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The impact of falling sugar prices on growth and rural livelihoods

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ABBREVIATIONS AND ACRONYMS

ACP	Africa, Caribbean and Pacific
AGRODOSA	Dominican Republic Agricultural Insurance, SA
ASR	American Sugar Refineries
BAHA	Belize Agricultural Health Authority
BEL	Belize Energy Limited
Belcogen	Belize Co-Generation Energy Ltd
BSCFA	Belize Sugar Cane Farmer Association
BSI	Belize Sugar Industries, Ltd.
BZ$	Belizean dollars
CARDI	Caribbean Agricultural Research and Development Institute
CARICOM	Caribbean Common Market
CENTA	National Agricultural Technology Center in El Salvador
CET	Common external tariff
COAGRICSAL	Cafetalera San Antonio Agricultural Cooperative Limited, Honduras
EBA	Everything-But-Arms
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
Ha	Hectares
HFCS	high fructose corn syrup
ICDF	International Cooperation and Development Fund, Taiwan
IDB	Inter-American Development Bank
IFAD	International Fund for Agricultural Development
IICA	Inter-American Institute for Cooperation on Agriculture
ITVET	Institute for Technical and Vocational Education and Training
Kg	Kilograms
Km	Kilometers
LDC	Least Developed Country
MIF	Multilateral Investment Fund
MNRA	Ministry of Natural Resources and Agriculture
MPCI	multiple-peril crop insurance
Mt	Metric tons

MW	Megawatts
MWh	Megawatt hours
NGO	non-governmental organization
OECD	Organization for Economic Cooperation Development
QTG	Quality Test Group
SCPC	Sugar Cane Production Committee
SDP	Strategic Development Plan
SICB	Sugar Industry Control Board
SIMIS	Sugar Industry Management Information System
SIRDI	Sugar Industry Research and Development Institute
SPS	Special Preferential Sugar
TRQ	tariff rate quota
UK	United Kingdom
US	United States of America
US$	United States dollars
USDA	US Department of Agriculture
WINCROP	Windward Island Crop Insurance Ltd.

CONVERSION FACTORS

1 BZ$ = 0.50 US$

1 long ton = 2,240 lb = 1.1605 metric tons

1 short ton = 2,000 lb = 0.9072 metric tons

1 metric ton = 1,000 kg = 2,204.6 lb

1 acre = 0.4047 hectares

SUMMARY

Sugar is one of Belize's main export crops and an important contributor to the national economy. Most of national sugar production is exported, but the global sugar industry faces great uncertainty in near future, with weaker prices expected. This is mainly due to reform of the EU's sugar regime but also because of downside risks to global sugar demand and competition from much larger producers.

The largest share of Belize's sugar has traditionally been exported to the EU market, making its sugar industry highly vulnerable to these risks. Other preferential markets are also available, including the US, Caricom and the Fair Trade market, but unless Belize's sugar exporters can achieve a larger share of these markets, any increase in output in the coming years will be sold on the free market at a lower price, contributing to a decline in the average price of its sugar exports.

It is the northern region of the country – the Orange Walk and Corozal districts – that is most vulnerable to falling prices. Here, sugar is the dominant crop and so a key driver of the local economy. The structure of the sugar industry in this region leaves many small farmers highly exposed to any weakness in the sugar price. Low agricultural yields and high handling costs suggest that there is ample scope for improving production techniques and the efficiency of harvesting methods. This is the focus of the industry's Strategic Development Plan. However, highly-indebted farmers will find it difficult to finance improvements; enthusiasm for the plan among farmers is weak; and the current limited capacity of the only mill in the northern region means that farmers who expand their output risk being unable to deliver all their cane. Moreover, unless Belize is able to increase the amount of sugar it is able to export on favorable terms, farmers' real gross income per metric tonne will be diminished if output increases. In the new capital-intensive sugar industry in the west of the country, a revenue decline from lower sugar prices will mainly hit the company (and, if the decline is severe, perhaps also its creditors), with a far weaker impact on farmer incomes or the local economy.

Official policy for the industry, with the support of international donors, has been focused on the need to raise the productivity and efficiency of sugar production. At the same time, the benefits of diversification are well understood and it is an explicit policy objective in Belize. Government agencies provide technical support and agricultural health, although these could both be strengthened to improve results. Diversification also requires more data than is currently available, and a continued effort to build an appropriate institutional structure for effective supply chains and marketing to bring new products to new markets. Further agricultural research effort is also needed to develop alternative crops for which there is a market (particularly for Caricom, for which Belize has preferential access. The development of the northern region as an 'emerging destination' is under way, with IDB support, providing a further potential source of livelihoods to substitute for sugar earnings.

Without effective implementation of a clear strategy to (i) improve the competitiveness of the sugar industry in the northern region, and (ii) diversify into other activities for those farmers who will be unable to earn sustainable livelihoods from the crop, Belize's economy and the communities of its northern region will be vulnerable to severe difficulties in the uncertain years ahead.

INTRODUCTION: THE PROBLEM

Sugar is one of Belize's main industries. It accounts for 14 percent of all agricultural earnings and a similar share of goods export revenue. The sugar industry is currently expanding, having recently attracted substantial foreign investment, but it faces an uncertain future. Reforms in the European Union (EU), in particular, will remove some of Belize's most significant trade preferences at the end of 2017, increasing the industry's exposure to price volatility in world markets. With average agricultural yields for Belizean sugar well below the Central American regional average, there appears to be scope to improve the industry's prospects by raising yields and productivity. However, the extent to which this approach has the potential to sustain the industry's contribution to the national economy and livelihoods in sugar-dependent communities in the face of international market conditions is uncertain.

The challenges facing the sugar sector are the focus of this report, which is divided into three chapters. In the first we identify the markets for Belize's sugar and factors that will determine prices in each of them in the coming years. Each of the markets – the European Union (EU), the United States of America (USA), Caricom, the world surplus market, the Fair Trade and domestic market – has specific characteristics that are determined by international organizations and agreements.

The second chapter presents an impact analysis of these baseline and price scenarios on Belize´s sugar sector, taking into account the structures and prospects for the two distinct regional industries. This chapter uses information gathered through site visits and semi-structured interviews with Belizean government officials, industry groups, and farmer representatives (listed in appendix A). On the basis of these findings, we assess the vulnerability of Belize's economy and sugar industry livelihoods to the expected softening of average sugar prices.

In the third chapter, we offer a broad assessment of policy options to diversify income sources to protect the livelihoods of sugar workers who are most vulnerable to the approaching changes in market conditions. The discussion reviews the adequacy and appropriateness of existing policies for diversification, and possibilities for building on that work.

The report's conclusions and recommendations are presented in chapter 4.

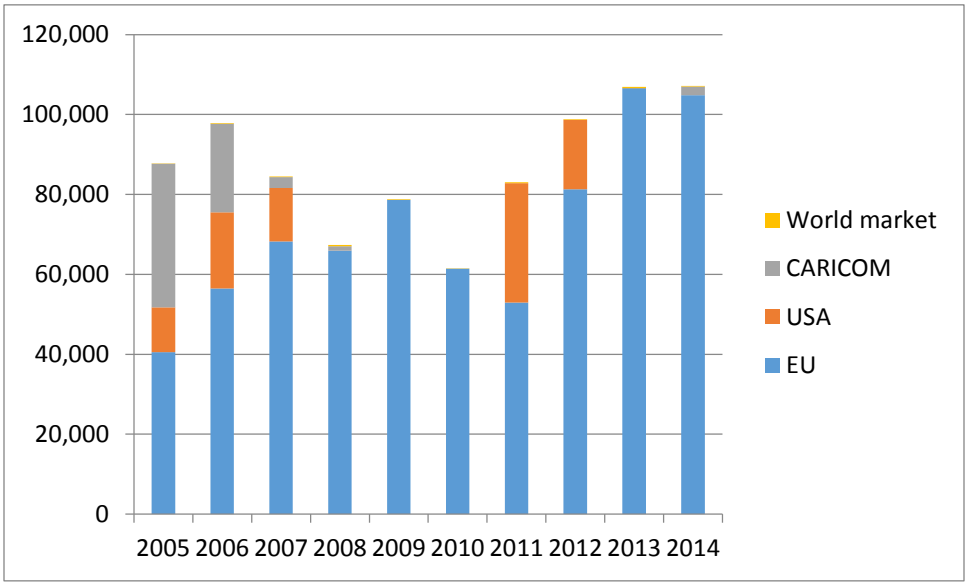
1. THE PRICE OF BELIZE'S SUGAR

A. MARKET STRUCTURE AND PRICE DETERMINANTS

(I) EXPORT MARKETS

The distribution of Belize's sugar to its different markets varies from year to year, but a constant feature is that most of the country's sugar production – generally between 80% and 90% (Figure 1; see also Appendix B, table 13) – is exported. The destination of the sugar exports, and their average price, depends on movements of the divergent set of prices in its different markets: the EU, the US, the Caribbean Community (Caricom), the world market and the fair trade market.

Figure 1 Belize sugar exports: destination



The EU

The EU is by far the most important market, and the one that presents the greatest uncertainty in the coming year. Under the African, Caribbean, and Pacific (ACP)[1] Sugar Protocol of the Lomé Convention, the EU has imported a quota of raw sugar under duty free access, plus additional volumes as necessary to supplement the internal EU market needs under the Special Preferential Sugar (SPS) agreement. Until 2006-07, this allowed imports not only to enter duty free but also to benefit from preferential (internal) prices. Reforms to the EU sugar regime that began in 2006/07 have gradually phased out the preferential price, but ACP exporters were able to receive some compensation through increased access for Least Developed Country (LDC) sugar exporters under the Everything-But-Arms (EBA) transitional quotas. These quotas increased from 2001/02 to 2008/09 Since 2009 the LDCs have no longer had preferential prices, although duty-free access to the EU sugar market (Nyberg, 2007) has remained.

[1] The ACP group consists of 46 countries, including Belize, that were former colonies of EU member countries.

Most of the sugar exported by Belize to the EU is shipped through the UK. The UK's plans to leave the EU, following its referendum in 2016, add another layer of uncertainty.

The US

Access to the US market has been restricted by prohibitively high tariffs (US$0.339/kg for raw sugar). However, as part of its commitments during the Uruguay Round of the World Trade Organization the US allows a tariff rate quota (TRQ) of approximately 1.7 million mt of raw sugar to 40 countries (all developing countries with the exception of Australia). The US Trade Representative allocates the TRQ among these countries using a formula based on their share of exports to the US between 1975 and 1981. Under the North American Free Trade Agreement, Mexico initially secured increasing duty-free access to the US market, but additional US import controls imposed in 2014 put limits on Mexico´s exports to the US, allowing other developing countries a slightly larger share of the US market for TRQ access.

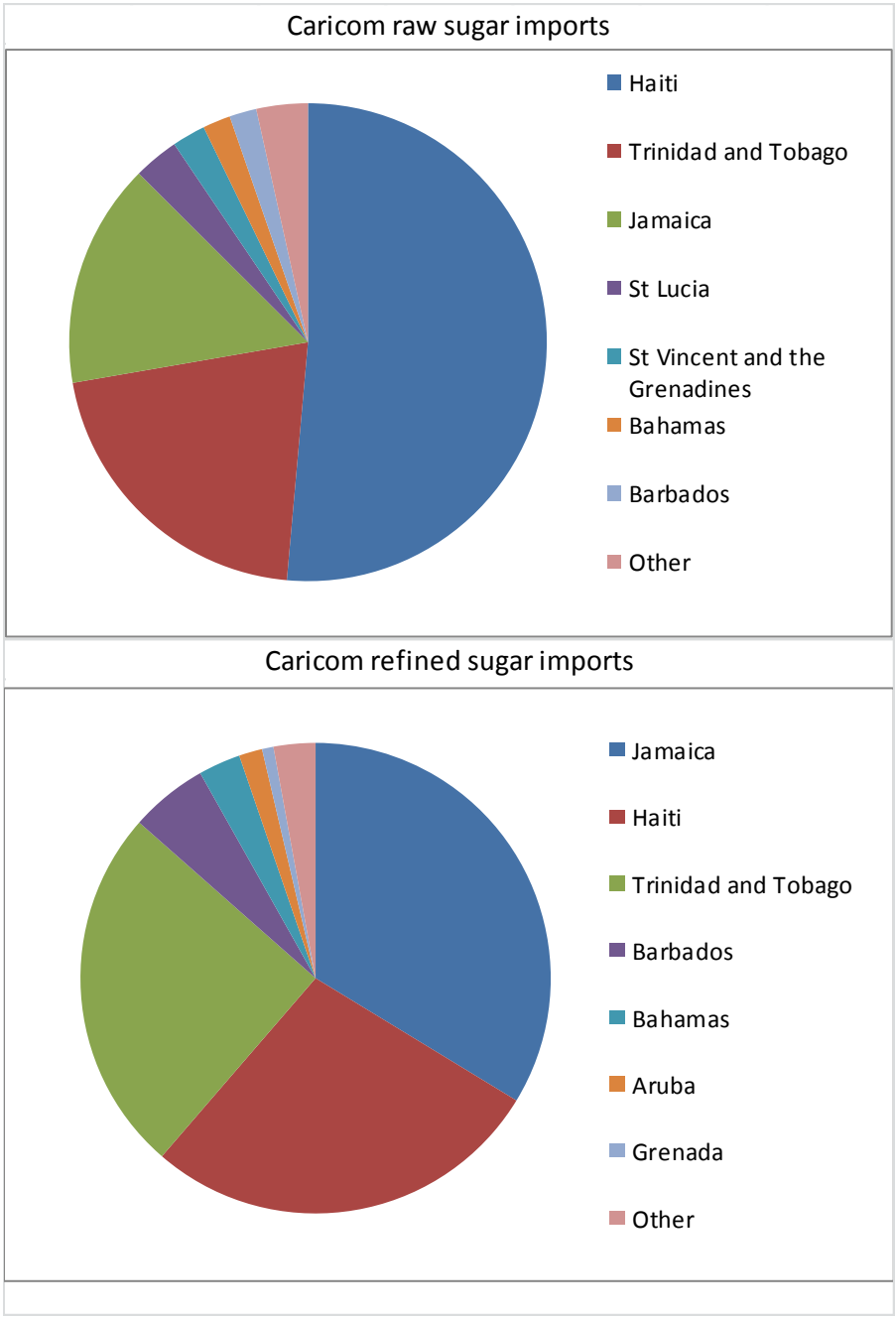
Belize's quota for access to the US market under the TRQ arrangement is 11,583 mt. The US price stays above the world market price but tends to fluctuate in line with it. When the EU price has been more attractive than the US price, Belize's quota has been unused; but when the US price rises above the EU price, Belize's exporters have been able to switch from the EU to the US market, as in 2011-12 (see Chart 1 above).

Caricom

Sugar production in most Caribbean countries was in decline long before the first round of EU market reforms. St. Kitts and Nevis left exporting in the early years of this century, and Trinidad and Tobago ceased to export in 2009. Many Caribbean countries have become net importers of sugar in recent years. Raw sugar imports into the Caribbean Common Market (Caricom) averaged 186,000 mt in 2011-13, while refined sugar imports averaged 150,000 mt (Figure 2).

The principal origins for raw sugar imports are Guatemala, Brazil and the United States, and refined sugar imports are sourced mainly from Colombia, Guatemala, Honduras and the United Kingdom, but there is potential for other Caribbean countries to gain a greater share, as they have duty-free access to this market, while imports of raw sugar from outside the region face a 40% common external tariff (Mitchell, 2005). Belize's sugar exports to Caricom countries were important in the early years of the 21st century, but have been practically absent in recent years, although the country's Molasses exports to Caricom have been increasing in recent years (Appendix B, Table 12).

Figure 2 Caricom sugar imports (average, 2011-13)



Source: FAOSTAT.

The world market

As most of the sugar traded internationally is under various types of interventions that provide higher and more stable prices than those on the free market for exporters, the global free (or 'spot') market is in effect a residual one. That is, as Nyberg (2007) notes, the world sugar trade is subject to "significant and widespread domestic support and trade distorting policies", with interventions including

guaranteed minimum payments to producers, production and marketing controls, state regulated prices, tariffs, import quotas and export subsidies, while the small residual share of the global trade for which prices move freely according to market forces is characterized by wide fluctuations in demand and supply, and therefore prices are highly volatile. Price volatility is exacerbated by the strong linkages between world sugar and oil prices, due to the ability of some of the main producers (particularly Brazil, the world´s largest producer and exporter) to switch between sugar and ethanol in Brazil in response to shifting prices.

Between 2007 and 2011 world market sugar prices doubled, from US$0.233/kg in 2007 to US$0.526 in 2011 (figure 8 below and table 22 in appendix B), initially as part of the general commodity boom associated with increased economic growth, and later in response to supply shortfalls in several leading producer countries (including India, which for a time became a net importer). Significant increases in global sugar production followed, particularly in India, the EU and the United States, leading to large production surpluses and falling world market sugar prices in the ensuing years.

Figure 3. World market sugar price (US cents per lb)

Source: Bloomberg.

Fair trade market

Belize has also benefited from a Fair Trade premium. Fair Trade sugar began in the late 1990s, “in order to improve the position of small-scale sugar cane growers and their dependent communities, which were being undervalued by the global sugar market” (Fairtrade Foundation, 2013b). Fair Trade certified sugar is open to small producer organizations with democratic decision-making processes, who commit to promoting best agricultural practice focusing on lower use of agrochemicals, no use of genetically modified organisms, proper management of waste, maintenance of soil fertility and water resources, and no forced or child labor. Fair Trade sugar is operated under a mass balance program, where it is not

kept separate from conventional sugar, which would be cost prohibitive, but is instead tracked by volume and audited through the supply chain (Fairtrade Foundation, 2013a).

