has maintained domestic sugar prices at between US\$0.20 and US\$0.22 per pound since 1983. Imports have been regulated by means of quota allocations for individual countries. These quotas have been reduced by 57% since their inception in 1982. Import quotas were increased in 1988 and 1989 however because of a recovery in demand for sugar alongside the impact of drought on domestic production.

In the 1987/88 season US farmers produced 6.5 million tons of raw sugar while US domestic consumption amounted to 7.4 million tons. Although the US is still a net importer there has been a very strong trend towards reduced imports during the 1980s. Domestic production has risen by 1 million tons per annum since 1981/82 while consumption has fallen by a similar amount over this period. Domestic demand has been undermined by a switch in consumers' preferences towards artificial sweeteners and by the substitution of high fructose corn syrup for sugar in processed foods.³

The US imported 957,000 raw tons of sugar under quota in 1988, with the Ivory Coast, Dominican Republic and the

³ The share of sugar in total US consumption of calorific sweeteners fell from 74% in 1977 to 47% in 1986. (IMF, 1989 p47-48)

Phillipines having the largest individual quotas. Belize's quota in 1988 amounted to 10,000 raw tons (1% of the total quota allocation).⁴ In 1989 Belize was given a quota amounting to 11,000 tons.

The US quota regime has recently come under challenge at the General Agreement on Tariffs and Trade (GATT). Australia, a major sugar producer, has argued that the regime - by favouring domestic producers at the expense of importers - violates GATT provisions relating to quantitative import restrictions. Australia has also claimed that the reallocation of Guyana's sugar quota in 1988 to three other Caribbean producers, including Belize, was a further violation of GATT provisions which require that quotas be administered in a non discriminatory manner. GATT is currently considering the first issue but it appears likely that the US will not in future reallocate any shortfall in quota imports from a Caribbean country solely to other countries in the region.

⁴ Belize was actually able to export to the US over 14,000 tons under quota in 1988 because of the reallocation of Guyana's sugar quota to other Caribbean producers and a general increase in quotas as a result of the drought which cut US domestic production.

The Competitive World Market

Prices on the competitive world market fell sharply in 1981 and 1982 and remained depressed until 1987. From nearly 29 US cents per pound in 1980 prices fell to 4 US cents per pound in 1985 (table 1). The size of this market was reduced during this period from 22 million tons to 18 million tons per annum because of both the increased protectionism in some of the industrial markets and growing sugar production in many developing countries which has reduced their own demand for imports. In the last two years however prices have made a partial recovery, reaching nearly 13 US cents per pound in 1989 as a result of growing demand, particularly in Asia, and supply shortfalls in a number of major producers.

Free market prices tend to be sensitive to the ratio of the level of world sugar stocks to world consumption. A fall in stocks leads to expectations of shortages and of higher prices and this encourages buyers to accumulate inventories. This accumulation of inventories temporarily boosts demand and thus pushes up prices. Stocks declined from 32 million tons in 1982/83 to 21 million tons in 1987/88 because world consumption grew more rapidly than world production in this period. The former grew by 2.5% per annum while the latter grew by only 1% per annum. Stocks are forecast to remain at around the 21 million tons level in 1988/89.

Free market prices have tended to move in cycles lasting several years, with a short price boom being typically followed by a longer period of depressed prices. Production tends to increase under the stimulus of higher prices, but is much less flexible downwards when prices fall as a result of the excess supply created by the production increase. As a consequence prices remain depressed until rising consumption has caught up with production and cut into stocks. Any major supply shock is then liable to drive prices up sharply thus restarting the cycle.

Although prices have already doubled since 1987 it appears possible that in the short term prices may rise even higher. World consumption is again expected to exceed production in 1989. Higher prices witnessed in recent years are however almost certain to stimulate increased world production and possibly a slowdown in the rate of growth in world demand and this is likely to induce a prolonged period of lower prices. The short term price elasticity of world sugar supply may have risen in recent years because of the increase in beet production and the diverting of sugarcane supplies to the ethanol market. Moreover the increasing importance of the developing countries as buyers on world markets will have raised the price elasticity of demand for sugar imports. As a result it is unlikely that higher free market prices can be sustained for more than two or three years.

The extent to which Belize must sell sugar on the competitive world market depends upon the volume of domestic output and on the scope for quota sales to the US. Belize's dependence on the competitive world market had declined during the 1980s because of the fall in domestic production and the introduction of the US quota system, but sales will almost certainly increase in 1989. Approximately 26,000 tons are likely to be exported to the free market from Belize in 1989, slightly less than one third of Belize's total sugar exports. This volume could rise in future years if quota exports to the US are cut back. If Belizean exports to the competitive world market remain at a level of at least 26,000 tons per year, changes in free market prices will have a significant impact on the industry's export receipts. A fall in prices from 13 US cents per pound to 5 US cents per pound would cut sugar export receipts by \$9 million a year.

The Domestic Sugar Industry

History of Production

The sugar industry in Belize, which is situated in the northern lowland districts of Orange Walk and Corozal, became established on a commercial scale in the 1950s, and grew rapidly in the next two decades. Sugar was processed for export at the Libertad factory in Corozal district which had been built in 1937. The estimated acreage harvested expanded from 14,055 acres in 1960/61 to 29,590 acres in the 1970/71 season, while sugarcane harvested increased from 243,460 long tons in 1960/61 to 632,629 long tons in 1970/71.⁵

In 1967 a second sugar factory opened at Tower Hill in Orange Walk district, and with sugarcane production continuing to grow during the 1970s under the impetus of higher world prices, the factory was expanded in 1974 to meet the increased demand for grinding capacity. The estimated acreage harvested had increased to 60,000 acres in 1979/80 with 1,013,500 long tons of sugar being harvested and 103,300 long tons of sugar being produced (see tables 4 and 5). The cane yield per acre however began to decline after the 1972/73 season suggesting that more marginal land

5 CSO Abstract of Statistics 1970-72, p39

was being brought into production as the industry expanded.⁶ The higher prices of the 1970's encouraged farmers to mechanize some of their operations, but by the late 1970's problems were beginning to emerge in the industry.

Sugarcane production fell sharply in the 1978/79 season because of the spread of smut disease, a black fungus which severely reduces the size of the sugar cane stalks, and this was followed by a dramatic decline in world market sugar prices in both nominal and real terms. The New York price for Caribbean sugar fell from 28.67 US cents/pound in 1980 to 8.41 US cents/pound in 1982 (see table 1). Moreover between February 1980 and February 1983 domestic consumer prices increased by a third and commercial bank lending rates of interest often exceeded 20% per annum. As a result production costs were raised while producer prices fell. In May 1982 the US government imposed country quotas on sugar imports which reduced the amount of sugar which Belize could export to the US by more than half, although there was some consolation to the sugar industry in that the US was offering a guaranteed price for imports under the quota system which at the time was considerably higher than the prevailing world market price (although only about two thirds of the 1980 world market price).