There are now 69 Fair Trade certified sugar can producer organizations in 15 countries. One of the main markets for Fair Trade certified sugar is the United Kingdom, with a market share of 40% in 2014, where Tate & Lyle is a principal supplier and has committed to sourcing all of its retail sugars as Fair Trade certified. The global Fair Trade sugar market has grown dramatically over the past decade, and Belize has taken a significant share of it: in 2011, at Belize's fair trade sugar export peak, the country was the world's largest supplier, accounting for 38% of global certified production (Potts, et al, 2014).

Since 2009, the Belize Sugar Cane Farmer Association (BSCFA), the entity that represented all Belize's sugar farmers until early 2015, has participated in Fair Trade sugar sales[2]. The association receives the price premium of US$60/mt, which, in 2015, was equivalent to a premium of 10.9% compared to the average export price of sugar from Belize to the UK. The use of these funds is approved by the association´s members in a general meeting, and an annual audit takes place to verify the use of funds. The premiums are used for social investments, technical assistance and administrative support in the organization. For example, BSCFA introduced a new scheduled delivery system which reportedly reduced the harvest-to-mill time from an average of 136 hours to 36 hours. Other important programs are for cane quality improvement and pest management, and providing scholarships for children in the sugar cane community (Fairtrade Foundation, 2015). Premiums have also been used to buy and distribute free fertilizers and herbicides, carry out soil analyses, and promote cane replanting (Fairtrade Foundation, 2013b).

Like most of the large exporters, Belize is a former beneficiaries of the EU Sugar Protocol. Belize´s Fair Trade sugar sales have been through Tate & Lyle, which was purchased by ASR in 2010. Until 2015 Tate and Lyle´s demand was characterized as "reliable" (Potts, et al, 2014), with annual sales of around 60,000-65,000 mt, around 35-40% of total export value, but in 2015/2016, the company has offered to purchase a minimum of only 10,000 mt, due to signs of a softening of the market. After delivery of the sugar in London, the BSCFA used to receive the whole premium in a period of three weeks, but the company has now secured the agreement of farmers for the premium to be paid in four instalments at fixed intervals, in October, January, April, and July.

Average export prices

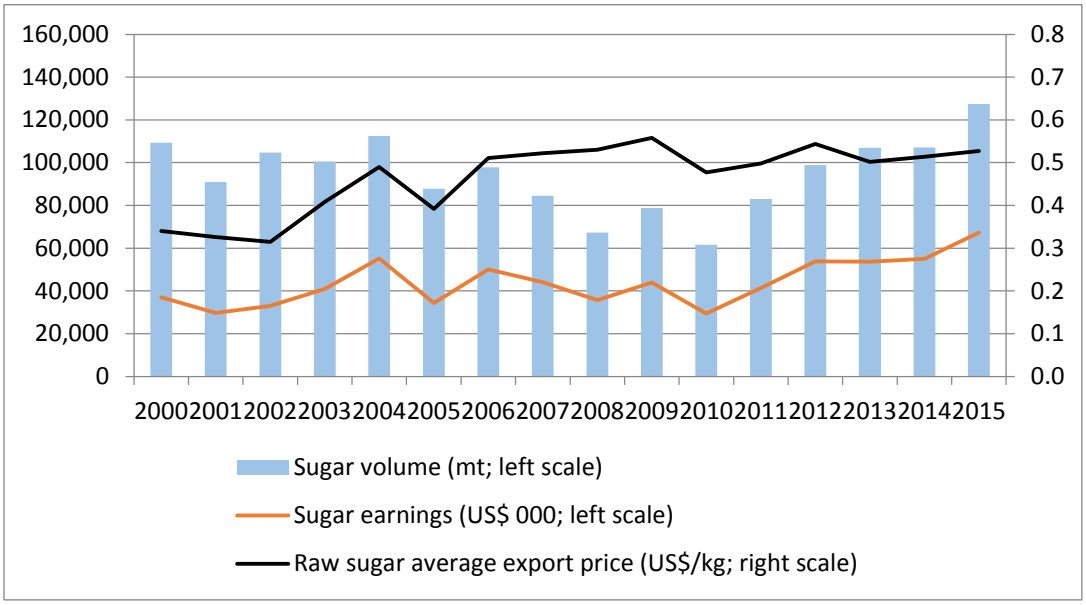
The impact of fluctuations in average prices on sugar earnings is shown in Figure 4 (see Appendix B, table 5 for full data). Molasses exports, which are far less important in terms of total export earnings, follow a similar trend. After a particularly sharp downturn in earnings in 2005 when both volumes and prices of sugar fell, firmer international prices mitigated the impact on earnings of a renewed downturn in production between 2006 and 2009. Then, after suffering from a fall in both prices and volumes in 2010, from 2011-15 relatively steady prices combined with rising output to produce a surge in earnings. That is, in 2011-15, the impact of deteriorating terms for exporters to the EU together with weaker

[2] According to BSCFA, the other two cane farmer associations have also applied to begin Fair Trade certifications for their members.

world prices on Belize's sugar export earnings was mitigated both by the expansion of production and the industry's ability to switch some of its sales to the US market, where Belize's favorably-priced US quota helped to compensate for the negative trends in other markets.

In the 2015/16 season, however, earnings have fallen. In the first three quarters of 2016, despite a 17% increase in export volumes, export earnings were 9% below their year-earlier level due to a 23% fall in average export prices. The next section examines the prospects for prices over the medium term, the implications of which are explored in Chapter 2.

Figure 4 Belize sugar exports: volume, earnings and price



Sources: FAOSTAT, COMTRADE and Central Bank of Belize.

(II) THE DOMESTIC MARKET

A significant though relatively small share (between 10 and 20 percent) of Belize's sugar is sold on the domestic market under a quota arrangement stipulated in the Sugar Industry Act.[3] The law requires ASR/BSI the quota to be sold at capped prices as set out in the 1987 Supplies Control Regulations, which apply to sugar as well as rice, flour, bread, red kidney beans, and a few non-food products, including beer. The price was fixed BZ$0.50/lb (US$0.25) for over ten years, before being increased to BZ$0.75/lb, from 1 January 2016. This adjustment provided farmers with an estimated additional BZ$4.60 per ton of cane (ASR Group/Belize Sugar, 2015).

[3] "The Minister, if he considers it in the public interest, may…require any manufacturer to reserve for sale in Belize any portion of the sugar manufactured by him" (Art. 59). The Sugar Industry Act (reformed in 2015) requires that "no person shall export from or import into Belize any sugar, ethanol or any other derivative of sugar cane, except in accordance with the terms and conditions of a valid license issued to him for that purpose by the Minister or such person as may be appointed by him" (Art. 57). There are no sugar imports registered in Belize in recent years, even in years with world prices lower than Belize´s domestic market price, indicating that the import license scheme is effectively an import prohibition.

B. THE UNCERTAIN FUTURE: PRICE EXPECTATIONS

(I) EXPORT MARKETS

The EU

The fate of Belize´s sugar industry depends, to a large extent, on imminent changes in the European Union (EU). Reforms to the EU Common Agriculture Policy agreed in June 2013, which will take effect in October 2017, will remove EU production quotas for sugar and high fructose corn syrup (HFCS) and abolish minimum sugar beet prices. Import duties will be maintained at €419/mt for white sugar and €339/mt for raw sugar (imports from ACP countries and LDCs are now duty free and quota free[4]). The OECD/FAO (2015) projects the effect of these changes over the next decade will be to stimulate an increase in sugar beet production in the EU´s most productive regions. Although EU producers with relatively high marginal costs will be negatively affected, the overall impact is expected to be greater EU self-sufficiency in sugar: that is, the total amount that it imports from the rest of the world will diminish.

Moreover, there are two additional threats to the size of the EU market for non-EU producers. One is increased competition from HFCS (isoglucose), with its share in overall sweetener consumption in the region expected to increase from 3% to 10%; and the other is a continuation of a new trend of declining per capita sugar consumption in many EU member countries due to health concerns. In Europe there are growing calls for specific or excise taxes on products containing sugar. Mexico's 2014 imposition of a tax of about US$0.06 (one peso) per liter of drinks with added sugar and 8% ad-valorem tax on foods with high caloric density is being monitored as a possible model for other countries. While the price elasticity of demand for sugar may be small (Aguilar, et al, 2015) and the impact of sugar taxes at their current level may be slight (Powell and Chaloupka, 2009), these developments do not augur well for the growth of EU sugar demand in the long term.

Despite these trends, FAO (2015) forecasts continue to anticipate rising exports to the EU market by non-EU producers in the medium term, for as long as for as long as non-EU producers are competitive at the EU price. However, the FAO considers that over the longer term, EU prices will tend to fall towards world market prices. Other studies have also forecast weakening prices. Burrell, et al (2014), using the CAPRI spatial partial equilibrium model to simulate the new EU policy environment, project that the EU sugar price will fall by 15-16% relative to the current in-quota price, and that there will be a change in the composition of EU sugar imports: while imports from high-cost countries (of which Belize is one) will fall by 43% between 2015 and 2020, imports from low-cost countries (such as Brazil) will fall only slightly, by 4%. A more alarming prognosis is offered by a 2013 impact study by the European Commission, which predicted that domestic sugar prices could decrease by 45% and imports would decline by almost 50% between 2013 and 2023, and a 2014 OECD/FAO assessment, using the Aglink-Cosimo model, similarly predicted that EU sugar imports would fall by 54% between 2013 and 2023. However, a subsequent 2014 European Commission assessment projects a decline in less severe 16.5%

[4] As of October 2014, duty free and quota free access to the EU market is now conditional on signing and ratifying an Economic Partnership Agreement, which the Caribbean did in October 2008 (ISO, 2014).

below baseline volumes for the 2018-2024 period. This study, like that of Burrel et al (2014) also anticipates that Brazilian sugar global exports will be 16% higher, while other countries, such as the ACP countries, will fall by 3%. Previous studies of EU sugar quota elimination, using different partial equilibrium models, predict have predicted price reductions of between 3.5% and 27% by 2020 (EC, 2011a, and Nolte, et al, 2012) and import volume reductions ranging from 5% to 70%, respectively.

For the price scenarios in this report, we use those developed by the European Commission (2014) (table 23 in appendix B), which predict an initial decline followed by a slight increase at the end of the ten-year period, with the EU price moving towards world market levels. The scenarios in this report for Belizean export levels to the EU assume a gradual linear reduction of 45% between 2015 and 2020 with stability until 2024, while Belize´s average selling price is projected to decline by 12.5% by 2020 (in line with the projections of the LMC and ODI, 2012).

The implications of the departure of the United Kingdom from the EU are as yet very uncertain. The terms of the separation are to be negotiated over the next two years. For this study, we assume that Belize's sugar exports to the UK will continue to be determined by the EU framework over the medium term.

The US

According to US Department of Agriculture projections, US sugar production will increase gradually over the next decade, with the level in 2024/25 expected to be 4.6% higher than in 2015/16, with improved field yields and industrial recovery rates more than compensating for a reduction in the area harvested (USDA, 2015). If we assume that, despite competition from other sweeteners and health concerns surrounding over-consumption of sugar, US sugar demand rises in line with population growth (in line with Nyberg, 2007), domestic consumption will be slightly ahead of the rise in domestic sugar production, so that US sugar imports will increase over the next decade, so that by 2024/25 they are 10% higher than in 2015/16. With Mexican sugar production projected to decline (with rising domestic consumption and the area planted falling faster than gains in yields), the increase in US imports is expected be sourced primarily from TRQ imports. This outcome could be favorable for Belize, whose base quota level in the US is 11,584 mt, with additional quota volumes being granted in some years due to supply shortfalls by other quota holders.

In the price scenarios in this report, price projections from the USDA are used for Belize exports to this market during the next decade, which show prices stable at US$0.494/kg. This US price projection is higher than the projected EU and world market price, and therefore it is assumed that Belize will always fulfill this export volume first. It is also assumed that Belize's base quota level will not be supplemented through additional TRQ allotments, although on US quota reallocations are possible.

Caricom

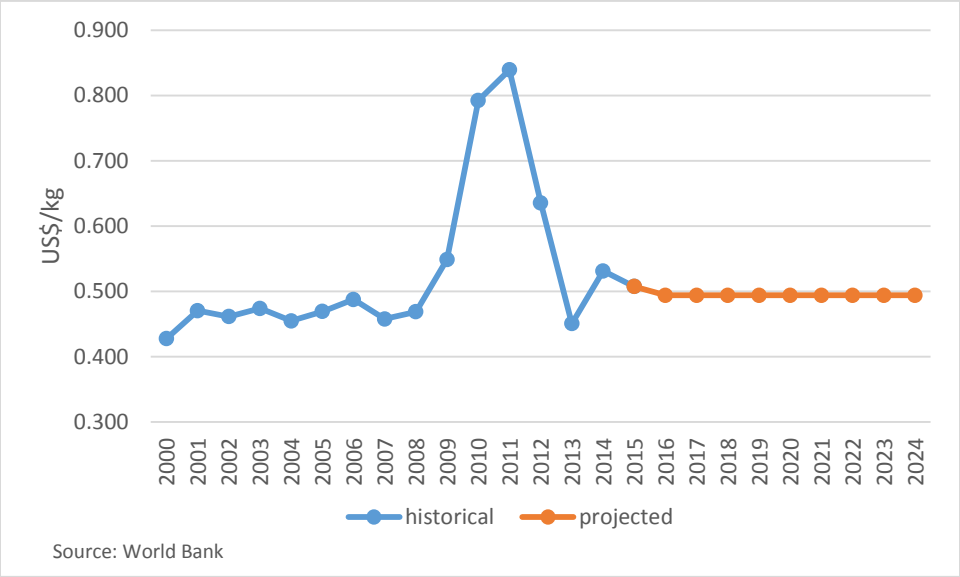
The Caricom market offers an interesting potential opportunity for Belize, as its price premium of 40% over the world market price looks set to continue. Indeed, this market could compensate for lower import demand in the EU and lower world market prices to a certain degree. Guyana has already

implemented a strategy of increased sugar exports to Caricom countries (IMF, 2015b). The Caricom price will be more attractive than the projected EU price, and given that most sugar imports into CARICOM are sourced from non-Caricom countries, we assume Belize can exploit its trade preference and that its exports gradually increase to a volume of 20,000 mt by 2018.

The world surplus (spot) market

Global sugar inventories are near record levels and the economic slowdown in China has contributed to weaker demand growth, so that over the next decade sugar prices are expected to remain weak (IMF, 2015a). Both the World Bank (2015; Figure 5) and OECD/FAO (2015) are forecasting prices in the range of US$0.36-0.38 in 2024-2025 (table 23 in appendix B). These projections also anticipate a narrowing of the premium for white sugar.

Figure 5 World Bank historical and projected prices for raw sugar in the world market



Falling world prices and high stock levels in a number of countries should lead to lower levels of investment in the sector, which should spur the deficit phase of the world sugar production cycle, preventing further declines in prices. Moreover, while sugar consumption is slowing in OECD countries, it is rising in developing countries thanks to higher population and income growth as well as changing dietary patterns towards more westernized diets with more sugar-containing and processed food products (Nyberg, 2007). During the next decade, sugar deficit regions of Asia and the Pacific and in Africa will be responsible for most of the increase of sugar use (OECD/FAO, 2015).

On the supply side, Brazil´s cost of production in dollars and the allocation of its sugarcane crop between sugar and ethanol production are key elements to determine prices at the global level for the coming decade. Ethanol production in Brazil has become more profitable than sugar production since 2012, despite falling petroleum prices, and the share of sugarcane allocated to ethanol in that country is expected to expand from 53% in recent years to 60% by 2024. The arbitrage between sugar and ethanol

in Brazil effectively creates a price floor for the world sugar price. OECD/FAO projects that globally, in 2024, 26% of sugarcane will go toward ethanol production, up from 20% in recent years.

For the price scenarios in this report, we use world price projections from the World Bank (figure 8 above and table 23 in appendix B), and Belize export volumes are assumed to be surplus supply not going to other markets, because the projected world price is the lowest price.

Fair trade market

The BSCFA has shown a great deal of concern the threat to the Fair Trade premium. Projects funded by the premium will be greatly reduced. However, because the Fair Trade premium technically does not go directly into the cash flow of cane farmers, and because of the relatively small volume and increased uncertainty concerning Belize's access to this market, it is not included in the calculations for future price scenarios.

(II) THE DOMESTIC MARKET

For the price scenarios in the following section, we maintain the new price ceiling of BZ$0.75/lb, while per capital consumption will be unchanged so that domestic consumption is projected to grow at the rate of population growth as projected by the World Bank.

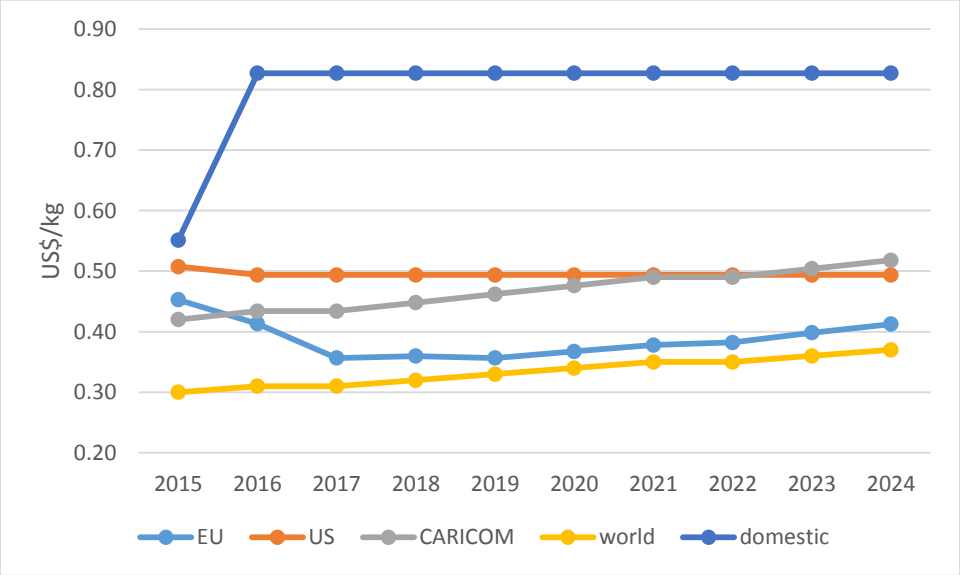
The economic case for the liberalization of domestic prices is strong. With sugar representing only 0.48% of the basket of goods and services in the Consumer Price Index in Belize, the price control's benefit in terms of the cost of living is marginal. Moreover, the price control has the effect of stimulating black markets. Within the country, the fixed price results in frequent shortages in stores (Valdés and Foster, 2013) that create higher effective prices for consumers through extra time spent to find supplies and/or higher-priced black market sales. Meanwhile with higher prices in neighboring countries, local traders on the border with Mexico are known to repackage Belizean sugar for informal export. This informal trade highlights the weakness of border controls by the Belize government. Valdés and Foster (2013) have speculated that this lack of control might be a sign that "the government at some level has made the decision not to control such commerce as a source of income" for small-scale rural traders, or that enforcement to prevent the contraband might be too costly, although recent indications from the Ministry of Trade suggest that the authorities are hoping to make headway in reducing contraband trade.

So the fixed price depresses the incomes of cane farmers and profits of ASR/BSI, encourages informal trade, and has a perverse effect on consumer utility. Valdés and Foster (2013) and Horton and Norton (2010) both suggest that the price controls should be eliminated (as well as import licenses that effectively restrict sugar and molasses imports). Nonetheless, the Government is reluctant to make the change due to (albeit misplaced) public perceptions that the controlled price provides protection for Belizean consumers, and particularly for low-income households. For this reason, we assume that the price control will remain in place. If it were to be removed, the effect would be to increase the sugar industry's earnings from domestic sales, which account for around 15% of total sales.

(III) SUMMARY OF PRICE PROJECTIONS FOR THE DIFFERENT MARKETS

On the basis of the discussion above, the projected prices used in the scenarios for each of the markets in the following chapter are as shown in Figure 6 below. The price in the EU, which has been the most important market, is projected to decline sharply to 2017 before a gradual and partial recovery in subsequent years; the US sugar price is projected to remain flat; the CARICOM price is projected to rise gradually, converging with the US price by 2021; and the world market price, which will remain lower than any of the others, is projected to pick up slowly from current lows. The domestic sugar price is assumed to remain fixed.

Figure 6 Prices used for simulations

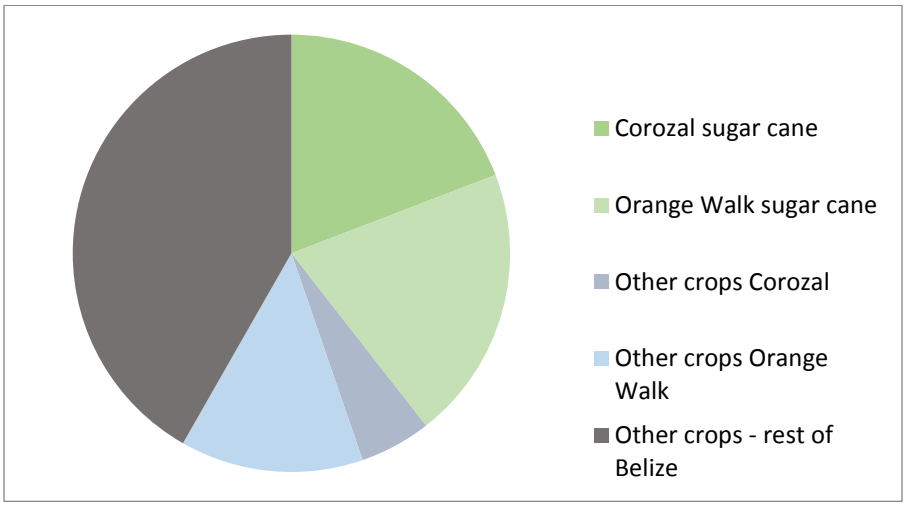


To forecast the earnings of the sugar industry, we now also need to forecast Belize's future output, which in turn will determine the average price for the country's sales to the different markets. The average price depends on the proportion of sugar sold to each of the markets, which in turn depends upon the volume of sugar exported. In the following chapter, we therefore examine the determinants of sugar output and sales volumes from the two regions over the forecast period, in order to generate a series of scenarios for average prices and earnings.

2. IMPACT OF PRICE CHANGES ON BELIZE'S SUGAR INDUSTRY AND LIVELIHOODS

The impact of changing global market conditions will differ between the two sugar-growing areas: the traditional sugar region in the north of the country and the new sugar fields in the west, around the country's new second sugar mill that has transformed the country's agricultural profile (Figure 7). The characteristics of these two industries contrast sharply in terms of methods of production, labor and capital intensity, and the nature and local concentration of employment; and these differences affect the nature of their vulnerability to weaker market prices.

Figure 7. Agricultural crop land in Belize (ha), 2015



Source: Belize Farm registry

A. TRADITIONAL SUGAR INDUSTRY IN THE NORTH

(I) INDUSTRY STRUCTURE, TRENDS AND VULNERABILITIES

Of Belize's two sugar regions, the northern region is undoubtedly the most exposed to the changing fortunes of the industry. Sugar in the north covers almost 30,000 ha (Table 1): 60% of all agricultural land in Orange Walk district and 78% in Corozal district. Before the arrival of the new sugar industry in the west, this amounted to 40% of the country's total agricultural crop land. (See map of sugar cane areas in Appendix B.)

All the sugar in the northern sugar region is processed at the Belize Sugar Industries (BSI) Tower Hill mill, which has been majority owned by American Sugar Refineries (ASR) since 2012, but the sugar farms are mainly privately-owned by small farmers. There are 5,440 cane farmers across the region. The majority are in Orange Walk, where the average farm size is smaller than in Corozal. According to the Sugar Industry Research and Development Institute (SIRDI), 14% of the farms produce less than 50 tons, 22% between 50 and 100 tons, and 32% 100 to 200 tons. These figures do not include sugar land owned by ASR/BSI, which accounts for around 9% of production.

Table 1 Structure of sugar cane farms in northern region

	Corozal	Orange Walk	Total
cane farmers	2,488	2,952	5,440
cane area (ha)	14,507	15,440	29,947
cane grown 2015 (mt)*	1,074,596	799,065	1,873,662
avg. area per farmer (ha)	5.8	5.2	5.5
avg. production/farmer (mt)	431.9	270.7	344.4

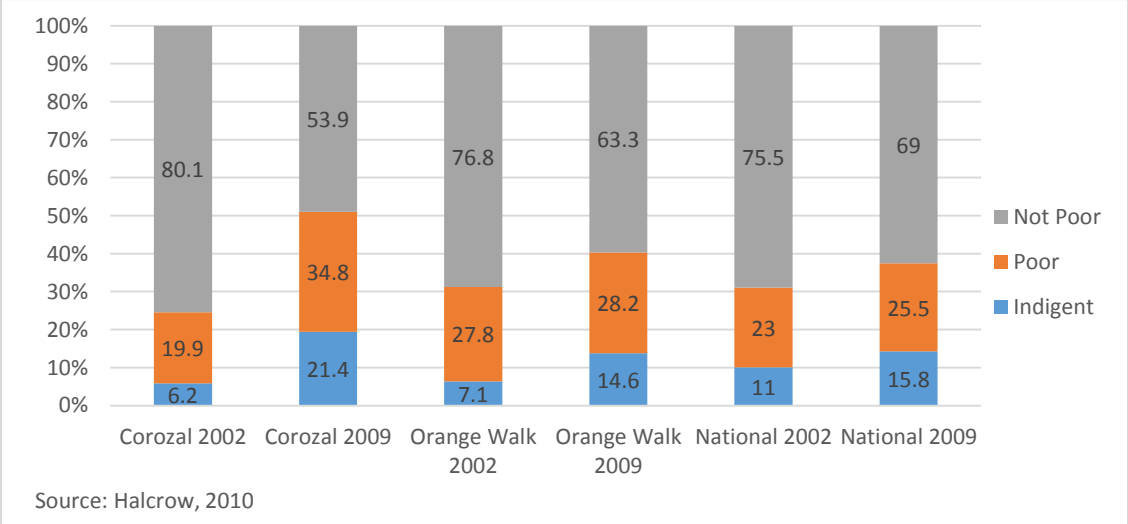
Sources: SIMIS; Belize Farm Registry; Sugar Cane Production Cmte.
Note: Cane delivered does not include cane fields grown by the mill.

The vulnerability of the local economies of the two northern districts to the fortunes of the sugar industry is evident in the data for farm ownership (including leaseholds) and agricultural employment. In Orange Walk, cane farmers represent 97% of the households with farmland, and in Corozal the proportion is 90.3%. In addition to the 5,440 registered sugar cane farmers, cane production is estimated to employ an additional 4,800 workers, and the Tower Hill mill employs over 500 people. In all, sugar accounts for over 30% of the total 35,000 jobs in the Orange Walk and Corozal districts.

The northern region's vulnerability arises not only from the dominance of sugar in the regional economy, but also from the relatively low incomes – and high incidence of poverty – among sugar-dependent households, which are also heavily indebted. Nationwide, the highest levels of indigence is among farmers and agricultural laborers. Census data shows that among households whose primary sector is agriculture, the overall poverty rate was 50%, far higher than the national average (a finding confirmed by Halcrow, 2010), and 42% of agricultural households are 'indigent' compared to only 23% of households nationally. No separate poverty data are available for sugar cane, but the available evidence suggests that poverty levels among sugar farmers, and particularly among cane harvest workers, are high relative to the rest of the population. This is illustrated by the rise in poverty between 2002 and 2009 in Corozal and Orange Walk, which was much more marked than for the national average (Figure 8). In Corozal, poverty doubled and indigence almost tripled. While Hurricane Dean in 2007 and flooding in 2008 affected farming livelihoods across the country, and the cost of the minimum food basket also increased strongly between 2002 and 2009,[5] the particularly sharp rise in poverty in Orange Walk and Corozal coincides with the decline in sugar production over the period due to lack of investment. (Problems in Banana production at the time of the 2009 census similarly explain an increase in poverty in the banana-growing Stann Creek district.)

[5] From BZ$1,244 to BZ$1,953 in Corozal and from BZ$1,215 to BZ$1,942 in Orange Walk. Source: Statistical Institute of Belize.

Figure 8 Population poverty rates, 2002 and 2009



Source: Halcrow, 2010

(II) TRANSMISSION OF WORLD PRICES TO INCOMES AND PROFITS

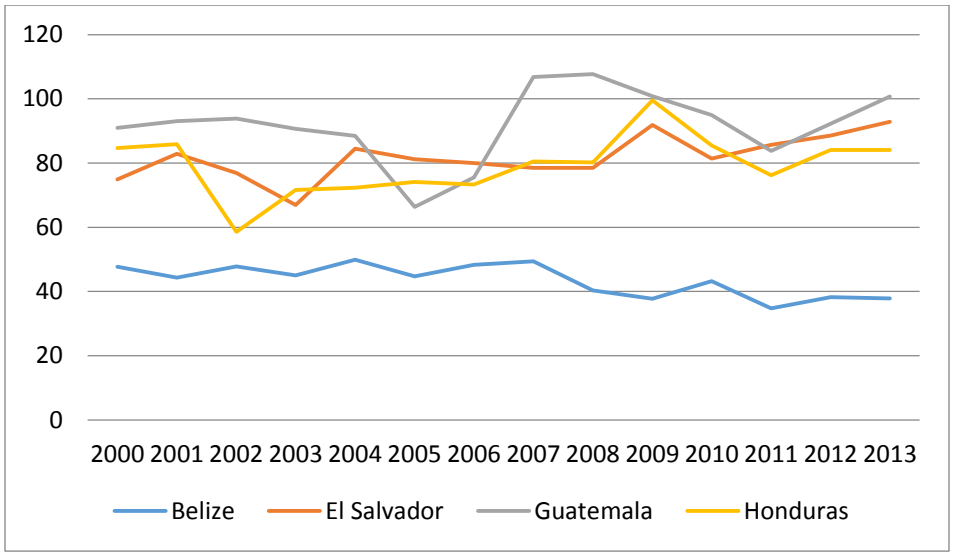
The current price sharing agreement between cane farmers and the sugar mill owners in the northern region, which is valid for seven years from 2015, divides all net proceeds from the sale of sugar and molasses, with 65% of the "net stripped value"[6] going to cane farmers and 35% going to the sugar mill.[7] The impact of falling sugar prices is therefore directly felt by farmers.

The farmers are paid by the mill owners in three stages: (i) one week after cane delivery, they are paid the equivalent of 85% of their estimated final share, based on the expected export price and a uniform assumption for sugar content and quality; (ii) five weeks after the harvest ends they receive a further 10% of the estimated final share, with an adjustment for sugar content and quality of the cane that each farmer delivers; and (iii) after the end of the crop year in November for the remaining 5% is paid, based on the actual final price for sugar and molasses sales.

The impact on farmers' livelihoods of falling sugar export prices will depend on their ability to either increase productivity or reduce costs, or both. The exceptionally low level of agricultural productivity relative to neighboring countries (Figure 9) suggests that there is plenty of scope for productivity improvements: simply by increasing yields to the regional average, production per hectare would double.

[6] 'Net stripped value' is the revenue from sales of sugar minus the costs of transporting the sugar to the ship.
[7] At first sight the 65%/35% split appears to be favorable for Belize´s farmers when compared to neighboring countries, such as Guatemala, with 54% for producers , Mexico, with 57% for farmers, Honduras, with 40%, and El Salvador, with 54.5%. However, further research would be required into the details of the arrangements in order to establish the true value of the Belizean agreement relative to the others.

Figure 9 Sugar cane yields in Central America, 2000-13 (tons/ha)



Source: FAOSTAT.

This is the approach suggested by the Strategic Development Plan (SDP) for Belize's sugar industry, which has the goal of doubling agricultural yields from 42 to 88 tons/ha (42.7 to 89.4 mt/ha)[8], and increasing cane quality from 12% to 15% pol. A yield of around 70 ton/ha (71.1 mt/ha) is seen as the threshold for sustainability of the industry. This goal is also accompanied by the target of decreasing sugar production costs by some 30%, from US$0.22/lb (US$0.485/kg) to US$0.15/lb (US$0.331/kg) (ASR Group/Belize Sugar, 2015). This is to be achieved by:

- **Introducing best practices** through improved extension services, to teach improved pest and disease management, promote better seed varieties and replpant with improved early, mid and late maturing cane varieties, to ensure a more steady flow of fresh cane.
- **Green harvesting**. Over 98% of sugar cane is currently burned at harvest, and the aim is to reduce this to less than 93% in the short term. To make this possible it is necessary to increase mechanization. Less than 3% of the crop is currently mechanically harvested, and increase this ratio, it will be necessary to adapt farms to provide sufficient length of rows and distances between them, and turning areas for machinery.
- **Cutting the cost of harvesting and transport to the mill**. Harvesting groups in Belize are small and numerous, with cane loaders typically used at only 3% of capacity annually and trucks at approximately 15% of capacity. Of the 269 registered harvesting groups, 43% are so small they can only deliver one load per day, and only 23% can deliver more than two loads per day. (Weekes, 2015). Consolidating these small harvest groups would allow for economies of scale and a more efficient use of machinery.
- **Improved drainage and irrigation.**

[8] Pilot plots can achieve yields up to 135 mt/ha.

ASR/BSI has been working closely with SIRDI, with support from the EU and IDB, to boost agricultural yields in line with this strategy. However, in order to achieve the higher production targets, the industry will need to surmount three main obstacles:

- **Financing**. A debt overhang and lack of access to affordable financing for replanting and investment in improved inputs. Farmers who are already heavily in debt are unable to borrow further to improve yields. Limited access to financial education and low financial literacy has compounded this problem.
- **Lack of a sense of urgency** among farmers. Previous predictions of sharp price falls (for example, a 32% fall by 2013 projected by Conforti and Rapsomankikis, 2006) following an earlier EU sugar policy reform in 2006 failed to materialize because of the strength of global market prices. This experience has eroded farmers' belief that the elimination of preferential prices in the EU necessarily presents a major threat.
- **Mill capacity constraint.** The Tower Hill Mill has a milling capacity of 1.32 million metric tons (mt), so when overall agricultural production in the region rises, the additional sugar over that amount is left unprocessed. Indeed, this has already occurred in 2015, when cane production exceeded milling capacity, leading to approximately 20% of the cane being left in the field[9].

The mill capacity constraint presents an intractable problem, and one that creates tension between farmers and BSI-ASR. The company has outlined a proposal to invest US$100-150 million to expand the capacity of the mill to 2.03 million metric tons of cane, as well as doubling the plant's cogeneration capacity to 22% of national electricity needs (for which farmers could earn additional payments for delivery of bagasse)[10], but it has not yet confirmed the financing, indicating that it first needs (i) consistent higher production; (ii) improved terms for the sale of electricity to the state-owned electricity company, Belize Electricity Limited (BEL); and (iii) reduced costs of transport of raw sugar for export. It has been calculated that of total costs of production of sugar (field to port), 62% are for transport (EC, 2013a). Each of these conditions is problematic.

(i) Unless farmers can be guaranteed that their sugar will be purchased, they have little incentive to increase production. As the mill is already at full capacity, they have been discouraged as their efforts to improve yields have resulted in having to leave some of their product to go to waste. With a total debt overhang for cane producers estimated at BZ$25-30 million, Belizean sugar farmers' ability to invest is constrained by the risk of 'debt escalation' identified by Mitchell (2005) as a characteristic that is widespread in the Caribbean sugar industry.