⁶ Estimated yields per acre declined from an average of 21.2 tons during the 1969/70-1973/74 seasons to an average of 16.1 tons during the following five seasons, a decline of nearly 32%. (CSO Abstract of Statistics 1988 p55)

The combination of smut disease, falling real prices and high interest rates severely reduced the profitability of cane farming, and although the volume of cane production actually increased further in the early 1980s, it began to fall sharply after its peak of 1,131,986 long tons in the 1982/83 season. With farmers reluctant or unable to finance the replanting of cane fields both the acreage harvested and the yield per acre declined.

In early 1983 Tate and Lyle, which owned a majority shareholding in Belize Sugar Industries (BSI), announced a proposal to close the Libertad factory in an effort to stem losses by BSI of some \$2 million a year. The economic and social consequences of the closure of the Libertad factory prompted the government to appoint a ministerial task force (the Swift Committee) to examine possible alternatives to the closure. Tate and Lyle indicated that they would be willing to sell all or part of their stake in BSI and it was initially proposed that the Cane Farmers' Associations should purchase shares in the company. The farmers however were reluctant to take on further large financial commitments at a time when many were having to invest in the replanting of smut infected cane fields, and an agreement was eventually signed in 1985 under which a majority stake in BSI was sold to the company's employees, with minority stakes being held by Tate and Lyle, the government and the DFC. The transfer of ownership could not however prevent the closure of the Libertad factory after the 1984/5 crop

season, a move which reduced sugar processing capacity in Belize by around 25%, and consequently reduced the amount of cane which the farmers were allowed to sell to BSI under license.⁷

Belize's US sugar Quota, which had been initially set at 31,000 tons was reduced to 24,000 tons in 1985, and to 18,000 tons, spread over 14 months, in the following year. With world prices remaining depressed the average price per ton of cane paid to the farmers in the 1984/5 season fell below \$32, a level at which cane production was barely economically viable (see table 7 and part 3.2). Farmers were also experiencing difficulties in borrowing from the commercial banks during this period. Loans to sugar farmers from the banks fell by more than 50% in nominal terms between 1983 and 1985 (see table 12). The continuing economic difficulties faced by the farmers led to a steady disinvestment in sugarcane farming. Cane fields were not replanted and an estimated 10,000 acres were taken out of cultivation between 1983 and 1987. The production of sugarcane declined to 776,600 long tons in the 1987/8 crop season, the lowest level since 1976.

The decline in the output of the sugar industry was reversed in the 1988/89 season. Cane farmers delivered 867,267 long tons of cane to BSI from which 90,933 long tons of sugar

⁷ The current grinding capacity of the Tower hill factory is around 850,000 tons of cane per season.

were produced. Sugar production was 11.2% higher than in the previous crop season. A further 56,000 long tons was sold to Petrojam. The farmers produced around 923,000 long tons of cane, an increase of 19% on the previous crop. The most important reasons for the sugar industry's revival in 1988/89 are likely to have been the sustained increase in producer prices in recent years, the efforts of the Sugarcane Extension and Technical Support Service (SETSS) of BSI to encourage farmers to replant their fields with smut resistant varieties of cane and to generally improve cultivation practises, and possibly the greater availability of credit to the farmers from the commercial banks.

A combination of factors has significantly raised export earnings per unit of sugar, and consequently cane producer prices, since 1985. Producer prices in the 1987/88 season were 61% higher in nominal terms than in the 1984/85 season. Prices have risen mainly for two reasons. First, the reduction during the 1980's of Belize's total sugar exports has raised the proportion of the total which is sold under quota in the UK and US markets and thus increased the average price for the country's sugar exports. Second, world market prices for sugar have risen substantially since 1985 (see table 1). The rise in prices has given cane farmers the necessary financial incentive to undertake the rehabilitation of their cane fields and replanting with the smut resistant varieties, aided by the advice and technical

support offered by the SETSS.

The Role of the Sugar Industry in the Economy of Belize

The importance of the sugar industry to the economy of Belize lies in its contribution to export earnings and to employment and income generation in the northern districts.

Between 1980 and 1988 the total export earnings from sugar and molasses amounted to \$641.6 million, or 47.4% of the country's total merchandise export earnings. The decline of sugar production during the 1980s, together with the growth of the citrus, banana and garment industries, has however reduced the industry's relative importance as an export earner. Sugar and molasses exports amounted to 60.9% of total merchandise exports in 1980 but only 37.7% in 1988. Nevertheless the country still relies heavily on the industry to generate foreign exchange earnings and is likely to do so for many years to come.

Belize has a guaranteed market in the EC for 42,000 long tons of sugar which at current prices is worth almost \$40 million per annum, and a US sugar quota which is currently nearly 16,000 long tons and which is worth at least \$12 million per annum. This effectively sets a floor of about \$52 million under which, barring natural disasters, annual sugar export earnings are unlikely to fall.

Given the industry's present cane growing and milling capacity, sugar production at Tower Hill is likely to average between 82,000 long tons and 93,000 long tons per annum, which, once EC and US quota allocations and domestic consumption requirements have been met, will leave between 18,000 long tons and 29,000 long tons of sugar for sale on the world market. This would be worth between \$3 million and \$17 million given world market prices of between 4 US cents and 13 US cents per pound. In addition there are potential earnings of at least \$2 million per annum from the Petrojam project.

With EC and US quota sales, world market sales and earnings from the Petrojam project it would seem reasonable to assume that on average Belize will therefore be able to maintain export earnings of at least \$60 million, and probably nearer \$70 million from the sugar industry for the foreseeable future.

Since 1984 the non sugar exports of Belize have expanded in nominal terms by 53% or an average of 11.7% per annum. If this rate of increase is maintained over the next four years non sugar exports will amount to around \$183 million in 1992. On the assumption that nominal sugar earnings are maintained at around \$65 million, the sugar industry will still be providing over 26% of total merchandise export earnings in 1992. This percentage will be much higher if the expansion of the Petrojam project develops as planned or if

non sugar exports fail to increase at the rate achieved in the last four years.

As well as being the most important export earner in the Belizean economy the sugar industry also provides the main source of income for the population of the Orange Walk and Corozal districts. There were 4,905 farmers with licenses to supply cane to BSI in 1988. Although many of these farmers will engage in alternative non sugar income earning activities such as food crop farming or trade, especially during the rainy season, it is likely that for the majority of farmers sugar provides the major part of their income.