(ii) The cogeneration plant argues that the price paid for electricity is not high enough to incentivize it to increase output, but the electricity company is unwilling to raise it. Belize´s electricity market is officially liberalized but the government has extensive control through the Public Utilities Commission, which regulates tariffs and grants licenses for generation, transmission and

[9] According to Sugar Cane Production Committee data, 1,458,000 tons of cane were produced but only 1,167,000 tons processed.

[10] The price sharing agreement includes a payment to farmers of an additional BZ$0.50 (US$0.246/mt) per long ton of cane delivered for the "fiber" used. Belize is the first country in the region to formalize such payments. In Mauritius (ASR Group/Belize Sugar, 2015) cane farmers receive US$3.46/mt (Mauritius Sugar Syndicate, 2015)

distribution; and BEL, which has a virtual monopoly on electricity transmission and distribution. The sugar mill cogeneration plant, a separate business entity named Belize Co-Generation Energy Ltd (Belcogen), is under contract with BEL to provide electricity for around US$100/MWh. Belcogen has the capacity to supply 13.5 MW, 12% of BEL´s electricity (BEL, 2014) over eight months of the year, and claims that it could potentially expand electricity sales sufficiently to boost ASR/BSI total revenue from its Belizean operations by one third with additional investments to use alternative sources of biomass, such as King grass (pennisetum purpureun) or fast-growing woody trees (such as Eucalyptus, Gliricidia sepium, or Leucaena leucocephala), to produce electricity year round. However, Belcogen complains that the price paid by BEL, which is 60% lower than the cost of electricity imported from Mexico, is a disincentive to further investment (ASR Group/Belize Sugar, 2015). For its part, BEL is reluctant to raise the price, arguing that Belize´s final electricity rates to users are among the highest in the Central American region (Gischler, et al, 2014).

(iii) No financing is yet available for the investments required to reduce transport costs. At present there is no access for deep sea vessels in the proximity of the mill; sugar and molasses are transported through barges and tugs sailing 33 miles north along the New River to Corozal Bay, and then 89 miles southwest along to the coast to a deep water anchorage situated 4 to 6 miles offshore from the port of Belize. High handling and freight costs adversely affect the competitiveness of the industry. In 2015, export costs for sugar averaged US$94.14/mt for the EU market and US$49.31 for the US market. In comparison, export costs range from US$28.66 to US$47.40/mt of sugar in El Salvador, depending on the sugar mill. The Port of Belize is contemplating an improved bulk handling facility, which would reduce sugar loading times; the EU has recommended the use of larger barges and tugs and improved loading arrangements, which could increase loading from the current 700 to around 4,000 metric tons per day (EC, 2012). ASR/BSI has supported plans for the creation of a new bulk handling facility at Commerce Bight (estimated cost US$60-US$70m), but with current volumes and tight fiscal restraints, neither ASR /BSI nor the government are ready to finance the required investment.

(III) AVERAGE EXPORT PRICE SCENARIOS FOR THE INDUSTRY IN THE NORTH

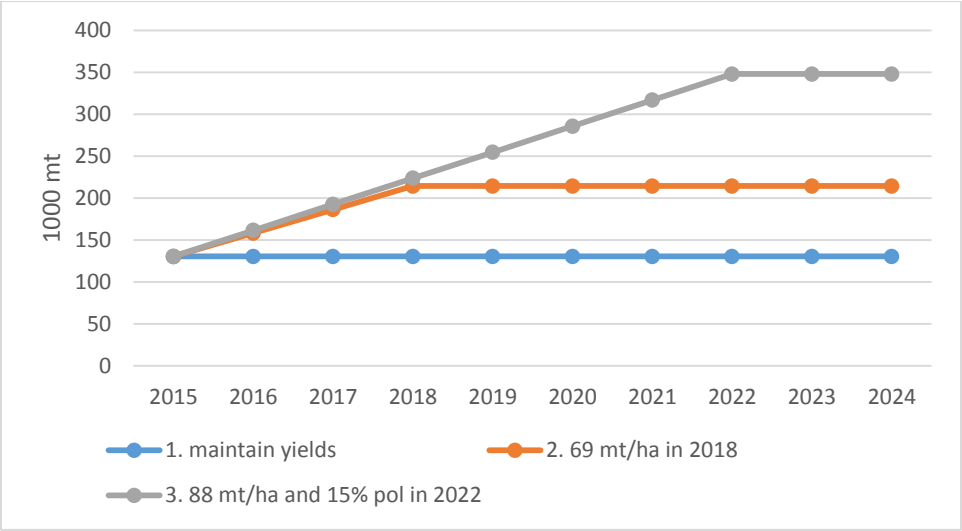
Given the uncertainty about the capacity of the sugar industry in the northern region to raise production, we use three production scenarios for the simulations for the impact of falling sugar prices:

1. Maintain current yields, estimated at 42 mt cane/ha and 110 kg sugar/1 mt cane, resulting in a production of 130.473 mt.
2. Achieve SIRDI goals for yield (69 mt/ha) in 2018, reaching a production level of 214,349 mt.
3. Achieve SDP goals for yield (88 mt/ha) and pol[11] (15% - which would lead to an industrial yield of 140 kg sugar/1 mt cane) in 2022, reaching production of 347,929 mt.

These three scenarios are illustrated in Figure 10.

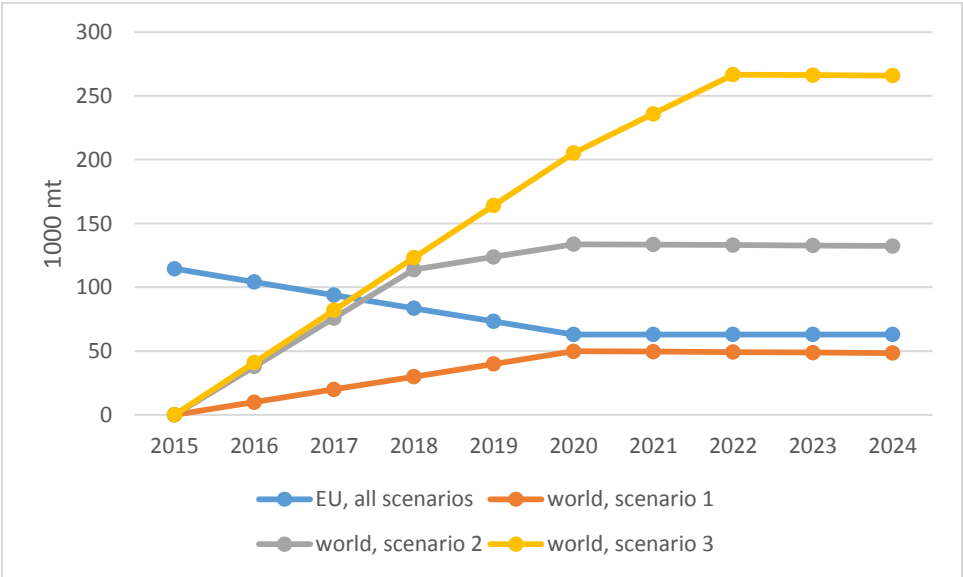
[11] See appendix C for an explanation of how pol % affects sugar yields.

Figure 10 Production scenarios for sugar in the northern region



To determine how much of the sugar at the different levels of production would be exported to each market, we begin with the assumption that supply to the domestic market and exports to the US (limited by its TRQ) remain constant, and CARICOM exports grow to 20,000 mt by 2018. We also assume that exports to the EU diminish from 2016-2020 as EU becomes a less attractive market. Sales on the world market, where prices are lower than the other markets, will therefore represent the residual of Belizean sugar exports. Figure 11 below (and table 17 in appendix B) shows the impact of the three different production scenarios on the level of exports to the world surplus market. As production levels grow, exports to the world surplus market, where prices are lowest, grow accordingly.

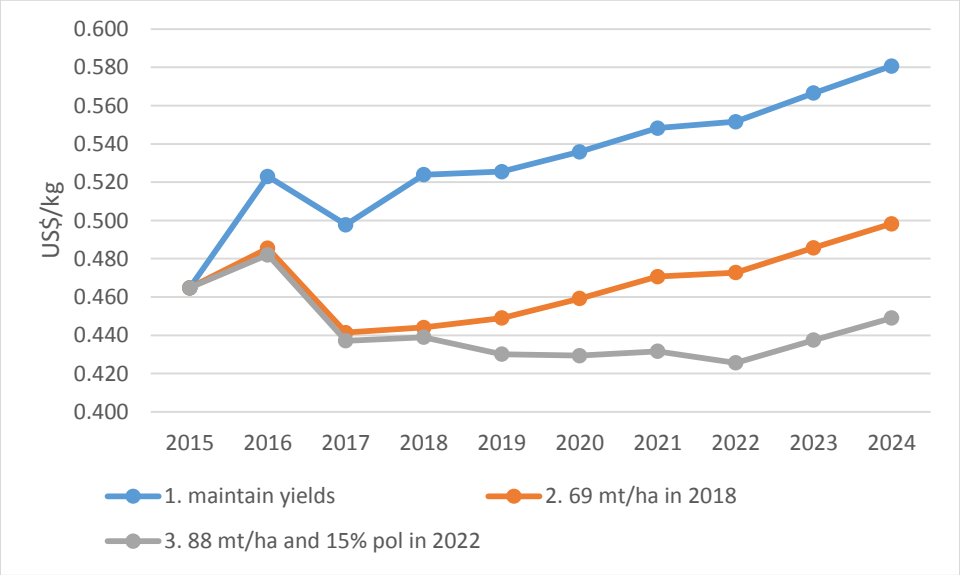
Figure 11 Sugar exports under different production scenarios



To calculate the weighted average prices for Belize sugar, these export volumes to each market (and sales to the domestic market) are combined with projected prices in each market. The weighted average prices are shown in figure 12 (and in table 17 in Appendix B).

Under the maintenance scenario, the weighted average price for Belize´s sugar increases as higher-priced domestic consumption grows, Caricom exports grow initially, and exports to the lower-priced EU and world surplus markets decline. The other two weighted average price scenarios show that average weighted price for sugar would fall as production grows, because an increasing share of sugar would have to be sold to the surplus world market, whose price is relatively unfavorable.

Figure 12 Weighted nominal average prices for sugar under different production scenarios



The negative effects of productivity gains on the average real price of sugar might suggests that the more the farmers invest to increase production, the less they will earn per ton. However, the effect of the lower price on the net incomes of farmers will also be determined by output and any efficiency improvements (at the growing, harvesting or transporting stages).

(IV) REAL NET INCOME PROJECTIONS FOR PRODUCERS IN THE NORTH

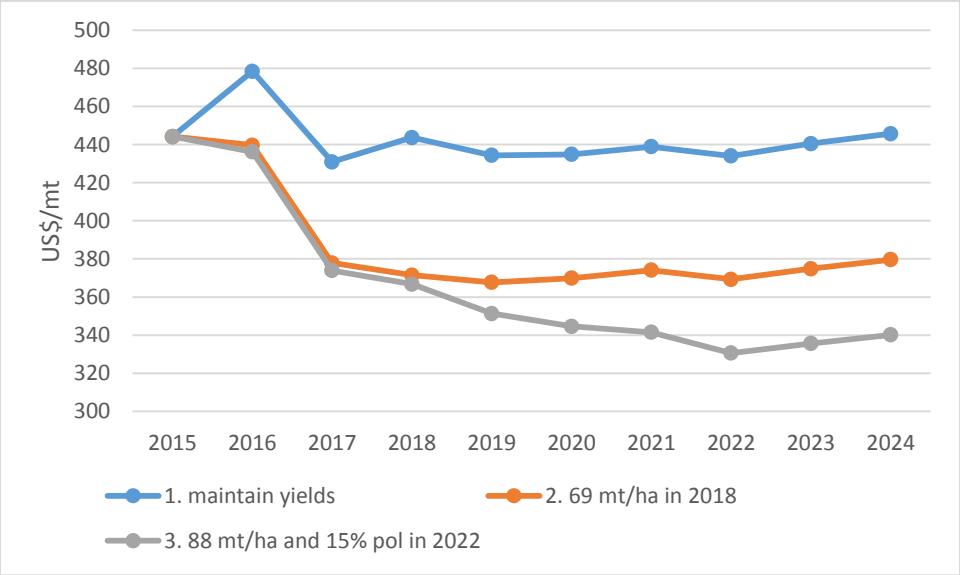
In order to estimate the effects of investments on farmer´s livelihoods we first need to adjust for inflation. We deflate price projections using an annual rate of 1.5% (table 18 in appendix B), slightly above the 1.1% average rate of inflation in Belize during the past five years. We then need to adjust these real prices for the typical price premium that Belize sugar achieves in its exports, as shown by reports from BSI/ASR to estimate the cane price in 2015, minus expenses for shipping and handling, to arrive at the net stripped value for sugar destined for each market (figure 13 below and table 20 in

appendix B).[12] These prices follow a similar pattern as do the nominal, non-adjusted ones (figure 12, p. 38), with greater production levels leading to lower average prices as more exports go to the lower-value world surplus market, but at lower levels.

Given these adjusted prices, we return to the three scenarios for production (table 27 in appendix B):

1. Maintain current yields, estimated at 42 mt cane/ha and 110 kg sugar/1 mt cane, resulting in a production of 130,473 mt of sugar.
2. Achieve Sugar Industry Research and Development Institute (SIRDI) goals for yield (69 mt/ha) in 2018, reaching a production level of 214,349 mt of sugar.
3. Achieve SDP goals for yield (88 mt/ha) and pol (15% - which would lead to an industrial yield of 140 kg sugar/1 mt cane) in 2022, reaching production of 347,929 mt of sugar.

Figure 13 weighted average real prices for sugar

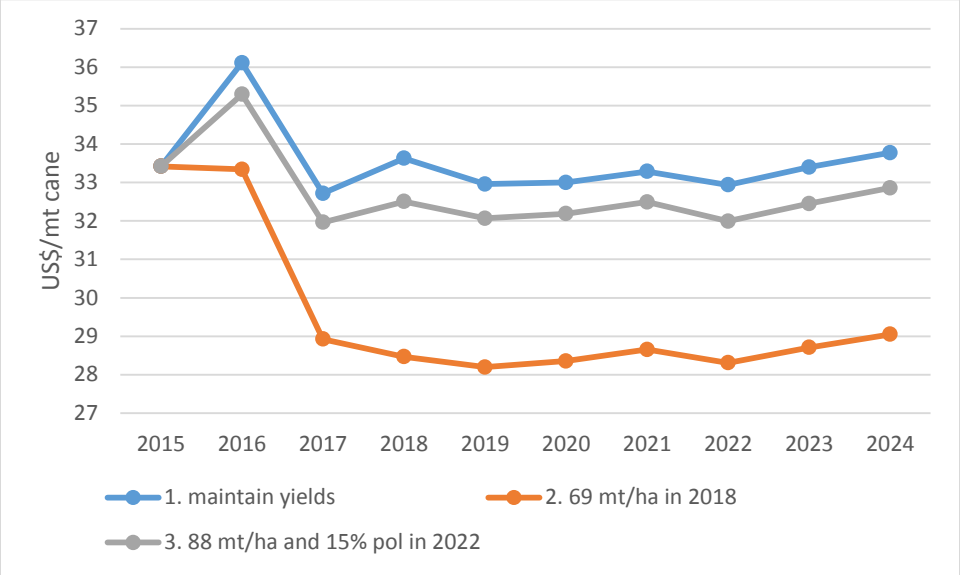


These scenarios are used to calculate expected gross revenues for sugar cane. The adjusted real weighted average prices for sugar are then combined with net stripped value from molasses sales (table 27 in appendix B) (whose prices and yields per ton of cane are assumed to be unchanged from 2015), and these values are used to calculate cane farmers´ share of 65% of the net stripped value of sugar and molasses sales per metric ton of cane (figure 14 below and table 20 in appendix B), including also the new revenue from bagasse of US$0.246/mt as of 2016. Because cane quality is also assumed to improve

[12] In 2015, the average premium for Belizean exports to the EU, compared to the reference price, was 21.6%, while the premium for exports to the US was 5.7%. The differential for intermediaries between the official price for domestic sugar and the price received by the industry was US$167.57/mt. Average export costs for sugar shipped to the EU was US$95.32/mt in 2015, while for the US, this figure was US$46.80/mt; domestic handling costs were US$23.82/mt. It is assumed that export costs for the world market and for CARICOM are assumed to be equal to those for the US. Average export and handling costs for molasses were US$18.30/mt.

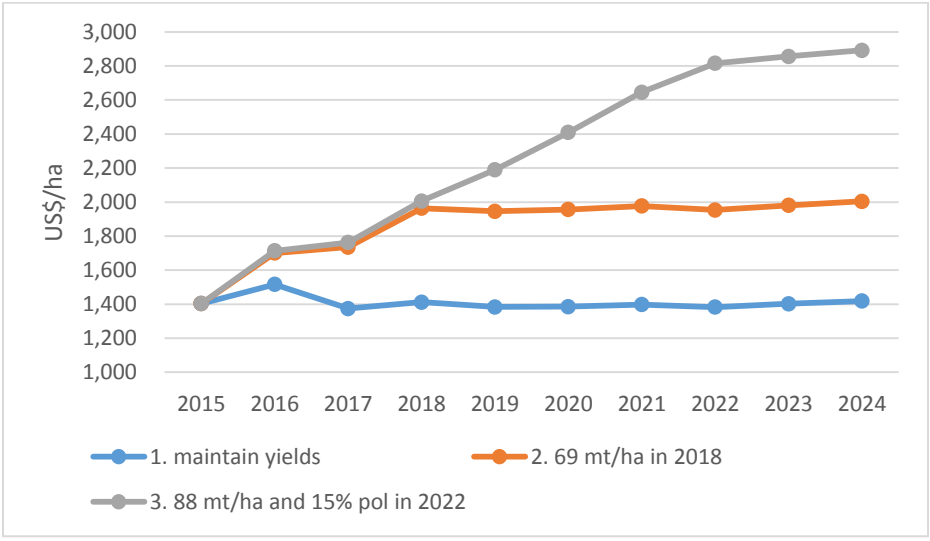
in the third scenario, reaching 88 mt/ha and 15% pol, gross incomes per mt for cane farmers are higher than in the second scenario.

Figure 14 Real gross income per mt of cane produced



In order to forecast farmers' incomes, these real gross incomes per mt of cane need to be calculated on a per hectare basis (figure 15 below and table 20 in appendix B). Here the benefits of improved yields and quality are evident. Gross incomes fall slightly to under US$1,400/ha under the maintenance scenario, while when productivity and production grow to 69 mt/ha, gross revenues increase to US$1,900/ha, and when yields and quality improve in the third scenario, gross incomes grows to around US$2,800/ha.

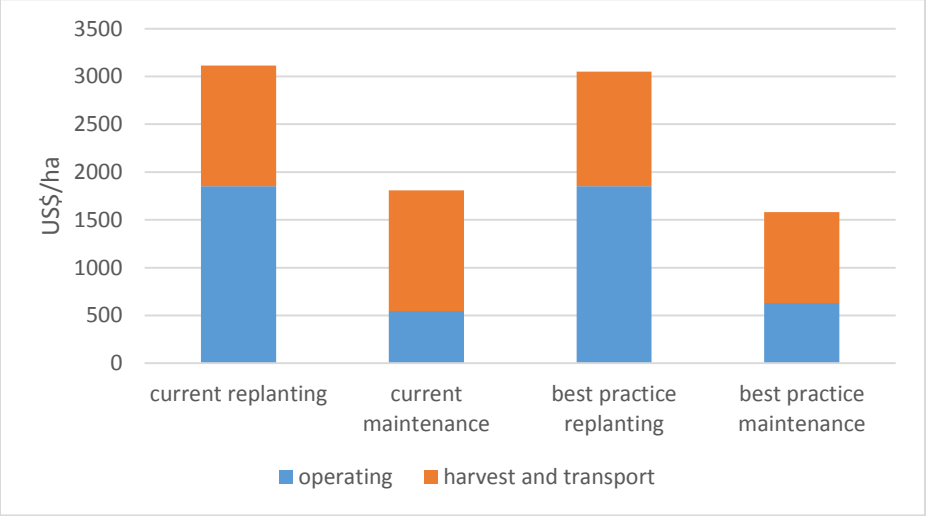
Figure 15 Real gross income per hectare of cane



This analysis is not complete until costs of production are taken into account, to show farmer's net incomes. One cane farmer association estimates current agronomic costs for replanting one hectare in the North at approximately US$1,853 (table 7 in appendix B), and ratoon maintenance costs at US$549, while transport costs are on average US$30.02/mt (table 8 in appendix B)[13]. Estimating that cane was previously replanted every 15 years, this would lead to an average annual cost of production of US$1,890.87/ha, including harvest and transport. These current practices yield the average 42 mt/ha of cane, and are used as costs of production to estimate net incomes under the first production scenario.

For the other two scenarios, SIRDI estimates that under ideal conditions and using best management practices, replanting costs for one hectare in the northern region would be approximately US$3,052 (table 7 in appendix B), and maintenance costs for subsequent years would be US$1,580 (table 8 in appendix B), both including harvesting and transportation. These best practices should yield at least 87.9 and 62.8 mt of cane per hectare, respectively. When put on a six year cycle, which is recommended for sugar cane, the average yield is 66.98 mt/ha, and the weighted average cost of production per metric ton of sugar cane is US$27.25. Current and best practice costs of production are compared in figure 21. For the increasing production scenarios, use the SIRDI estimates for agronomic costs, an average of US$833.77/ha, and adjust harvest and transportation costs according to production levels, at US$14/mt.

Figure 16 Current and best practice costs of production for sugar cane



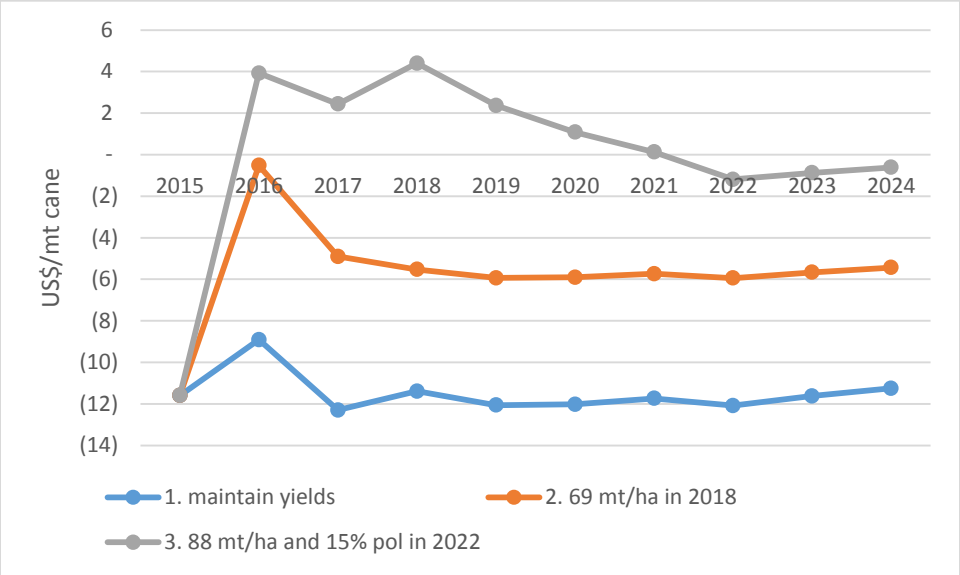
When these costs of production are subtracted from the real gross revenues estimated previously, this generates estimates for real net incomes for cane producers (figure 17 below and table 21 in appendix B). Initial incomes as approximated for 2015 show negative values, because it is customary to include all labor costs in estimates for costs of production, even labor provided by cane farmers or family members which are not directly remunerated. Therefore it is common to find estimates of costs of production

[13] In comparison, agronomic replanting costs in El Salvador, which has similar scales of production as Belize, are approximately US$1,394.60/ha, ratoon maintenance costs are US$741.84/ha, with yields of 102.87 mt/ha and 89.23 mt/ha, respectively, plus harvest and transport costs of US$8.40/mt (DGEA, 2014).

where farmers have negative earnings, because they earn less for their own labor than if they had worked in another´s farm.

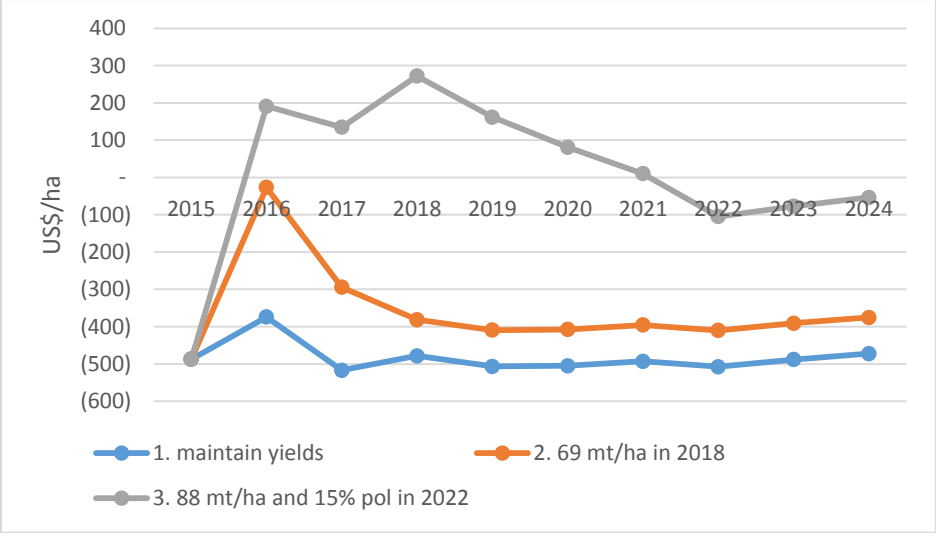
Over time, in the maintenance production scenario and in production scenario 2, when yields improve to 69 mt/ha, these net incomes remain negative. In the more ambitious production scenario 3, when cane productivity and quality improve more strongly, net incomes are positive until the final years, when the lack of improvement in real US and world projected prices lead to negative earnings, particularly when exports to the lower valued world surplus market reach their maximum as of 2022.

Figure 17 Real net income per mt of cane (US$)



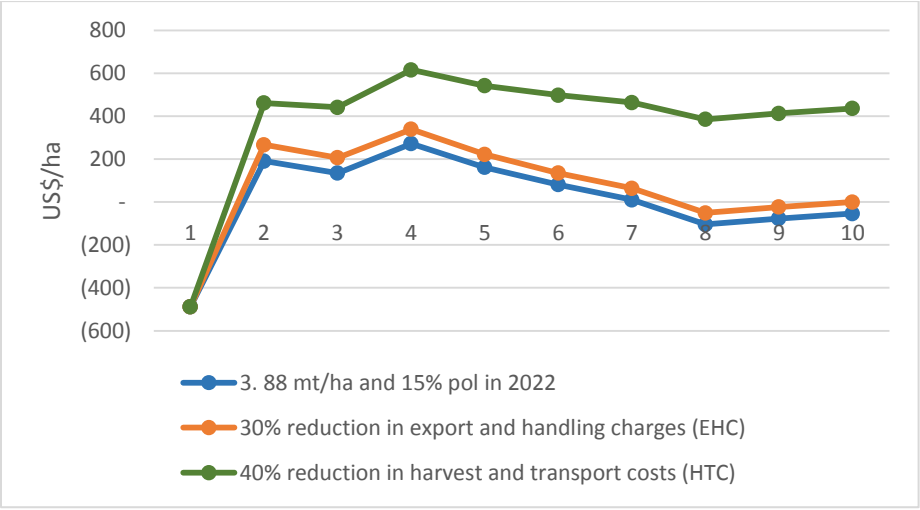
When shown on a per hectare basis (figure 18 below), even when earnings under production scenario 3 are positive, they are relatively low, between US$100 and US$200 per hectare. Considering that most farmers are small, with 76% cultivating 2 ha or less of cane, and that another 19% farm between 2 and 4 ha, total net incomes for the first group would not be more than US$400 per crop, much less than US$2 a day, and in the second group, would be between US$400 and US$800.

Figure 18 Real net income per hectare of cane



These results appear discouraging. However, while yield and cane quality improvements are not enough to move the sector into a more profitable long term position, there are important opportunities to reduce costs whilst investing to raise yields. Two important areas discussed previously are cane harvest and transport costs, and sugar export and handling charges. Harvesting and transport costs amount to around 40% of Belizean farmers' gross income, at around US$30 per mt of cane, despite relatively short transport distances (with the *farthest* distance of around 56 km compared with an *average* distance of 75 km in El Salvador).Given the high level of Belize's harvest and transport costs relative to other countries, and considering the strategy laid out by Weekes (2015), it appears that it should be possible to reduce cane harvest and transport costs by 40%. In the case of sugar export and handling charges, the chart below (Figure 19, based on data in Table 19 in appendix B) shows that a 30% reduction in these costs (also) net incomes improve slightly. If combined with the reduction of harvesting, loading and transport costs, net incomes double, producing farmer incomes consistently above US$400 per hectare.

Figure 19 Production scenario 3 with reduced harvest, transport and export costs



The simulations shown here suggest that it might be possible to increase farmer incomes at the same time as raising agricultural yields to improve competitiveness in the face of changes in international market conditions. However, to achieve this positive outcome would require major investments in infrastructure as well as coordinated efforts to improve agricultural practices and efficiency within the industry.

If, as the above scenarios suggest is likely, Belize's northern region is unable to increase net real income per hectare despite improvements in yields, it will not be possible for all sugar farmers to sustain their families through sugar cultivation. With a decline in earnings per tonne, some degree of consolidation is likely, with marginal farmers facing unsustainable debts eventually selling up to less indebted or more profitable neighbors. Indeed, the possibility of farm consolidation is mentioned in SDP (ASR Group/Belize Sugar, 2015) and Weekes (2015). No forced sales or incentives for sales are mentioned, but the most likely path to such consolidation would be the loss of livelihoods for a significant, though uncertain, proportion of Belize's sugar farmers in the northern region.

B. NEW SUGAR INDUSTRY IN THE WEST

(I) INDUSTRY STRUCTURE

The sugar industry in the Cayo district in the west of Belize is known as Green Tropics, and is part of the Santander Group of Guatemala. The agricultural interests operate as Santander Farms and the mill company is known as Santander Sugar. The mill (purchased and transported from St. James, Louisiana) is situated between Valley of Peace and More Tomorrow, some 20 km north of Belmopan, and began operations in 2016.

The sugar cane area owned by Santander Group is 13,000 acres, producing a projected 1.3 million mt of cane: around the same level of production as the north. The total amount of land planted to sugar is eventually expected to expand to reach 20,000 acres, as other growers set up plantations in the region. These independent farmers will sign forward contracts with the mill (capacity to process 6,000 tons of cane a day, compared with the Tower Hill Mill's capacity of 8,000 tons), and receive technical, mechanical furrowing and harvesting assistance from Santander.

Agricultural productivity and efficiency are expected to be much higher than in the north, thanks to the highly mechanized and vertically integrated operation. According to the company's statements (see Belize Environmental Consultancies, 2013) agricultural yields are projected to be 40 tons/acre, or 100.4 mt/ha, much higher than recent levels in the Northern region, and more in line with the surrounding countries in Central America. The large plots of land facilitate mechanization, with savings on harvesting particularly strong thanks to specifically designed spacing of rows and allowances for turns for machinery. Mechanization also allows for green harvesting (ie no burning), which improves cane quality and reduces weeds and increases soil moisture and fertility during the next growing season. The use of early, mid and late maturing varieties means that the harvest can be programmed throughout the season to reap cane at its peak sugar content and ensure efficient receiving at the mill to reduce sugar loss. The cane fields should have standardized agronomic practices and finely tuned pest management, maximizing cane yield and quality, and substantial investment has been made in irrigation and drainage to ensure stable yields through climate extremes. Transport costs will be reduced by the relatively short distance between the cane fields and to the mill (within a radius of approximately 15 miles).

The sugar industry in the western region is expected to employ 750 people during harvest season, including 560 for the farming operation (Belize Environmental Consultancies, 2013), representing anticipated production of an average of 2,321 mt and 23.2 hectares per worker, compared with 127 mt and 2.8 ha per worker in the northern region.

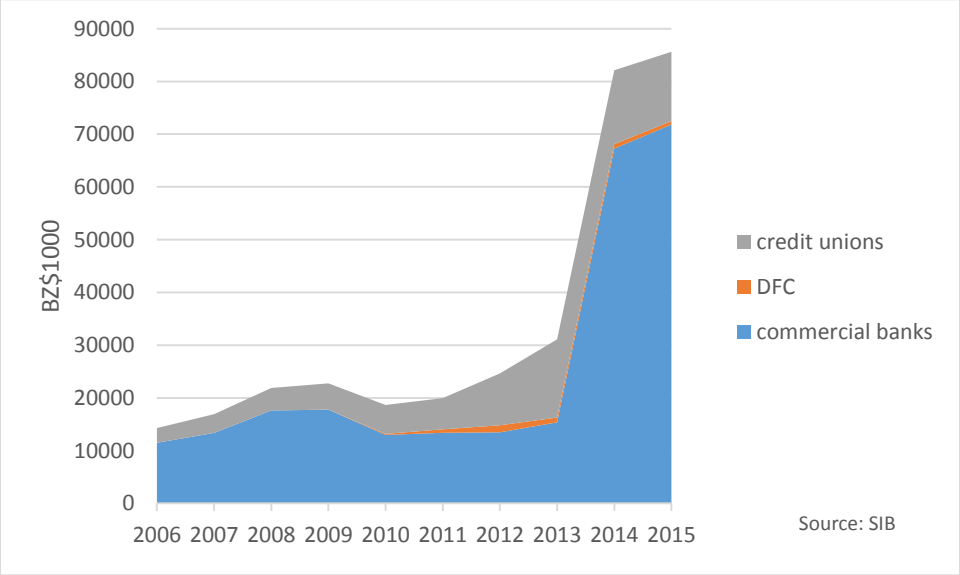
(II) VULNERABILITIES

The difference between the two regions highlights the impact the mechanization can have on labor productivity – and therefore also on the exposure of sugar workers and the local economy to changes in international market conditions. Unlike the sugar farmers in the north, Santander employees are paid salaries rather than a share of export earnings, so their incomes are not directly linked to the price of

sugar exports. However, as the industry expands in the region surrounding the Santander mill and new sugar farms set up in the area, an increasing number of farmers will be directly affected by the price paid by the mill for their sugar deliveries, which in turn are likely to be determined by the export price. The intended export destinations of Santander's Belizean sugar operation, and its success (or otherwise) in gaining a share of the EU, US or Caricom markets, are not yet clear. Statements by company officials suggest that the project was designed to be competitive in the market without EU preferences, but also that prospects for exporting to Canada, the US and Caricom are also being explored.

In the absence of data on export destinations, price projections are not possible, but with fewer people employed by the sugar industry in the western region, it is clear that fewer households will be vulnerable to fluctuations in the world sugar market than in Belize's sugar industry in the northern districts. In the case of the western sugar industry, the impact of changes in export prices will instead be felt mostly by the company. Santander, a private (family-owned) company has invested an estimated US$147 million, around half of which is from its own resources. Although exact details of the sources of the remaining finance are not known, it appears that a large proportion of this financing is bank borrowing, and a significant share of this, in turn, has been borrowed from Belizean banks. This explains the leap in total bank lending to the sector since 2013 (figure 20).