In addition to the farmers themselves there are an unknown number (but probably at least several hundred) of agricultural labourers who are hired by the farmers to cut and load the cane and assist in the replanting of fields. Slightly under 50% of these labourers are thought to be migrants from neighboring countries. Given that labourers in the industry can earn up to \$200 per week (which is significantly more than labourers can earn in most other sectors of the economy) and that the cane harvesting season lasts for 6 months of the year, it is likely that work in the sugar industry provides the bulk of the annual income of these workers.

There are a further 625 people employed on a full time basis by BSI and 28 full time and 90 seasonal workers currently

employed by Petrojam. The total number of people resident in Belize who are dependent on the sugar industry for all or a major part of their earnings is likely therefore to be between 5,500 and 6,000. Given an estimated population in the Corozal and Orange Walk districts of 60,000, of which (on the basis of national figures) about 50% are between 15 and 64 years old,⁸ the sugar industry provides an income for around 20% of the potential workforce of 30,000. The total number of people actually employed (including self employment) in the Corozal and Orange Walk districts however could be as low as 15,000. Paid female employment is very scarce in the Corozal and Orange Walk districts and male unemployment is also high, with possibly about 10% of the male workforce either unemployed or working outside the two northern districts. The sugar industry therefore probably provides an income for up to 50% of the actual workforce of the Corozal and Orange Walk districts, although sugar is not the only source of income for many of these people.

⁸ CSO Abstract of Statistics 1988, p5-6

Sugarcane Farming

Sugarcane in Belize is grown largely on small to medium sized farms with a mixture of self employed and hired labour.⁹ On most farms hired labour is required to assist with the cutting and loading of the cane during harvesting. The farmers require a license from the Belize Sugar Board to supply BSI with a specified amount of cane. The crop is resilient and reliable and will provide an annual yield for upwards of ten years after it has been planted. Most of the work and the expense of cane farming is incurred in harvesting the crop and transporting it to the sugar factory. Harvesting takes place in the dry season between November and June. The cane is difficult to harvest once the rainy season has begun because fields and roads become waterlogged. The cane is usually burnt to facilitate cutting. Replanting takes place on most farms towards the end of the dry season with fields being replanted once every five to ten years. The farmers receive 65% of the net stripped value of sugar and molasses from BSI as payment for the cane.

⁹ In some other developing countries sugarcane is grown on large farms and plantations, eg Cuba, Mauritius, Guyana.

Distribution of Sugarcane licences

Farmers receive licenses from the Belize Sugar Board allowing them to supply a specified tonnage to BSI. The quantity of sugar which individual farmers can supply varies considerably, with licenses ranging from under 100 tons to over 1,000 tons (see table 8). The majority of the farmers however are in effect small farmers (defined here as farmers with a license to supply not more than 200 tons of cane to BSI) whose earnings from sugar alone can barely be sufficient to support a family.

In 1987 2,528 farmers (51% of the total number of farmers with licenses in Belize) had licenses to supply up to 100 tons. These farmers supplied a total of 174,047 tons to BSI in the 1986/87 season (22% of the total output of the cane fields) at an average of 68.8 tons per farmer. Given the average land productivity of approximately 17 tons per acre in the cane fields as a whole, these farmers would have required on average around 4 acres each to produce this amount of cane.

A further 1,030 farmers (20.9% of the total) had licenses to supply between 100 tons and 200 tons in 1987. These farmers actually supplied 144,401 tons in the 1986/87 season (18.3% of the total cane output) at an average of 140 tons per farmer. Farmers with licenses of between 200 and 300 tons numbered 859 in 1987 (17.4% of the total) and they supplied

207,713 tons (26.3% of total cane output) in the 1986/87 season, at an average of 242 tons per farmer. The remaining 516 farmers (10% of the total) had licenses of over 300 tons and supplied 262,738 tons (33% of total cane output) in the 1986/87 season at an average of 509 tons per farmer.

The Economics of Cane farming

Production Costs

Estimates of the average production costs of cane farming are given in tables 9, 10 and 11. These estimates have been calculated by the SETSS of BSI. The costs are divided into three sections; replanting of cane fields, ratoon cultivation and harvesting. Replanting and ratoon cultivation costs are estimated on a per acre basis on the assumption that the farmer adopts the cultivation practises recommended by the SETSS. Harvesting costs are estimated on a per ton basis. Unless otherwise stated the estimates are made on the assumption that the farmers hire all mechanical equipment. The estimates include the imputed cost of labour, which is valued at \$20 per man per day (except in the case of harvesting where labour is paid per ton), and which may be provided by the farmer himself. To arrive at an estimate of total production costs per ton involves making assumptions about yield per acre and the frequency of sugarcane replanting.

Replanting

In order to maintain yields per acre sugarcane must be replanted at regular intervals. For maximum land productivity the fields should ideally be replanted every five years but this is not economic in Belizean conditions

and the SETSS recommends to farmers that they should replant every seven years. Many farmers however appear to replant at intervals of ten years or longer and this may partly explain the rather low average yield per acre of the cane fields as a whole.¹⁰ SETSS has also encouraged farmers to replant in order to replace the varieties of cane that are vulnerable to smut disease with smut resistant varieties.

Replanting involves land preparation, the purchase and planting of the seeds and the purchase and application of fertilizers and herbicides. The replanting is usually carried out towards the end of the harvesting season - between March and June - which will allow the cane to mature in time for harvesting in the following year. Land preparation becomes difficult once the rainy season has started because of the problems involved in moving mechanical equipment around waterlogged fields and roads.

A land preparation service for farmers is provided by the SETSS, which organises contractors to undertake ploughing with a bulldozer or crawler tractor, harrowing (light ploughing) and furrowing. SETSS technical staff supervise the land preparation. The contractor is paid by BSI which charges the farmer a standard fee. BSI aims to either break

¹⁰ On the assumption that 55,000 acres of cane was under cultivation during the 1988/89 season (Belize Sugar March 1989 p3) yield per acre amounted to 16.8 tons. The BSI SETSS estimates that the more efficient cane farmers should be able to achieve yields of at least 30 tons per acre and possibly as much as 40 tons per acre.

even or incur a small loss on the service. The SETSS service reduces the costs of land preparation to all but the largest farmers, primarily because the services are organised centrally and this enables the travelling time and costs involved in moving contractors' equipment between farms to be minimised. SETSS has organised land preparation for between 300 and 400 farmers on 1,200 acres in 1989, and estimates that replanting on an additional 5,000 acres was carried out privately by the farmers.¹¹ The farmers are charged \$90 per acre for ploughing, \$30 per pass per acre for harrowing (2 passes are usually necessary) and \$20 per acre for furrowing.

Farmers can purchase seeds for replanting either from SETSS or from other farmers. Seeds sufficient for one acre cost approximately \$75 with transport and cutting costs amounting to \$50. Unloading and planting the seeds, and fertilizing the fields requires around 2 man days of labour per acre - which assuming wage rates of \$20 per day - will cost about \$40 per acre. The fertilizer, generally purchased from the cane farmers' associations, costs \$130 per acre if applied in the recommended doses. Tine cultivation, which requires the use of a tractor, costs \$40 per acre.

The purchase of herbicide sufficient for one acre costs \$79

¹¹ Approximately 11% of the canefields were therefore replanted in 1989, a figure which suggests that the average time period between replanting is between eight and nine years.

and requires one man day of labour, valued at \$20, for application. Failure to use sufficient herbicide is likely to increase labour costs for weed control. Covering the cane seed and moulding entails an additional outlay of \$40 per acre.

The total cost per acre for replanting amounts to \$644, assuming that the farmer makes use of the land preparation service offered by SETSS. Farmers with a large area of land under cultivation may however be able to obtain land preparation for less than the cost estimated above, especially if they have their own equipment.

SETSS estimate that the cost of land preparation on a mechanised farm, excluding expenditure on equipment, roads and other overheads, amounts to about \$460 per acre. Maintaining the equipment and roads etc - capital which can also be used for other operations such as transporting the cane - is estimated to cost approximately \$210 per acre per year. This figure is however likely to vary from farm to farm depending on how well the capital stock is maintained and probably the size of the farm. There are presumably some economies of scale to be gained from the use of mechanical equipment which would reduce capital costs per acre on the largest farms.

Ratoon Cultivation

Ratoon cultivation is the cultivation required to maintain

the cane in the years between replanting. The cane actually requires very little work other than the application of fertilizer and pesticide. Ratoon cultivation requires fertilizer costing \$30 and herbicide costing about \$40 per acre per year. Labour costs for the application of the fertilizer and the herbicide are estimated at \$20. Froghopper control costs an additional \$2. Total costs of ratoon cultivation therefore amount to \$92 per acre.

Harvesting

Harvesting, which involves cutting the cane, loading it onto trailers or lorries and transporting it to the factory, forms the largest component of production costs. Depending on the yield of cane per acre and the distance of the canefields from the factory, harvesting costs are likely to amount to between 60% and 80% of total production costs.

Cutting and loading the cane is estimated to cost \$12 per ton. This figure is assumed to be invariant for all farms. Wages for skilled cutters, many of whom are migrant workers, can be as high as \$50 per day, although the hours of work are often long.

Transport costs vary depending on the distance to the factory. In the Orange Walk district transport costs are estimated at \$10 per ton of sugarcane for farms which are situated up to 15 miles from the Tower Hill factory and \$12 per ton for farms which are more than 15 miles from the

factory. In the Corozal district transport costs are estimated at \$12 per ton for the Buena Vista area and \$18 for the Consejo area. The average transport costs are therefore about \$13 per ton, with average costs of harvesting amounting to \$25 per ton.

For the mechanised farms the fuel and labour costs of transport are estimated to amount to an average of \$7 per ton. The maintenance cost of the lorries, tractors and trailers has already been included in the section on replanting above on the assumption that the same equipment can be used for both operations.

Total Production Costs

To arrive at an estimate of total production costs per ton it is necessary to make some assumptions concerning the length of time between replanting, and the cane yield per acre. Various examples are given below to illustrate the possible range in which production costs for most farmers in the cane fields are likely to lie.

A non mechanised farm replanting every seven years will incur an average cost for replanting and ratoon cultivation of \$170 per acre.¹² If the cane yield per acre is 20 tons the average cost per ton of replanting and ratoon cultivation will be \$8.5. If harvesting costs amount to an

¹² Replanting costs of \$644 * 1 acre + ratoon costs of \$91.5 * 6 acres = \$1193. \$1193/7 acres = \$170. \$170/20 = \$8.5/ton.

average of \$25 per ton total production costs will be \$33.5 per ton. Depending on the distance from the factory however total costs could be as low as \$30.5 or as high as \$38.5 per ton.

The estimate above includes all labour costs including the opportunity cost of the farmer's own labour. Farmers with smaller holdings will probably supply much of the labour for planting seed, fertilizer and herbicide application themselves. Assuming that the farmer can save \$100 per acre in wage costs for replanting and \$20 per acre in wage costs for ratoon cultivation (this would amount to about 16 man days of labour on a 10 acre farm) the monetised production costs of cane farming can be reduced by about \$1.5 per ton. It is unlikely that major savings in labour costs can be made in the harvesting operations because of both the amount of labour required to cut and load the cane and the very limited time frame available for this operation.¹³

If the non mechanised farm in the example above can increase its yield to 30 tons per acre the average cost per ton of replanting and ratoon cultivation will fall to \$5.7. Harvesting costs per ton however are not effected by the size of the yield, and given that these costs form the major

13 A farm with a yield of 100 tons, which is about the median farm yield in the canefields, would require 60 man days of labour for cutting and loading the cane. This operation would normally have to be completed within one/two days. Hired labour is therefore essential for this work.

part of total costs, the overall impact of higher land productivity on total production costs is not very great. If harvesting costs amount to an average of \$25 per ton total production costs will be \$30.7 per ton. As in the above example variances in transport costs could reduce this figure by up to \$3 or raise it by \$5.

A farm which is perhaps more typical of the canefields would replant fields once every ten years and obtain yields of 17 tons per acre. In this case the farm incurs lower production costs per acre but this is offset by the reduced yield. Average costs for replanting and ratoon cultivation amount to \$8.6 per ton¹⁴, marginally higher than in the first example. Given average transport costs total cost of production will amount to \$33.6 per ton.

A mechanised farm replanting every seven years will incur costs exclusive of equipment maintenance and replacement of \$144 per acre for replanting and ratoon cultivation, and an average of \$19 per ton of cane for harvesting. Capital equipment costs are estimated at \$10 per ton of cane. Given a cane yield of 20 tons per acre the total cost will be \$36.2 per ton. This figure will fall to \$33.8 if the yield per acre rises to 30 tons.

Several pertinent points are apparent from the above calculations.

¹⁴ Replanting costs of \$644 * 1 acre + ratoon costs of \$91.5 * 9 acres = \$1467.5. \$1467.5/10 = \$146.8. \$146.8/17 = \$8.6/ton.

First, total production costs on most farms are likely to be between \$30 and \$36 per ton. This means that farmers would have earned between \$12.5 and \$18.5 per ton in profits during the 1988/89 season (assuming a final price of about \$48.5 per ton paid by BSI). A farmer with the average yield for the canefields of 176 tons (excluding the cane sold to Petrojam) would therefore have earned between \$2200 and \$3250 in profits, while a farmer with the median yield of about 100 tons would have earned between \$1250 and \$1850 in profits during the season.

Second, neither the frequency of replanting nor land productivity (which presumably are positively correlated) have a major impact on total production costs because harvesting costs (which are assumed fixed on a per ton basis) are by far the most important element of total costs.