Figure 20 Belizean financial system: loans to the sugar sector by source



Source: Central Bank of Belize.

A sharp and unexpected fall in prices could create debt servicing problems for Santander, and ultimately also for its creditors. However, credit to the sugar industry is a relatively small component of the overall bank loan portfolio in Belize (amounting to only 1.5% of loans), so exposure would appear to be modest.

The risks facing the western region's sugar industry's highly-mechanized production system would appear to be mainly unrelated to the price of sugar. The company has already had to pay a major environmental fine for dredging in a wildlife sanctuary, and there are concerns over possible violation of

environmental protection laws arising from the run-off of chemicals. Moreover, the shift to capital-intensive farming in a region with many small subsistence farmers may well give rise to land conflicts. While much of the land farmed by Santander was formerly unfarmed, growing population pressure on land for agricultural uses could put the plantations in conflict with small farmers. Indeed, there has already been a dispute with some 30 local farmers who were evicted by the company from land that it had purchased for its own sugar cane crops that had previously been squatted.

C. FINDINGS

(I) IMPACT ON FARM LIVELIHOODS AND INDUSTRY SURVIVAL IN THE NORTH

The discussion above has highlighted the contrast between the north and west in terms of the impact of falling sugar prices on the sugar industry – and on the livelihoods of farmers. It is the farmers in the north of Belize that face the greatest risks from changing international conditions.

For the industry in the north, productivity improvements are imperative. The simulations shown here indicate that it is highly likely that, without a significant increase in agricultural yields requiring major investments in new varieties and farming systems, the low agricultural yields generated by current sugar farming practices would leave much of current production uneconomical at the lower prices projected for sugar exports.

Improving productivity will help some farmers in the north, but others are likely to suffer falling net earnings. Raising productivity is a means of improving livelihoods in the context of falling prices, but not for all farmers. Those with larger landholdings and manageable levels of debt would be favored. For farming households with only small amounts of land or high level of debts, investments to raise agricultural yields and the efficiency of harvesting could worsen their exposure to falling prices by leaving them unable to repay their loans. Moreover, in the absence of any increase in the capacity of the sugar mill, an increase in overall productivity across the region would result in an increase in production in excess of the capacity of the mill, and so increase the amount of sugar left unmilled. The current ASR/BSI-SIRDI-led drive to improve productivity would thus help some cane farmers in the north to survive the unfavorable international market conditions by raising average agricultural productivity, but for others it is unlikely to offer protection from falling prices, and indeed could have the effect of exacerbating their impoverishment. Eventually, it seems clear that smaller and more indebted sugar farmers will be impoverished, and many sugar-dependent households will have no alternative but to sell up and seek employment elsewhere.

(II) POLICY IMPLICATIONS

These findings highlight the vulnerability of the sector in the north to falling prices. There is a clear risk of severe social consequences if the prices fall below the level needed to keep farming households above the poverty line. The sugar industry there, led by the mill company ASR/BSI, has already outlined its strategy to ensure the survival of the industry, based on improving agricultural yields and industrial efficiency, and seeking to ensure public sector support for appropriate infrastructure investment. With the help of SIRDI, the EU and other public sector support, this strategy is being implemented. However, for Belize's public authorities, the concern is wider than that of the industry. The projections outlined above indicate that, without policy intervention, a significant proportion of today's sugar farmers in the north are in danger of losing their livelihoods. A weak international sugar price leaves them vulnerable, and would thus result in a rise in the level of unemployment and in the number of families in need of social assistance. The government's policy challenge is therefore to anticipate the risk and prepare

strategies to mitigate the direct impact on livelihoods and the wider damage to the regional economy by identifying alternative livelihoods.

In contrast, in the west, there is no clear need for policy intervention, as the number of households affected will be relatively small and the availability of alternative employment means that livelihoods would not be so severely affected. There would seem to be little justification for government intervention to support the sugar sector even in the case of a sharp decline in international prices. If that were to occur, some intervention might be required to stabilize the banking sector, but the land and labor could relatively easily be turned over to other agricultural uses without loss of livelihoods.

For these reasons, the focus of the discussion of policy options to mitigate the risks and effects of weaker sugar prices in the following chapter is on the options for the northern sugar region.

3. POLICY OPTIONS

Given the economic threat posed by changing conditions in the international sugar market, government policy intervention is required to ensure sustained livelihoods for the sugar farmers in Belize's northern districts of Orange Walk and Corozal, and to protect the local economies more generally. There are three approaches to the problem. The first is to ensure the survival of the sugar industry in the face of falling prices; the second is to develop alternative agricultural crops for cultivation by sugar farmers, either to complement or replace their sugar crops; and the third is to support the development of tourism as a non-agricultural economic activity in rural areas. The approaches are not mutually exclusive: all three are elements of the policy response to the threat of falling sugar prices.

A. SUGAR INDUSTRY SUPPORT

The low level of agricultural productivity and threat of falling prices has added urgency to the implementation of the sugar industry's Strategic Development Plan, prepared by ASR/BSI, which it has secured the support of sugar farmers. Its central aim is to improve yields and efficiency to ensure the industry's long-term competitiveness. The strategy is consistent with the objectives of the government and international donors, which have also been providing support to the sugar sector to make it economically sustainable and thus protect livelihoods in the face of changing international conditions.

The leading international donor for the sugar sector is the EU which, with its 'Accompanying Measures for Sugar' since 2006 has been seeking to mitigate the impact of its own policy reform for vulnerable developing countries. Its activities for supporting the sugar industry are outlined in the text box below.

EU Accompanying Measures for Sugar: sugar industry support activities

Ugrading of roads in sugar areas. EU-financed investments of over €55 million in over 150 km of roads in sugar cane growing areas.
Results: the investments have contributed to cost reductions, although cane grower representatives have complained that smaller roads were not included.

Support to the Sugar Industry Research and Development Institute (SIRDI) of €2.5 million to improve facilities at its headquarters and help to establish an extension services, a cane seed production system, information system (known as SIMIS) and demonstration farm for proper cane management.
Results: the activities of SIRDI appear to have had a significant impact on yields.

The Sugar Cane Replanting Credit Program allocated BZ$1,400/acre (US$1,730/hectare) of credits at subsidized interest rates (through the Caribbean Development Bank and local financial institutions) for replanting. The program is scheduled to end in March 2017.
Results: although the scheme may have contributed to a reduction in commercial bank rates charged to farmers of 15-18%, take-up was low. The annual interest rate of 8%-9% on loans supported by the scheme was in line with that of the state-owned Development Finance Corporation, while conditions for the loans were more onerous, with guarantees required for loan values above a threshold (initially BZ$5,000 (US$2,500) then raised BZ$7,500) and farmers with existing debts unable to benefit. By the

end of 2015, less than 1,000 farmers had used the EU-supported loans and around BZ$8 million of the allocated amount was unused.

Other activities. The EU measures were also intended to include support for diversification within the sugar sector (rum, cogeneration, ethanol, etc.), and possible investments in improving the tug and barge system to transport sugar from the mill to the terminal, and offshore transfer terminal with modern discharging equipment and (EC, 2012).
Results: To date, efforts to diversify sugar products have not achieved tangible results, and a feasibility for improvements to the transport system and terminal found that, at current levels of output, the investments would be uneconomic.

Overall assessment. As Valdés and Foster (2013) note, the EU accompanying measures were generous, amounting to a total of around €14,000 per sugar farmer, and their results have been disappointing. The most immediate and tangible positive impact has been road improvements (EC, 2011b), while the other benefits – particularly those arising from support for SIRDI – will be felt over the longer term and are less easily measured. In its assessment of EU funding to support sugar cane farmers in Africa, Caribbean and Pacific (ACP) countries in general, the United Kingdom´s Department for Environment, Food and Rural Affairs also noted that in many cases, the impact will not be felt in time to counteract the short-term negative impacts of EU sugar policy reforms (DEFRA, 2013).

EU support is scheduled to end in 2018, but the objectives of the Strategic Development Plan are also being supported by the Inter-American Development Bank's Multilateral Investment Fund (MIF) in its project for "Creating a Sustainable Sugarcane Industry in Northern Belize". Recognizing the importance of efforts to build capacity to improve yields for the industry's long-term sustainability, has focused its efforts on assistance to SIRDI. The MIF contribution of US$1.3 million is outweighed by the government's counterpart funding of an equivalent of US$3.9 million. The funds are being used to develop and consolidate the extension program to increase the application of new technologies and services through field research and train farmers; provide technical assistance to harvest groups to improve post-harvest losses; roll out the SIMIS centralized data system for monitoring and analysis (including geographically referenced databases, a cane farmer registry system, a barcode traceability system for cane deliveries, and training of harvesting captains and transport operators in the use of the system); and farmer training in Fair Trade certification requirements and financial literacy.

B. AGRICULTURAL DIVERSIFICATION

(I) THE CASE FOR DIVERSIFICATION

While improvements in the industry's competitiveness are necessary to secure the future of the sugar industry in the medium-term, alternative approaches are required to secure the future livelihoods of those sugar farmers who are likely to be driven out of the industry by falling prices, as described in Chapter 2.

Moreover, diversification is needed to mitigate other risks. One of these is the high probability that prices for sugar will weaken over the longer term, as other producers are able to benefit more than Belize from economies of scale and the rate of growth of sugar consumption slows. Another is the risk arising from climate change. The expected increases in temperature are likely to shorten the growth period of sugar cane, and therefore decrease yields, while greater variability in precipitation raises the risk of losses due to drought or flooding (Neal, et al, 2008). Rising sea levels could also affect sugar cane areas in Belize, with saltwater intrusion in coastal areas possible Santos and Garcia (2008). A recent study by the UN Economic Commission for Latin America and the Caribbean that models various scenarios of temperature and precipitation (Ramírez, et al, 2013) indicates that an optimistic scenario, with average temperature rising 2^{o}c over the next century and average precipitation falling 20%, would cut sugar cane yields in Belize by over 35% by 2100, while a more pessimistic scenario, with temperatures rising 4^{o} C and precipitation falling 25%, shows yields falling by75%. Although all crops are also susceptible to the effects of climate change – and indeed sugar may be more resilient than other crops for some types of extreme weather – over-dependence on a single crop leaves the regional economy particularly vulnerable to climate shocks: a more diversified agriculture spreads the risk.

On the positive side, the case for diversification in Belize's northern region is supported by its natural resource endowments, which appear to be well suited to the development of more diversified agriculture. Belize´s Ministry of Natural Resources as (figures 30 and 31 in appendix B), in its strategy for 2015-30, acknowledges the "ample supply of unused high quality land well-suited to agriculture" across the country, which covers 38% of the total land area (that is, 1,998 million acres, or 808 million ha), of which less than a third is currently being used for agriculture. Horton and Norton (2010) agree, citing " an excellent climate for agriculture" and a "natural endowment of the internally renewable water resources … about 10 times about that of Central America and the Caribbean as a whole, at 67,917 cubic meters per capita, versus an average 6,645 for the region." In the northern region in particular, the 60-140 inches of rain annually suggest that the costs of providing sufficient irrigation should be low relative to other countries of the region.

The region also has abundant labor. In addition to the over 9,000 farmers and workers currently employed in sugar cane, the two northern districts have an additional labor pool of 2,800 currently unemployed workers, most of whom are young (14-34 years), and with at least primary education (table 2). Moreover, additional seasonal labor needs have been traditionally met by cross-border temporary migrants from Mexico.

Table 2 Characteristics of the unemployed, Corozal and Orange Walk districts, 2015

		District	
		Corozal	Orange Walk
Age Group	14-24	436	625
	25-34	461	436
	35-44	184	98
	45-54	95	84
	55 and Over	70	45
	Total	**1,246**	**1,288**
Highest Level of Education Completed	None	288	289
	Primary	358	597
	Secondary	274	244
	Tertiary	301	159
	Other	25	0
	Total	**1,246**	**1,288**

Source: Statistical Institute of Belize

Diversification also needs skilled labor, particularly agronomists and other agricultural professionals, to conduct the research and provide the services needed to develop new crops. A degree program at the University of Belize, based at the Central Farm (appendix B, table 31), has been producing around 10 graduates in agricultural sciences per year since the 1980s (Canadian International Development Agency, 2012). With sufficient practical training these professionals could provide the services needed for diversification efforts (Halcrow, 2010).

(II) CURRENT DIVERSIFICATION EFFORTS

Efforts to promote agricultural diversification are not new in Belize or indeed among developing countries more broadly, and the mixed experiences of the past provide important lessons for policymakers. Based on its agricultural diversification experience around the world, the World Bank (2004) recommends "a multicomponent approach" involving both public and private sectors. The role of the government, it argues, is "to create the enabling environments for the private sector", including "necessary services to farmers for diversification" and investment "to widen the scope of research institutes…, improve the analytical capabilities of farmers to synthesize the diversification opportunities, and develop efficient knowledge and information systems" (World Bank, 2004; see also table 30 in appendix B). It also underlines the role of producer organizations in the diversification process, as small farmers´ interests can otherwise be "underrepresented in political decisions" and the associations are able to contribute by "sourcing inputs by bulk and at competitive prices, exploring market opportunities, pooling output to improve bargaining power, and forming beneficial partnerships with commercial enterprises, governmental agencies, research and extension entities, and other community groups".

In the case of Belize's northern sugar region, farmers seeking to diversify production face important constraints arising from the small size of the national economy and scale of production, high interest

rates, an overvalued currency, and vulnerability to natural disasters (Moskovits, 2015). To overcome the difficulties arising from these conditions, a range of policy tools are used to meet the strategic objective to "Increase production and promote diversification" as specified in Belize's "National Food and Nutrition Security and Improved Rural Livelihoods" set out in the *National Agriculture and Food Policy of Belize 2015 to 2030*. The approach is intended, as the World Bank suggests, for public policy to 'create an enabling environment for the private sector'. A survey of current policies and institutions designed to provide technical support for the development of new crops, access to product and market information, an agricultural health service and marketing support provides a profile of the strengths and weaknesses of the policy framework.

Technical support for development of new crops. In Belize's small economy, access to technical support is essential for farmers, and particularly for those aiming to diversify. The fact that sugar cane farms are predominantly small adds to the challenge; a small farmer is even less likely to have the skills and resources required to experiment with new crops. The Caribbean Agricultural Research and Development Institute (CARDI) plays an important role in agricultural research in Belize, with a focus in recent years on grain and legumes research (CARDI 2011). The Central Farm experimental station of the Ministry of Natural Resources and Agriculture (MNRA) has also focused on post-harvest management techniques and storage facilities, as well vegetable production (including celery, broccoli, cauliflower, lettuce, onions and potatoes) for import substitution[14]. However, as noted by Horton and Norton (2010), Belize's national system of research and training requires strengthening to support diversification. According to the Ministry of Natural Resources and Agriculture´s website, the services provided by the ministry to farmers include "farm visits, breeding stock, breeding services of all major livestock species, grafted and non-grafted fruit tree seedlings, hard wood seedlings, identify markets and conduct market studies, development of new value-added products, carrying out training for farmers and the development of technical materials, carry out research and other developmental activities, organize agriculture fairs/shows, liaise with other extension services within the country, and implement the programs and policies of the Ministry." However, interviews conducted for this study found that these services are considered to be inadequate, with insufficient resources to provide direct support to enough farmers. It is notable that the assistance of government and international donors to agricultural research in the north of Belize has gone mainly to SIRDI, which is specialized in supporting improvements in sugar cultivation, rather than diversification away from the monocrop.

Access to information. Belize's private sector representatives and international cooperation agencies have repeatedly cited the lack of information as an important obstacle to effective decision-making in agriculture (Moskovits, 2015). Farmers and their representatives, as well as officials at the Ministry of Natural Resources and Agriculture, complain of a lack of data on market opportunities for both domestic and export markets, as well as insufficient information on costs of inputs and market prices for different crops and technologies. In Belize's small economy, with its limited resources for state and industry institutions, producers face a disadvantage in this respect relative to larger economies. However, more could be done to improve the capacity of existing national institutions through training and efficiency

[14] http://www.agriculture.gov.bz/Agriculture_Dept.html

improvements, and there is scope for increasing the use of the data and resources on offer from international official agencies.

Agricultural health agency. A strong and adequately-financed agricultural health authority is also essential for the development of exports. The Belize Agricultural Health Authority (BAHA), the public agency charged with protecting and improving animal and plant health and food safety in Belize (with a Board of Directors including representatives from both government and the private sector), appears to be performing well but lacks the resources necessary to perform its functions well. Moscovits (2014), like Horton and Norton (2010) a few years earlier, notes concerns about the institutional resources available to protect the health status of the products in Belize, with a general perception that shortcomings are a major constraint on the penetration of new export markets. As the FAO notes (2011), with the increasing growth of tourism and supermarkets, quality compliance is an increasingly important marketing strategy, and is necessary to entice these more demanding consumers both in the domestic market and abroad.