Third, it is not possible for cane farmers on all but the smallest farms to significantly reduce their monetised production costs by supplying labour themselves. This is because the bulk of the labour costs are incurred in the cutting and loading of the cane, a job which must be completed within a short space of time and therefore makes hiring labour unavoidable.

Fourth, the mechanised farms incur total production costs which are between \$2.7 and \$3.1 higher than those on non

mechanised farms with the same replanting frequency and land productivity. This figure is however dependent on a rather arbitrary estimate of the costs of maintaining and replacing capital equipment and as such may not be very accurate.

The Financing of Sugarcane Farming

As in most agricultural activities, cane farmers incur fixed and working capital costs before they receive payment for their produce, and most farmers must therefore borrow money to finance these costs. Although the major part of working capital costs are incurred during harvesting, and therefore just before the farmer receives payment for the crop,¹⁵ the costs of replanting are incurred almost a full year before the crop is harvested. Farmers may also have to make large payments for the purchase or repair of capital equipment, the cost of which may not be recovered from cane sales for several seasons. Outstanding loans to the cane farmers from the financial institutions tend to increase from August to November and then decline until the following July.

Cane farmers receive finance from the commercial banks and the Development Finance Corporation (DFC), and can also receive credit from BSI to cover replanting costs. The commercial banks provided the bulk of credit for cane farmers during the late 1970's and early 1980's but total lending from the banks began to decline sharply in 1982 and

15 The farmer receives the first payment (which is for 65% or 85% of the total estimated value of the delivery depending upon which cane farmers' association he or she belongs to) on the Friday following the week ending on the Wednesday in which the cane is delivered. A second payment is made five weeks after the end of the crop season and the remaining payment is made at the end of the year when the final price of cane can be calculated.

only began to recover in 1986, with the level of outstanding loans to the cane farmers at the end of 1988 still below the level in 1983 and only 56% of the level in 1981 (see table 12). The decline in commercial bank lending to the cane farmers between 1982 and 1985 was caused by a combination of very high nominal interest rates which reduced demand from the farmers and by the banks' lack of liquidity which reduced the supply of loanable funds. The rapid growth in bank deposits since 1985 has eased the constraint on the supply of loans to the sugar farmers while the rise in producer cane prices since 1986 combined with a fall in nominal interest rates has served to increase credit demand from the farmers.

Lending to the cane farmers from the DFC increased rapidly during the early 1980's and by the end of 1984 it was providing more credit to the farmers than the commercial banks (see table 13). Since 1985 however lending has declined. At the end of 1987 the outstanding loans to the cane farmers from the DFC amounted to \$7.36 million while those from the commercial banks totalled \$7.41 million at the end of 1988.

The majority of cane farmers now rely on the commercial banks for finance even though interest rates are still high (15% or above for most loans). The banks also charge most farmers a \$50 transaction fee for each loan. In the 1988/89 season 87.5% of farmers borrowed money from the commercial

banks while 6.5% borrowed from the DFC.¹⁶ Future cane payments are used as collateral to support the commercial banks' lending to the farmers. The banks lend on the basis of the farmer's sugar license with the farmers agreeing to authorise BSI to pay their sugarcane receipts directly into their bank accounts.

BSI offers credit to those farmers who make use of the land preparation service organised by SETSS. The costs of the service are deducted interest free from the farmer's sugarcane receipts in the following year.

¹⁶ Information supplied by BSI.

Non Sugar Earning Opportunities and Alternatives to Cane Farming

Sugarcane farming requires full time labour for only a small part of the year; mainly for the replanting of fields towards the end of the season and during harvesting. For the remainder of the year the cane fields require only intermittent attention for weeding, fertilizer and herbicide application etc. As a result most cane farmers have the opportunity to pursue a secondary occupation particularly during the rainy season when sugar is neither harvested nor are fields being replanted.

The most common secondary occupations are farming and employment in small businesses in the services sector. It appears that the smaller and less wealthy cane farmers are most likely to grow food crops for their own consumption and/or for the local market - if they have the available land - while the larger and wealthier farmers often own small businesses such as shops in the urban areas.

Since the fall in sugar prices and the reduction in the volume of cane licenses in the first half of the 1980s many cane farmers have sought to diversify their activities into alternative cash crops. These include rice, corn, beans and vegetables and many of these crops are apparently more profitable than sugar. The major disadvantage to the farmers in cultivating these crops is their higher costs of

production relative to sugar and the much greater risk involved. The risk arises from both the vulnerability of the crops to unfavourable weather and the possibility of inadequate demand for food crop output in local markets. Farmers have apparently been unable to sell certain vegetables in recent years because the market has already been over supplied. Sugar in contrast is a relatively cheap and safe crop for the farmers to grow. It does not require a great deal of labour, except from in the harvesting operation, or expensive applications of chemicals; it is extremely resilient to all but the most extreme of adverse weather conditions and in addition the farmers have a guaranteed market for their output at BSI.

Current Problem Areas in the Sugar Industry

The quantity and the quality of the sugarcane being processed at the Tower Hill factory in recent years has been adversely effected by a number of technical and institutional problems. The major problems include the susceptibility of much of the cane to disease and pest attack, the poor coordination of the farmers' cane deliveries to the factory and the presence of extraneous matter in the cane. These problems, their effects and the attempts being made to remedy them are briefly discussed below.

Smut Disease

Smut disease is a black fungus which has spread throughout the cane fields since the late 1970s. The "white cane" variety of sugarcane has proved to be particularly susceptible to attack by smut disease which severely reduces the width of the cane stalks. White cane has been the most popular type of cane planted in Belize in the past because farmers believed that it provided relatively good yields with a high cane/juice content. About 28,000 acres (50% of the cane fields) are currently planted with white cane. This variety of cane is also susceptible to rust which is another fungal disease.

The only effective method to reduce the incidence of smut disease is to replant fields with smut resistant varieties of cane, and the SETSS has mounted a major campaign since 1987 to encourage the farmers to do this. Smut resistant varieties of cane are grown on an experimental basis by the Research and Extension Department of BSI and those which are found to be most suitable to the soil and climate of Belize are recommended to the farmers. The farmers are able to purchase the appropriate seeds either directly from SETSS or from other farmers in contact with SETSS. SETSS estimates that at least 7,500 acres of smut resistant varieties of cane will be harvested in the 1990 season and that this will provide 175,000 tons of cane.¹⁷

Pests and Weeds

Inadequate control of weeds in the canefields is one of the major reasons why Belizean cane yields are very poor by international standards.¹⁸ Weeding, either by hand or with herbicides, is often carried out only when the cane and the weeds are almost fully grown, and as a result the cane yield may be reduced by as much as 40%. Unfortunately herbicide application is both complex and problematic and must be carried out very carefully if the cane is not to be damaged.

¹⁷ Belize Sugar, April 1989 p2.

¹⁸ The average yield per acre in Belize is 17 tons compared with 30 tons in other Caribbean countries. Belize Sugar, February 1989 p4.

SETSS has provided farmers with a demonstration of a weed control programme as part of its efforts to improve cultivation practises in the cane fields.

Infestation of the cane fields with froghoppers also poses a serious threat to cane yields. These insects, which infest the cane fields during the rainy season, destroyed more than 60,000 tons of cane in 1983,¹⁹ and must be controlled by spraying with insecticide.

Extraneous Matter

A major problem which developed at the beginning of the 1988/89 season was the inclusion of extraneous matter in the sugarcane delivered to the Tower Hill Factory because many farmers were failing to remove the tops and trash from their cane. The tops are the leaves at the top of the cane stalk while the trash is the dried leaves immediately below. Because the sugar content of both is negligible failure to remove them from the cane before delivery to the factory reduces the cane juice ratio of the cane and therefore the amount of sugar which can be produced in the factory in any given time.

The problem arises because farmers are paid for the quantity of cane that they can deliver to the factory. While the overall quality of the cane will clearly effect each farmers

¹⁹ Belize Sugar, April 1989 p1.

earnings the quality of the individual farmer's own delivery will have only a negligible effect on the overall cane quality. The farmers thus have a financial incentive to maximise the weight of their deliveries, by including extraneous matter, even at the expense of the quality of the cane.

In an attempt to reduce the amount of extraneous matter in the cane BSI carries out inspections of the deliveries of certain farmers. It is only possible however to inspect 30 lorry loads a day out of the usual 600 delivered to the factory. BSI also held meetings in January with the Cane Farmers Associations to stress the need to tackle the problem and subsequently carried out an educational campaign urging farmers to remove the tops and trash before delivering the cane. As a result of these measures the amount of extraneous matter in the cane fell substantially from early February. BSI estimate that because of the improvement an additional 5,000 tons of sugar was produced during the 1988/89 season.

Coordination of Sugarcane Deliveries

Sugarcane will start to go stale unless it is processed within about 72 hours of being cut. Staleness reduces the amount of sugar which can be extracted from a given volume

of cane and introduces dextran into the sugar which results in financial penalties being incurred when the sugar is exported. Poor coordination of cane deliveries, which has often resulted in long queues of farmers' trucks waiting to unload their cane, has been a major cause of staleness. Stale cane is estimated to cost the industry up to \$1.9 million in lost sugar during the course of a season.

The Tower Hill factory has the capacity to grind nearly 6,000 tons of sugar a day (nearly 390 truckloads), but during some days early in the 1988/89 season over 10,000 tons was actually delivered to the factory. As a result large queues developed with Orange Walk farmers having to wait on average 20 hours between arriving at the factory and unloading their cane and Corozal farmers having to wait 10 hours on average.²⁰

The responsibility for coordinating cane deliveries lies with the Cane Farmers' Associations. The Associations allocate quotas allowing individual farmers to deliver a specific volume of cane on a particular day so as to ensure that total deliveries on any day do not exceed the factory's grinding capacity. In practise however these quotas appear to be widely ignored by the farmers with the result that cane deliveries tend to be concentrated together in bunches instead of being evenly dispersed over the course of the season. Although the present system of coordination can

20 Belize Sugar, February 1989 p1

probably be improved given the cooperation of the Cane Farmers' Associations, the major obstacle to effective control of deliveries is the large number of individual farmers.

Petrojam

Petrojam, a subsidiary of the Petroleum Corporation of Jamaica, leased the Libertad factory in 1987 in order to produce liquid molasses for the ethanol industry. Ethanol, which is highly concentrated alcohol, can be mixed with gasoline in order to boost the octane content of fuel. Lead has traditionally been used by the oil industry for this purpose, but greater environmental concern together with fiscal incentives and regulations designed to discourage the consumption of leaded petrol in many developed countries have increased the demand for a less environmentally harmful substitute.

Sugarcane can be used as the raw material for ethanol. The cane is processed into molasses which is fermented and then distilled to produce wet ethanol. The water in the wet ethanol must then be removed in a dehydration plant to enable the ethanol to be blended with gasoline.

The present operations of Petrojam at the Libertad factory involve processing locally grown sugarcane into molasses and then fermenting the molasses into liquid molasses. The latter is then transported to Jamaica for distillation and dehydration. The company currently employs 28 staff on a full time basis at the Libertad factory and a further 92 were employed on a temporary basis during the 1989 grinding

season. Petrojam are intending to reduce the transport costs of their operations by using the same tankers which deliver diesel fuel to Belize to ship the liquid molasses to Jamaica on their return journey. There are plans to extend the operation at Libertad by installing a distillation plant to convert the liquid molasses into wet ethanol before shipping it to Jamaica.

The advantages of the Belizean operation to Petrojam stem from the opportunity to acquire relatively cheap supplies of sugarcane. Both land and labour in Belize are less expensive than in Jamaica. The company has however been criticised for its decision to invest in Belize by Jamaican sugarcane producers, who deny that Jamaican cane is more expensive than Belizean cane.

Petrojam has acquired 5,000 acres of farmland in the San Pablo area of Corozal near to the Libertad factory in order to grow sugarcane. This land is currently being cultivated by a local contractor under the technical supervision of a Petrojam employee. Petrojam is also buying any excess cane which farmers have available after supplying their quota to BSI.

In the 1989 season Petrojam offered sugarcane farmers between \$27 and \$28 per ton of cane. For many farmers this price can barely have covered their production and transport costs. Nevertheless Petrojam was able to purchase 56,000 tons from the farmers in May and June of 1989. It is

possible that some of these purchases may have been from farmers who had originally hoped to be able to sell the cane for a much higher price to BSI using licenses bought from farmers who had been unable to meet their own quotas. The farmers may therefore not have covered their overall production costs although presumably the price offered by Petrojam must have covered their cutting and transport costs.

Petrojam also received in 1989 a further 1,000 tons of cane from its own cane fields of which 1,700 acres have been planted so far by the contractor. The company is hoping to double their purchases of sugarcane from local farmers in the 1990 crop season and in addition harvest around 50,000 tons from their own lands. They would therefore have at least 160,000 tons available for processing. In the long term Petrojam is hoping to be able to grind 400,000 tons of cane per season at Libertad. The company intends to harvest 130,000 tons per season from its own land. To obtain this amount of cane would require the contractor to harvest 26 tons per acre, a land productivity which is well within the 30/40 tons per acre that should be possible under the best cultivation practises.