Marketing. Farmers seeking to diversify from sugar cane, which is delivered to a single buyer in one transaction per year, need to develop ways to effectively market their alternative products. Particularly in the case of small farmers and those producing perishable fruits or vegetables, getting the product to market can be a daunting challenge. Resistance to change among Belize's cane farmers may be exacerbated by their age distribution, which is heavily skewed towards older ages, with 53% being over 50, and the low educational level, with only 12% of farmers having completed secondary school, and 3%, tertiary level training. Indeed, the EU estimates that only around 40% of cane farmers would be interested in diversifying their sources of income, in place of sugar or in addition to it (EC, 2010). Discussions with leaders from cane farmer associations confirm this resistance, with farmers' aversion to uncertainty borne out by their greater willingness to experiment with new crops alongside sugar cane, rather than switching their activities completely. Joint marketing efforts by groups of farmers, such as marketing and distribution cooperatives or farmers' associations, can make a crucial contribution, by improving producers´ bargaining strength, negotiating agreements with exporters or contracting private investors for packing or processing (Horton and Norton, 2010). However, although the creation of these joint marketing efforts has a strong logical appeal, experience in other countries has shown that they are not a natural option for farmers who are accustomed to a high degree of independence. As Horton and Norton (2010) warn, the structure of any association "must be compatible with entrepreneurial decision making" – that is, they need to take into account the extent to which farmers are willing and able to work together. In Belize's case, Mennonite communities have been successful in diversifying their mix of agricultural activities, venturing into chicken, eggs, hogs, and papaya production (Valdés and Foster, 2013). Their focus on collective efforts for marketing, input procurement and solving other challenges may provide useful lessons for other small farmers, but it should be noted that the characteristics of their communities (although there are variations between them) are very different from the communities of sugar farmers in the northern region, with a larger scale of operation, a well-organized social structure with strong traditions of collective action, and the unifying factor of religious beliefs. In the case of Belize's sugar producing districts in the north of the country, the most appropriate existing organizations that might be able to take on the responsibility for supporting marketing efforts for

alternative crops might be the sugar farmers' associations, but as yet these associations have focused only on sugar production and negotiations with the sole buyer, ASR/BSI.

(III) POTENTIAL ALTERNATIVE CROPS AND MARKETS

While the desirability of diversification away from sugar in Belize's northern districts may be clear, there the question of the types of crops that might best replace sugar remains open.

In interviews conducted in the field among specialists, technicians and aid workers, the three products that were most frequently mentioned as having potential for agricultural diversification in Corozal and Orange Walk districts were onions, honey, and goats. It seems that this preference arose, in part, from the fact that there are recent or ongoing small scale experiences with diversification for these products. These have demonstrated potential, whilst also serving to highlight some of the problems that need to be overcome. For example, in the case of onions, commercial production of which began in Belize in 1988 through the efforts of the MNRA, production has now reached over 600 mt of production a year. However, research continues in the search for solutions to storage constraints and to try to extend the harvesting season, which is very brief (Balan, 2015).

Others crops that were mentioned were sweet pepper, tomato, chili habanero, coconut (particularly as oil), lemon, potatoes, bananas, pineapple and papaya. For these crops, farmers would require technical and financial support to begin production and launch the products in new markets. The experience of papaya production is a cautionary one, which underlines the risks involved. The industry, which began in the 1980s with USAID support, expanded until the area under cultivation grew to over 1,000 acres, mostly in the Corozal and Orange Walk districts, but weak prices and hurricane losses cut production from a peak of 34,000 tonnes in 2006 to just 8,900 tonnes in 2015. In 2016, the largest exporter went out of business, reporting that Belize's production was no longer competitive.

Interestingly, among the crops suggested by farmers in interviews for this study, there was little mention of beans, corn or chicken farming, which the Mennonites have developed with some success, or of citrus or cocoa, both of which are grown for export in other districts of Belize (see text box below). Given that existing expertise and market access could help to establish new production of these crops, the potential for expanding their production to the northern districts would seem to deserve exploration.

Existing Belizean export crops with potential for expansion in the northern districts

Citrus: Over 18,000 ha are farmed with citrus in Belize, mostly in the Stann Creek district, with more small-scale production in Toledo, Cayo and Orange Walk districts. The industry employs around 10,000 people and is developing new processed products with potential for growth, especially orange juice for export (Horton and Norton, 2010). Its main problem is citrus greening, also known as Huanglongbing disease. Discovered in Belize 2009, the disease kills trees once they are infected and has no cure to date. Measures to reduce its spread and mitigate its impact appear to be having some positive impact, but farmers in the north may be deterred by uncertainty about the containment of the disease.

Cacao: Over 1,000 subsistence farmers, primarily in Toledo and Stann Creek districts, produce cacao (cocoa). While international prices of cacao, like sugar, are highly volatile, the Fair Trade and organic certified cacao that account for most of Belize's production enjoy more stable premium prices. Most of Belize's cacao and chocolate is exported to the United Kingdom (Horton and Norton, 2013). The Toledo Cacao Growers Association functions as a cooperative and provides services to members, including organic inspections, technical training (to improve cultivation methods and control disease), quality control, pruning services, farm consultations, and infrastructure (Choco, 2010). This business model would benefit small farmers looking to diversify in the north, which appears to have suitable climate and soils for cacao production. However, it is worth noting that, in order to establish the industry, the existing growers benefited from significant support from international agencies. Similar partnerships may be required to extend the industry to the northern districts.

Decisions about which alternative agricultural crops to choose will depend upon assessments of their markets. Given the cost and uncertainty involved in seeking export markets, products destined for domestic consumption might be relatively easy for farmers to sell. However, the small size of the domestic market is a major constraint. Table 3, which shows which agricultural products are currently imported into Belize, suggests that import substitution might be feasible for carrots, chilies, onions and lettuce, but the increase in production that would be required to fully meet domestic demand would use only a relatively small area, for example, 19 ha of carrots or 37 ha of onions. Therefore, any major drive towards diversification needs to focus export markets, either as fresh or processed products.

Table 3 Belize production, trade, and consumption for selected products, 2013

Product	Production (mt)	Imports (mt)	Exports (mt)	Apparent consump-tion (mt)	Area needed to substitute imports (ha)	Unit value of imports (US$/mt)
Bananas	102,000	-	98,823	3,177	0.0	-
Cabbages	1,539	366	-	1,905	7.3	331
Carrots	315	573	-	888	19.1	417
Chilies and peppers, dry	733	17	-	750	6.8	1,765
Chilies and peppers, green	n/a	14	-	n/a	1.4	1,571
Cocoa, beans	66	-	29	37	0.0	-
Cocoa, powder & cake	n/a	36	-	n/a	n/a	4,417
Coconuts	1,041	-	-	1,041	0.0	-
Coconuts, desiccated	n/a	1	-	n/a	n/a	3,000
Honey	45	1	-	46	n/a	1,000
Juice, citrus, single strength	25,426	-	-	25,426	n/a	-
Juice, grapefruit	n/a	-	2,417	n/a	n/a	-
Juice, orange, concentrated	n/a	-	28,255	n/a	n/a	-
Juice, orange, single strength	n/a	-	226	n/a	n/a	-
Juice, pineapple	n/a	12	307	n/a	n/a	1,000
Lettuce and chicory	n/a	322	-	n/a	9.5	1,016
Mangoes, guavas	597	-	-	597	0.0	-

Onions, dry	641	916	-	1,557	36.6	660
Oranges	230,000	-	135	229,865	0.0	-
Papayas	26,000	-	25,634	366	0.0	-
Peas, green	2,000	3	-	2,003	0.5	2,000
Pineapples	1,297	-	-	1,297	0.0	-
Tomatoes	768	2	-	770	0.0	3,000

Source: FAOSTAT

Among the potential export markets, the most favorable terms for Belizean agricultural producers are offered by Caricom, where Belize, as a member country, enjoys preferential tariff access, while non-member countries face import tariffs of 40% in most cases (rising to 100% or above in some instances). As table 4 indicates, Caricom members import significant quantities of bananas, onions, juices, carrots, lettuce, tomatoes, and cabbage. However, as Halcrow (2010) notes, it is relatively expensive to ship to Caricom destinations, so minimizing costs of production and domestic handling are critical.

Table 4 Caricom and Dominican Republic imports of selected products, 2013

Product	Volume (mt)	Value (US$1000)	Unit value (US$/mt)	Largest importers
Bananas	19,604	12,724	649	Saint Lucia, Trinidad and Tobago, Barbados
Cabbages	3,943	5,049	1,280	Trinidad and Tobago, Aruba, Bahamas
Carrots	7,509	8,264	1,101	Trinidad and Tobago, Bahamas, Barbados
Chilies and peppers, dry	595	1,564	2,629	Dominican Republic, Trinidad and Tobago, Jamaica
Chilies and peppers, green	1,780	3,537	1,987	Bahamas, Antigua and Barbuda, Aruba
Cocoa, powder & cake	1,148	5,132	4,470	Trinidad and Tobago, Jamaica, Dominican Republic
Copra	904	744	823	Trinidad and Tobago, Saint Lucia
Honey, natural	345	1,044	3,026	Bahamas, Barbados
Juice, grapefruit	1,062	2,036	1,917	Trinidad and Tobago, Grenada, Jamaica
Juice, grapefruit, concentrated	310	583	1,881	Bahamas
Juice, lemon, concentrated	717	1,193	1,664	Bahamas
Juice, orange, concentrated	7,298	15,753	2,159	Trinidad and Tobago, Bahamas, Barbados
Juice, orange, single strength	3,782	7,624	2,016	Jamaica, Trinidad and Tobago, Saint Lucia
Juice, pineapple	1,862	3,018	1,621	Jamaica, Trinidad and Tobago, Haiti
Juice, pineapple, concentrated	2,147	2,136	995	Trinidad and Tobago, Bahamas, Jamaica
Lemons and limes	2,024	3,996	1,974	Bahamas, Barbados, Aruba
Lettuce and chicory	4,798	8,487	1,769	Bahamas, Trinidad and Tobago, Barbados
Mangoes, guavas	659	1,065	1,616	Bahamas, Aruba, Barbados
Meat, goat	2,942	11,877	4,037	Trinidad and Tobago, Jamaica, Bahamas
Onions, dry	27,674	15,943	576	Jamaica, Dominican Republic, Haiti
Onions, shallots, green	8,039	2,990	372	Trinidad and Tobago
Oranges	3,384	4,653	1,375	Barbados, Bahamas, Aruba
Papayas	489	536	1,096	Aruba, Bahamas
Pineapples	1,613	1,902	1,179	Aruba, Barbados, Dominican Republic
Tomatoes	4,446	8,376	1,884	Bahamas, Trinidad and Tobago, Aruba

Source: FAOSTAT

Belize's immediate neighbors, Guatemala and southern Mexico, might also offer potential for growth of agricultural exports. The Ministry of Natural Resources and Agriculture report that there is an existing trade, but since most of it is through informal channels, there are no data on which to determine the scale of current agricultural exports (or, indeed, imports) or the potential for market growth.

C. BEYOND AGRICULTURE: TOURISM POTENTIAL

Belize's second largest sector is tourism, which now generates over a 10% of total national employment directly and 30% indirectly, and contributes over 10% of GDP. So far, northern Belize has seen fewer opportunities for economic growth through tourism compared to some other regions of the country. The National Sustainable Tourism Master Plan for Belize 2030 (Ministry of Tourism, 2011) addresses this situation, citing the north of Belize within its vision of future tourist destinations:

> *Corozal: Will be established as a mid-to-high shopping and entertainment destination as it will have fully developed an attractive open-air mid-high end shopping center hosting well known brands, restaurants, cafes, bars and entertainment facilities such as casinos, theaters, and bowling alleys, among others. The area will have good access by land, boat and border crossings. As a secondary motivation it will host cultural and nature tourism product offering such as Shipstern Nature Reserve, Corozal Bay, Sarteneja and the manatees.*
>
> *Orange Walk: The destination will be hosting diversified cultural heritage, living traditions and nature based eco-tourism products with high involvement of local rural communities. It will cater to a well-managed cruise visitors market while establishing a growing overnight sector.*

Specialists from the Tourism Office in Belize confirm that a regional development strategy is being developed, with a local committee including representatives of hotels, tour operators, and business leaders has been looking at ways to integrate small farmers into tourism activities, as part of a local development strategy. Indeed, Corozal listed by the IDB as one of the country's 'emerging destinations' (IDB Sustainable Tourism Program II (BL-L1020), approved in October 2015).

Interviewees connected to the agricultural sector stressed that the task of connecting agriculture and tourism in Corozal and Orange Walk requires the involvement of young entrepreneurs in tourism activities, organizing opportunities for local farmers to supply tourist visitors not only in local restaurants near tourist sites but with visits to farms with agricultural diversification projects and to local markets. In other words, the challenge is to build opportunities for "authentic" learning experiences for tourists to experience agriculture and rural life in Belize. These types of activities are commonplace for segments of the coffee and cocoa sectors in other countries in the region, for example, the experience of Café Britt in Costa Rica, or local chocolate making enterprises in Antigua, Guatemala.

Rather than visiting the North solely for agricultural tourism, it is more likely that these activities would be a part of a broader itinerary, including Mayan sites such as Lamanai in Orange Walk or Santa Rita in Corozal, allowing agricultural tourism to "piggyback" onto efforts to expand this tourism segment, providing recreational activities with local gastronomy and cultural experiences. These efforts could extend the presence of tourists in the northern region, which is consistent with the shift in the master plan to focus on different types of vacation experiences with longer stays, instead of growing numbers of cruise ship visitors. However, overnight stays would require appropriate accommodations for visitors, which are practically non-existent in the area. For any tourism attraction, road access is another critical

point. Other potential public inputs are marketing support, education and training for skill development, and minimum quality standards for tourism sites (Moscovits, 2015).

Another potential opportunity might be to supply fresh or cut fruits and vegetables to cruise ships. Despite the intuitive attractiveness of this opportunity, such efforts in other countries have been generally disappointing, due to the need for a regular, predictable supply without high pesticide residues and free from insect damage or other problems (Mitchell, 2005). Heavy investment in equipment and infrastructure would be required to ensure reliability and reduce seasonality.

4. CONCLUSIONS AND RECOMMENDATIONS

Prospects for prices for Belize's sugar exports are poor. Current price forecasts for the different markets, together with a set of scenarios for Belize's production, suggest that weak prices are likely to leave many of Belize's sugar farmers in the northern sugar regions without sufficient income to remain in the industry. In the western region, sugar production is far less labor intensive, so weaker prices will have little impact on farmers' incomes and employment, or on the local economy.

The abandonment of sugar cultivation by marginal farmers in the north will allow for the consolidation of farms, which will benefit agricultural efficiency and thus help to secure the sugar industry's future in Belize, but it will also leave many former farmers looking for alternative employment, depressing the local economy

These forecasts are based on our assumptions for prices, output and the destination of exports. If the exporters (ASR/BSI and Santander) are able to secure improved terms, for example by shifting exports from the EU market to Caricom, the industry's prospects for the medium term will be improved. However, over the longer term, overdependence on sugar will continue to leave the national economy exposed to the fortunes of the global sugar market and to the future of preferential trade arrangements.

To reduce the vulnerability of Belize's economy to any weakness in prices in export markets, we recommend greater policy emphasis on the diversification of production and activities in rural Orange Walk and Corozal districts. While this is a stated objective of national agricultural policy, resources for agricultural research and development in this region are currently heavily focused on improving yields and efficiency within the sugar sector: work that is necessary for the sustainability of the industry but will not ensure the livelihoods of the many small farmers who are unable to earn an adequate income from their lands.

Diversification faces many challenges, not least the lack of enthusiasm of sugar farmers themselves, many of whom are heavily indebted and risk averse. It requires investment in essential public goods, including research, training and the construction of physical and institutional infrastructure. Past experience in Belize and beyond has demonstrated the importance of involving a variety of actors and adopting a comprehensive approach that responds to local conditions and constraints. In the case of Belize's northern district, these include land use patterns, drainage and irrigation requirements, the farmers' own characteristics (level of knowledge, traditions for organization, age profile), information gaps and training needs. To achieve diversification Belize's sugar farmers need to strengthen technical support, agricultural health services, research, data, and its institutional structure for effective supply chains and marketing to bring new products to new markets. Tourism also offers some potential.

Experience demonstrates that returns to this investment are uncertain, but nonetheless a clear strategy and program of public interventions is imperative. Without it, the farmers of Belize's northern region face the prospect of rising poverty and associated social problems. Moreover, given the large size of the sugar sector in relation to the regional and national economy, any future problems in the sugar sector will also have a negative impact on national economic performance.