Petrojam is also hoping to buy 270,000 tons of cane per season from the farmers. This target appears somewhat optimistic given the present state of the cane farming industry. BSI has first claim on 850,000 tons of cane per

season, and Petrojam can only purchase cane from the farmers once BSI is assured of receiving this amount. Petrojam's target of 270,000 tons from the farmers therefore entails total cane production from the farmers of 1,120,000 tons per season. Although this amount of cane was produced in the 1982/3 season, several thousand acres of cane (probably as much as 10,000 acres) have since been taken out of cultivation and farmers are unlikely to replant these fields, or expand output on existing fields, unless they have a strong financial incentive for doing so. The current price of \$27/28 per ton which Petrojam is offering the farmers hardly provides such an incentive. A fairly substantial increase in the producer price of cane would appear to be necessary if Petrojam is to achieve its target of purchasing 270,000 tons per season.

The long term viability of Petrojam's operations in Belize depend crucially upon future developments in the market for ethanol in the US. Two issues are of particular importance to Petrojam; access to the US market and the future price of ethanol.

Under the Caribbean Basin Initiative (CBI), exports of ethanol from the qualifying countries in the Caribbean and Central America have duty free access to the US, provided that at least 35% of the value of the ethanol is added in CBI beneficiary countries. US ethanol producers and corn growers (corn is an alternative to sugar as the raw material

for ethanol) however have lobbied the US Legislature for the minimum value added requirement to be raised to 75%. This is a requirement which most CBI ethanol producers would not be able to meet because adequate supplies of sugarcane or alternative alcohol feedstuffs are not available in the CBI countries. CBI ethanol producers are currently having to import alcohol feedstuff from Brazil and Spain in order to operate their plants at an economically viable scale of production.

The future market price of ethanol is the other major factor that will determine the long term viability of Petrojam's ethanol production. Prices are likely to be affected by two factors; the price of gasoline in general and the demand for lead free gasoline in particular. The latter is likely to be the more important influence on the price of ethanol because the demand for lead free gasoline should rise much more rapidly than the demand for gasoline in general over the next few years. To discourage the use of leaded gasoline the Federal Government in the US currently offers a fiscal incentive of US\$0.6 per gallon of lead free gasoline and several states in the US offer additional financial incentives. Given the present level of concern for environmental issues in the US it is possible that the fiscal incentives in favour of lead free petrol will be extended in the future.

Petrojam will be competing in the US ethanol market with

both US and other CBI ethanol producers (provided of course that the local value added rules eventually adopted do not effectively exclude the CBI countries from the US market). Tariff barriers will probably exclude all non CBI exporters from the US market. The CBI countries are currently exporting an average of 360 million litres of ethanol per annum to the US with the Petrojam project adding around 110 million litres to this figure.

Prospects for the Future of the Sugar Industry in Belize

Despite the serious difficulties faced by the sugar industry since the end of the 1970s the industry remains a vital part of the economy of Belize, both as the country's most important source of foreign exchange and as the major source of incomes in the northern districts. The shocks suffered by the industry - the fall in world sugar prices and the outbreak of the smut disease - have reduced sugar output to 90,000 tons, 16% below the level produced in the record 1982/83 season. Because of the structure of the export markets on which Belizean sugar is sold, however, current output levels may be close to those which are optimal for the continued financial viability of both cane farming and sugar processing in Belize.

An increase in sugar output is unlikely to be economically viable in the foreseeable future. To increase output of sugar from the Tower Hill factory would require a substantial investment in additional grinding capacity. Increased output would however inevitably lead to lower average unit prices of sugar because any additional output would have to be sold on the free market, where prices are lower than those received for quota sales to the UK and US. Lower average unit prices for sugar would have to be passed

on to the farmers, thus reducing the financial incentives for cane production and - in view of the experience of the mid 1980s - possibly leading to a fall in cane production. Lower average unit prices would also reduce the profitability of BSI's sugar processing operation. BSI therefore is understandably extremely cautious about increasing grinding capacity at Tower Hill.

Current output levels however have allowed prices of around \$50 per ton to be paid to the farmers, and with production costs estimated in the region of \$30/40 per ton, this appears to be sufficient incentive for farmers to supply BSI's current requirements of 850,000 tons a year.

The cane farmers appear to have two possible opportunities to increase their incomes. The first is to expand production of cane beyond that necessary to meet the requirements of BSI and to sell the surplus to Petrojam. The price per ton of cane currently being offered by Petrojam is not however likely to be high enough to be attractive to the majority of the farmers. A major expansion of cane supplies to Petrojam would appear to be conditional upon an increase in the cane price offered to the farmers which in turn requires a rise in ethanol prices in the markets of the industrial countries.

The second alternative would be for the farmers to continue

to grow sufficient cane only to supply the requirements of BSI - ie they would grow the amount of cane specified on their license - but improve the land productivity of their cane farming. At present average yields per acre of 17 tons are only about half that which is achieved in many Caribbean countries. Improved cultivation practises (particularly weed control) and the continued replanting of the smut resistant varieties of cane can allow farmers to increase yields per acre, thus releasing land for other crops. Corn, rice, beans and vegetables are potentially more profitable to the farmers than sugar but involve a much greater degree of risk. With the sugar crop providing farmers with at least some financial security more farmers might be encouraged to devote surplus land to growing crops for the domestic market or to diversifying into non traditional export crops.

Table 1

World Market Sugar Prices

Caribbean Sugar (New York)

Year	US Cents/pound
1970	3.76
1971	4.53
1972	7.48
1973	9.62
1974	29.94
1975	20.56
1976	11.56
1977	8.11
1978	7.82
1979	9.66
1980	28.67
1981	16.89
1982	8.41
1983	8.47
1984	5.20
1985	4.05
1986	6.05
1987	6.76
1988	10.19

Source: IMF, International Financial Statistics Yearbook 1987,
IMF, International Financial Statistics May 1989

Table 2

World Production and Consumption of Sugar

Millions of Tons

September/August Crop Years

	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89 F
World Production	100.6	101.3	96.5	100.3	99.0	103.4	103.6	106.4
EC	17.1	16.0	13.3	14.4	14.5	15.0	14.0	15.0
US	5.5	5.4	5.3	5.3	5.5	6.2	6.7	6.3
World Consumption	90.5	93.8	95.9	96.5	98.4	101.4	106.3	107.5
EC	11.9	11.7	11.5	11.6	11.6	11.8	11.9	11.9
US	8.4	8.0	7.9	7.2	7.5	7.2	7.6	7.4
Reported Closing Stocks	26.0	31.6	28.8	29.9	26.1	23.8	21.2	21.1

F: Forecast

Source: IMF, Primary Commodities: Market Developments and Outlook July 1989

Table 3

US Sugar Quota Allocation

Thousands of short tons

Period	Belize Quota	Total Quota
10/01/82- 09/30/83	27.9	2,622
09/26/83- 09/30/84	30.4	2,876
10/01/84-* 11/30/85	25.3	2,426
12/01/85-** 12/31/86	17.1	1,675
01/01/87- 12/31/87	9.1	908
01/01/88- 12/31/88	10.0	957
01/01/89-*** 30/9/90	20.6	1800
* 14 months		
** 13 months		
*** 21 months		

Source: IMF, Primary Commodities: Market Developments and Outlook 17,3,88

Table 4

Belize Sugarcane Production

 1965/66-1988/89

Year	Cane Harvested and Delivered to BSI (long tons)
1965/66	411,353
1966/67	560,954
1967/68	642,515
1968/69	528,720
1969/70	676,175
1970/71	632,629
1971/72	667,654
1972/73	718,230
1973/74	824,074
1974/75	783,118
1975/76	607,022
1976/77	935,625
1977/78	1,123,100
1978/79	989,300
1979/80	1,013,500
1980/81	970,100
1981/82	1,095,500
1982/83	1,131,986
1983/84	1,022,202
1984/85	961,599
1985/86	853,605
1986/87	788,899
1987/88	776,559
1988/89	867,267*

* 57,000 tons were also delivered to Petrojam

Table 5

Belize Sugar and Molasses Production

1965/66-1988/89

Year	Sugar Produced (long tons)	Molasses Produced (long tons)
1965/66	43,453	13,084
1966/67	58,320	21,054
1967/68	63,588	24,385
1968/69	52,720	18,686
1969/70	66,785	26,397
1970/71	64,851	22,960
1971/72	69,967	24,521
1972/73	70,170	26,130
1973/74	88,897	27,042
1974/75	82,874	28,668
1975/76	61,799	19,750
1976/77	91,853	29,600
1977/78	113,500	39,900
1978/79	98,600	32,300
1979/80	103,300	32,278
1980/81	97,724	31,980
1981/82	105,980	37,704
1982/83	114,278	37,470
1983/84	101,525	32,300
1984/85	102,018	28,099
1985/86	93,345	29,518
1986/87	82,320	24,296
1987/88	81,748	23,138
1988/89	90,933	

Source: Central Statistical Office, Abstract of Statistics 1988

Table 6

Belize Sugar and Molasses Exports

1980-1988

Year	Sugar		Molasses	
	Volume 1/tons	Value \$000s	Volume gal 000s	Value \$000s
1980	97,152	95,403	4,652	4,377
1981	90,424	85,277	4,382	2,419
1982	98,151	66,673	5,404	1,790
1983	109,117	70,927	5,494	1,213
1984	93,877	65,072	4,417	2,280
1985	89,147	45,857	3,794	1,725
1986	98,480	62,908	3,373	986
1987	78,981	62,622	3,655	1,069
1988	79,700	70,028	3,270	955

Source: Central Statistical Office

Table 7

Sugar Cane Prices

Year	Cane Price BZ\$/ton
1977	32.32
1978	34.76
1979	38.77 #
1980	62.46 #
1981	54.27 #
1982	37.10 #
1983	37.48
1984	38.55
1985	31.23
1986	39.11
1987	47.99
1988	51.25
1989	48.43 @e

Prices are those paid to Orange Walk farmers
except:

- # All farmers and Research
- @ All farmers
- e estimate

Source: Belize Cane Farmers' Association,
Orange Walk District Division

Table 8

Size Distribution of Sugarcane Licenses and Deliveries 1987

A	B	C	D	E	F	G
Size of License (tons)	# of Farmers	# of farmers as % of total farmers	Total license tons	D as % of total license	Amount Delivered tons	F as % of D
up to 100	2528	51.2	169610	20.5	174047.3	102.6
101-200	1030	20.9	155402	18.8	144401.0	92.9
201-300	859	17.4	214184	25.9	207712.5	97.0
301-400	252	5.1	86536	10.5	83389.7	96.4
401-500	99	2.0	44019	5.3	39252.8	89.2
501-600	47	1.0	25865	3.1	24417.3	94.4
601-700	26	0.5	16935	2.1	16434.6	97.0
701-800	22	0.4	16505	2.0	14353.9	87.0
801-900	14	0.3	11936	1.4	10930.0	91.6
901-1000	11	0.2	10353	1.3	10783.9	104.2
over 1000	45	0.9	74531	9.0	63176.0	84.8
Total	4933.0	100.0	825876.0	100.0	788899.0	95.5

Source: BSI Sugarcane Extension and Technical Support Services

Table 9

Sugarcane Production Costs

Replanting

Land Preparation	Cost per acre \$
Ploughing	90.0
Harrowing	60.0
Furrowing	20.0
Cost of Seed	100.0
Transport of Seed	25.0
Planting Seed	40.0
Fertilizer	
200lbs Urea	60.0
200lbs TSP	70.0
Tine Cultivation	40.0
Herbicide	
8lbs Diuron	72.0
2 pints 2,4-D Amine	7.0
Application	20.0
Cover Urea and Moulding	40.0
Total Cost	644.0

Source: BSI SETSS

Table 10

Sugarcane Production Costs

Ratoon Cultivation

	Cost per acre \$
Fertilizer	
100lbs Urea	30.0
Fertilizer Application	10.0
Herbicide	
4lbs Diuron	36.0
1 pint 2,4-D Amine	3.5
Herbicide Application	10.0
Froghopper Control	2.0
Total cost	91.5

Source: BSI SETSS

Table 11

Sugarcane Production Costs

Harvesting

	Cost per ton \$
Cutting and Loading	12.0
Transportation (to Tower Hill)	
Orange Walk	
Up to 15 miles from Factory	10.0
Over 15 miles from Factory	12.0
Average for Orange Walk	11.0
Corozal	
Buena Vista	12.0
Consejo	18.0
Average for Corozal	15.0
Average for all Canefields	13.0
Total Average Harvesting Costs	25.0

Source: BSI SETSS

Table 12

Commercial Bank Lending for Sugar Farming

(loans and advances outstanding at the end of the year)

Year	\$000's	annual % change
1977	8715.0	
1978	10076.0	15.6
1979	13036.0	29.4
1980	12553.0	-3.7
1981	13291.0	5.9
1982	10674.0	-19.7
1983	8014.0	-24.9
1984	6552.0	-18.2
1985	3944.0	-39.8
1986	4030.0	2.2
1987	4554.0	13.0
1988	7410.0	62.7

Source: Central Bank Statistical Digest

Table 13

Development Finance Corporation Lending

for Sugar Farming

(loans and advances outstanding at the end of the Year)

Year	\$000's	annual % change
1978	1433.0	
1979	1932.0	34.8
1980	3058.0	58.3
1981	3585.0	17.2
1982	4109.0	14.6
1983	6976.0	69.8
1984	8087.0	15.9
1985	8941.0	10.6
1986	7685.0	-14.0
1987	7362.0	-4.2
1988		

Source: Central Bank Statistical Digest

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