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APPENDICES

APPENDIX A. PERSONS INTERVIEWED

Name	Position and Institution
Alegría, Martín	Ministry of Environment
Alonzo, Yvette	Economist, Inter-American Institute for Cooperation in Agriculture (IICA)
Budhram, Dowlat	Representative IICA
Bevans, Karen	Director of Tourism, Belize Tourism Board
Cansino, Ezequiel	Chairman, Belize Sugar Cane Farmer Association (BSCFA)
Canul, Elvis	Chairman, Corozal Sugar Cane Producer Association
Ford, Emory	Deputy Director Research, Research Department, Central Bank of Belize
Forgaray, Leonardo	Technical Support, Corozal Sugar Cane Producer Association
Garcia, Javier	Manager, Sugar Cane Production Committee (SCPC)
Gonzalez, Kevin	Director of Special Projects, Belize Tourism Board
Harrison, Roberto	Ministry of Agriculture, former specialist in Food and Agriculture Organization of the United Nations (FAO)
Hernandez, Cosme	Progressive Sugar Cane Farmers Association
Martinez, Gabriel	Chairman, Sugar Industry Control Board (SICB)
Nardi, Pietro	EU Programme Manager- Technical Unit
Nuenninghoff, Sybille	Natural Resources Lead Specialist, Inter-American Development Bank
Lopez, Jose	Project Manager Green Tropics/Santander
Novelo, Javier	Ministry of Agriculture

Name	Position and Institution
Ortega, Alfredo	Vice Chairman of the Committee of Management at the Belize Sugar Cane Farmers Association and member of the global Fair Trade Standards Committee
Osorio, Marcos	Sugar Industry Research and Development Institute (SIRDI)
Paredez, Javier	Director of Business Development, Belize Tourism Board
Quemec, Javier	Finance Committee, Belize Sugar Cane Farmer Association (BSCFA)
Ramirez, Gary	Agriculture Senior Research Officer, Crop Research and Development Unit, Agriculture Research, Development and Innovation Center
Robinson Fuller, Corine	Executive Director, Belize Credit Union League
Trejo, Diana	Data Dissemination Manager, Statistical Institute of Belize
Urbina, Yadeli	Acting General Manager, La Inmaculada Credit Union
Vargas, Albino	La Inmaculada Credit Union

APPENDIX B. SUPPLEMENTAL TABLES AND FIGURES

Table 5 Belize sugar and molasses exports, 2000-2014

Year	raw sugar			molasses			total
	volume (mt)	value (US$1000)	unit price ($/kg)	volume (mt)	value (US$1000)	unit price ($/kg)	value (US$1000)
2000	109,324	37,116	0.340	23,400	181	0.008	37,297
2001	90,972	29,685	0.326	30,539	824	0.027	30,509
2002	104,648	32,991	0.315	35,677	1,339	0.038	34,330
2003	100,462	41,000	0.408	27,200	3,000	0.110	44,000
2004	112,439	55,100	0.490	29,109	2,598	0.089	57,698
2005	87,751	34,362	0.392	33,841	1,410	0.042	35,772
2006	97,856	50,033	0.511	33,679	2,103	0.062	52,136
2007	84,468	44,071	0.522	42,383	2,754	0.065	46,825
2008	67,341	35,692	0.530	21,858	1,423	0.065	37,115
2009	78,770	43,965	0.558	18,324	2,674	0.146	46,639
2010	61,536	29,361	0.477	44,240	3,098	0.070	32,459
2011	83,063	41,371	0.498	23,137	1,579	0.068	42,950
2012	98,825	53,797	0.544	23,368	1,970	0.084	55,767
2013	106,905	53,678	0.502	13,652	3,819	0.280	57,497
2014	107,114	55,095	0.514	26,478	2,863	0.108	57,958

Source: FAOSTAT, COMTRADE

Table 6 Sugar cane yields in northern Central America, 2000-2013 (tons/hectare)

Year	Belize	El Salvador	Guatemala	Honduras
2000	47.70	74.93	90.95	84.67
2001	44.29	82.84	93.05	85.91
2002	47.77	76.92	93.86	58.57
2003	45.00	66.91	90.63	71.64
2004	49.86	84.52	88.50	72.36
2005	44.68	81.16	66.31	74.16
2006	48.33	79.98	75.56	73.29
2007	49.42	78.47	106.80	80.45
2008	40.36	78.47	107.71	80.21
2009	37.78	91.90	100.85	99.56
2010	43.19	81.34	94.94	85.46
2011	34.75	85.66	83.81	76.21
2012	38.21	88.54	92.30	84.06
2013	37.82	92.84	100.70	84.06

Source: FAOSTAT

Figure 21 Map of sugar cane areas in northern Belize

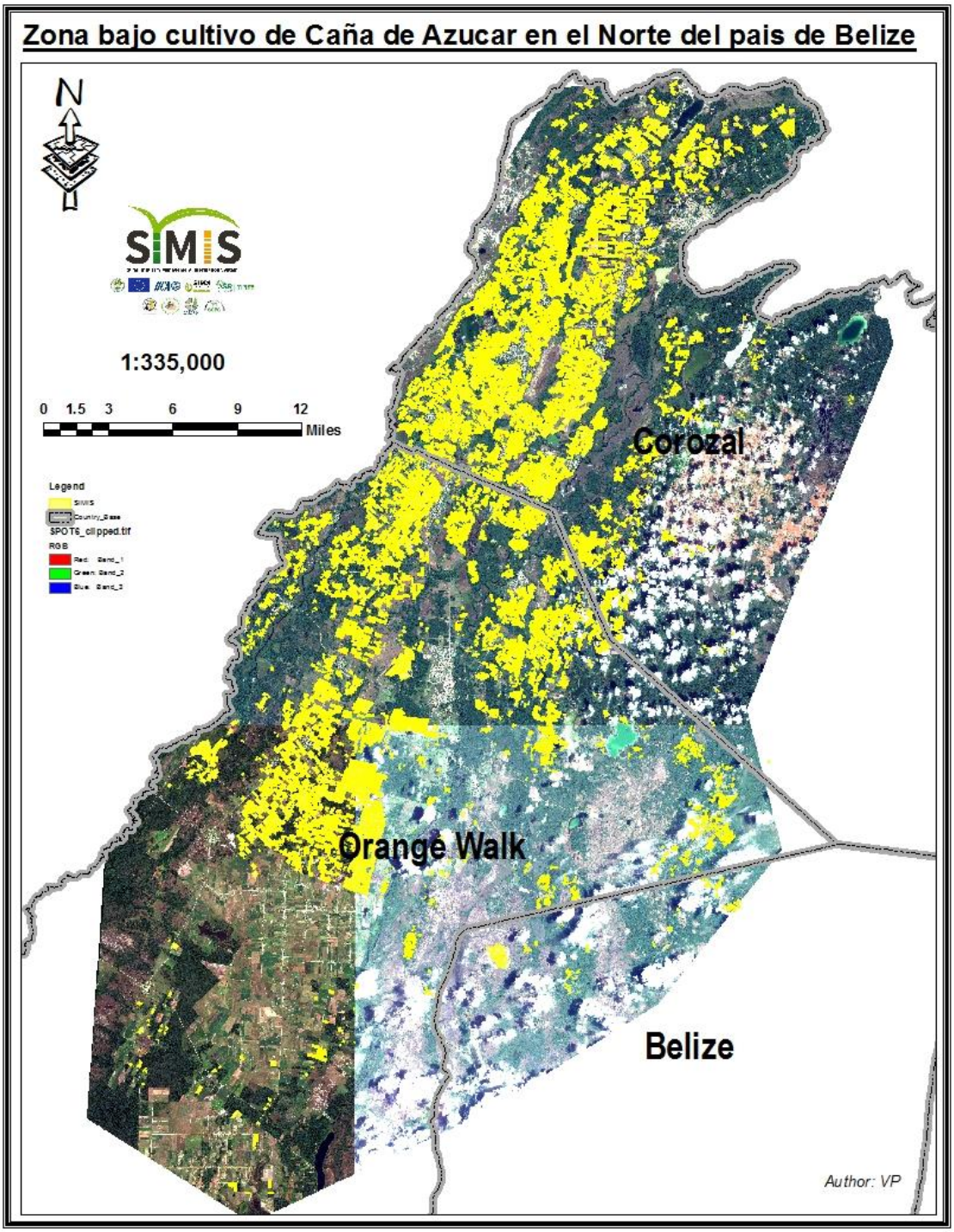

Table 7 Current costs of production for replanting sugar cane

Replanting	US$/ha	BZ$/acre
Machinery and Equipment		
- Plow	154.44	125.00
- Sub-soiling	154.44	125.00
- Harrow	111.20	90.00
- Furrow	49.42	40.00
- Seed Transp. & Distribution	123.55	100.00
- Covering Seed	49.42	40.00
- Firepass Maintenance	12.36	10.00
Subtotal Machinery & Equipment	**654.83**	**530.00**
Inputs		
- Seed Material	370.66	300.00
- Fertilizer	285.41	231.00
- Rooting Hormone	98.84	80.00
- Pre-emergent Herbicide	61.78	50.00
- Post-emergent Herbicide	59.31	48.00
Subtotal Inputs	**875.99**	**709.00**
Labour		
- Cutting Seed, Loading & Planting	247.11	200.00
- Fertilizer Application	19.77	16.00
- Pre-emergent Herbicide Application	37.07	30.00
- Post-emergent Herbicide Application	18.53	15.00
Subtotal Labour	**322.47**	**261.00**
TOTAL	**1,853.29**	**1,500.00**

Source: Corozal Sugar Cane Producers Association

Table 8 Current costs of production for ratoon maintenance and harvest and transport

Ratoon Maintenance	**US$/ha**	**BZ$/acre**
Materials & Inputs		
- Fertilizers	185.33	150.00
- Post-emergent Herbicide	44.48	36.00
Froghopper Control	135.91	110.00
Subtotal Inputs	**365.72**	**296.00**
Machinery & Equipment Services		
- Fertilizer Incorporation	49.42	40.00
- Mechanical Weed and froghopper control	49.42	40.00
Subtotal Machinery Services	**98.84**	**80.00**
Labour		
- P/emergent Herbicide Application	22.24	18.00
- Integrated Pest Management	61.78	50.00
Subtotal Labour	**84.02**	**68.00**
Subtotal Operating Expenses	**548.57**	**444.00**

Harvesting and Delivery Costs	**US$/mt**	**BZ$/ton**
Harvest	7.87	8.00
Load	5.91	6.00
Supervision	1.48	1.50
Transportation	14.76	15.00
Total	**30.02**	**30.50**

Source: Corozal Sugar Cane Producers Association

Table 9 Costs of production for replanting with best practices

Activity	Type	Cost US$/ hectare	Cost US$/mt	BZ$/acre
Soil preparation				
tractor and plowing	mechanical	469.50	5.34	380.00
Sowing				
Seed	material	370.66	4.22	300.00
Seeding	manual	247.11	2.81	200.00
Transportation	mechanical	123.55	1.41	100.00
Root hormone	material	98.84	1.12	80.00
Covering of seed	mechanical	49.42	0.56	40.00
Subtotal		889.58	10.12	720.00
Fertilization				
Fertilizer	material	284.17	3.23	230.00
Application	manual	18.53	0.21	15.00
Subtotal		302.70	3.44	245.00
Pest management				
Herbicides	material	121.08	1.38	98.00
Application	manual	55.60	0.63	45.00
pH and water softener	material	1.24	0.01	1.00
Maintenance of barrier	mechanical	12.36	0.14	10.00
Subtotal		190.27	2.17	154.00
Total planting costs		1,852.05	21.08	1,499.00
Harvesting				
Burning and cutting	manual	356.76	4.06	288.75
Loading	mechanical	259.46	2.95	210.00
Transportation	mechanical	518.92	5.91	420.00
Supervision and social security	manual	64.87	0.74	52.50
Subtotal		1,200.00	13.66	971.25
Total for cane crop		3,052.06	34.73	2,470.25

Note: Yield 87.9 mt/hectare (35 ton/acre)
Source: SIRDI, 2013

Table 10 Costs of production for cane field maintenance under best practices

Activity	Type	Cost US$/ hectare	Cost US$/mt	BZ$/acre
Fertilization				
Fertilizer	material	185.33	2.95	150.00
Application	manual	37.07	0.59	30.00
Subtotal		222.39	3.54	180.00
Pest management				
Herbicides	material	116.14	1.85	94.00
Application	manual	55.60	0.89	45.00
pH and water softener	material	1.24	0.02	1.00
Preventative plowing	mechanical	49.42	0.79	40.00
Pesticide	material	135.91	2.17	110.00
Application/cleaning	manual	37.07	0.59	30.00
Maintenance of barrier	mechanical	12.36	0.20	10.00
Subtotal		407.72	6.50	330.00
Total planting costs		630.12	10.04	510.00
Harvesting				
Burning and cutting	manual	254.83	4.06	206.25
Loading	mechanical	185.33	2.95	150.00
Transportation	mechanical	463.32	7.38	375.00
Supervision and social security	manual	46.33	0.74	37.50
Subtotal		949.81	15.13	768.75
Total for cane crop		1,579.93	25.17	1,278.75

Note: Yield 62.8 mt/hectare (25 tons/acre)
Source: SIRDI, 2013

Table 11 Belize sugar exports by destination, 2005-2014

	Year	United States	Canada	United Kingdom	Portugal	Finland	Total UE	Trinidad and Tobago	Jamaica	Netherland Antilles	Antigua and Barbuda	Total CARICOM	Total
Volume (mt)	2005	11,191	81	40,569	-	-	40,569	21,175	13,069	1,665	-	35,909	87,751
	2006	19,096	122	28,458	14,000	14,000	56,459	3,937	16,038	2,203	-	22,178	97,855
	2007	13,354	102	45,366	14,000	8,900	68,266	2,250	-	495	-	2,746	84,468
	2008	-	269	116,135	30,865	-	147,000	1,191	-	-	-	1,191	148,460
	2009	-	102	68,099	-	-	68,099	-	-	-	-	-	68,200
	2010	-	122	61,414	-	-	61,414	-	-	-	-	-	61,536
	2011	29,843	269	153,008	-	-	153,008	-	-	-	-	-	183,120
	2012	17,355	182	81,287	-	-	81,287	-	-	-	-	-	98,825
	2013	25	323	106,557	-	-	106,557	-	-	-	-	-	106,905
	2014	-	91	104,839	-	-	104,839	2,134	-	-	50	2,184	107,114
Value (US$1000)	2005	4,221	34	21,196	-	-	21,196	4,785	3,543	583	-	8,911	34,362
	2006	8,753	57	16,479	7,772	8,414	32,665	1,647	5,874	1,036	-	8,558	50,033
	2007	5,151	48	24,737	7,708	5,108	37,552	1,080	-	240	-	1,320	44,071
	2008	-	57	28,289	7,086	-	35,376	259	-	-	-	259	35,692
	2009	-	48	38,708	-	-	38,708	-	-	-	-	-	38,755
	2010	-	57	29,304	-	-	29,304	-	-	-	-	-	29,361
	2011	10,734	65	30,572	-	-	30,572	-	-	-	-	-	41,371
	2012	12,823	109	40,865	-	-	40,865	-	-	-	-	-	53,797
	2013	18	232	53,427	-	-	53,427	-	-	-	-	-	53,678
	2014	-	68	53,882	-	-	53,882	1,118	-	-	27	1,144	55,095
Unit price (US$/kg)	2005	0.377	0.418	0.522			0.522	0.226	0.271	0.350		0.248	0.392
	2006	0.458	0.467	0.579	0.555	0.601	0.579	0.418	0.366	0.470		0.386	0.511
	2007	0.386	0.467	0.545	0.551	0.574	0.550	0.480		0.485		0.481	0.522
	2008		0.212	0.244	0.230		0.241	0.218				0.218	0.240
	2009		0.467	0.568			0.568						0.568
	2010		0.467	0.477			0.477						0.477
	2011	0.360	0.242	0.200			0.200						0.226
	2012	0.739	0.602	0.503			0.503						0.544
	2013	0.736	0.717	0.501			0.501						0.502
	2014		0.745	0.514			0.514	0.524			0.534	0.524	0.514

Source: UN COMTRADE

Table 12 Belize molasses exports by destination, 2005-2014

	Year	United Kingdom	Guatemala	United States	Trinidad and Tobago	Barbados	Jamaica	Total CARICOM	Total
Volume (mt)	2005	33,826	7	-	-	-	-	-	33,832
	2006	33,603	75	-	-	-	-	-	33,679
	2007	4,819	88	14,790	22,687	-	-	22,687	42,383
	2008	34,798	188	-	12,325	-	-	12,325	47,311
	2009	22,535	314	-	-	-	-	-	22,848
	2010	42,982	43	-	-	-	-	-	43,025
	2011	28,712	-	12,156	-	6,100	-	6,100	46,968
	2012	-	19	-	-	4,484	18,007	22,491	22,509
	2013	-	-	2,895	-	-	10,757	10,757	13,652
	2014	-	-	26,478	-	-	-	-	26,478
Value (US$1000)	2005	1,410	0	-	-	-	-	-	1,410
	2006	2,099	4	-	-	-	-	-	2,103
	2007	313	7	961	1,474	-	-	1,474	2,754
	2008	1,025	7	-	363	-	-	363	1,395
	2009	1,575	20	-	-	-	-	-	1,594
	2010	3,004	5	-	-	-	-	-	3,009
	2011	813	-	393	-	238	-	238	1,445
	2012	-	1	-	-	379	1,523	1,903	1,904
	2013	-	-	1,598	-	-	2,221	2,221	3,819
	2014	-	-	2,863	-	-	-	-	2,863
Unit price (US$/kg)	2005	0.0417	0.0496						0.0417
	2006	0.0625	0.0529						0.0624
	2007	0.0650	0.0772	0.0650	0.0650			0.0650	0.0650
	2008	0.0295	0.0364		0.0295			0.0295	0.0295
	2009	0.0699	0.0627						0.0698
	2010	0.0699	0.1172						0.0699
	2011	0.0283		0.0324		0.0391		0.0391	0.0308
	2012		0.0661			0.0846	0.0846	0.0846	0.0846
	2013			0.5520			0.2065	0.2065	0.2798
	2014			0.1081					0.1081

Source: UN COMTRADE

Table 13 Export destinations of Belize sugar, 2005-2014

Market	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Exports	87,751	97,855	84,468	148,460	68,200	61,536	183,120	98,825	106,905	107,114
European Union	40,569	56,459	68,266	147,000	68,099	61,414	153,008	81,287	106,557	104,839
United States	11,191	19,096	13,354	-	-	-	29,843	17,355	25	-
CARICOM	35,909	22,178	2,746	1,191	-	-	-	-	-	2,184
Canada	81	122	102	269	102	122	269	182	323	91
Residual	18,249	20,145	18,532	(70,155)	24,138	28,023	(83,057)	17,549	13,333	15,967
Total	106,000	118,000	103,000	78,305	92,338	89,559	100,063	116,374	120,238	123,081

Note: Residual includes domestic consumption and change in stocks. Negative residual reflects drawdown on stocks or possible accounting errors.
Source: Author´s calculations based on data from FAO, Belize Sugar Industries, and UN COMTRADE

Table 14 Historical prices for sugar, 2000-2014 (US$/kg)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
nominal prices															
EU	0.555	0.529	0.549	0.597	0.670	0.665	0.646	0.681	0.697	0.524	0.442	0.455	0.420	0.434	0.434
US	0.428	0.470	0.461	0.474	0.455	0.469	0.488	0.458	0.469	0.549	0.792	0.839	0.636	0.451	0.531
world	0.180	0.190	0.152	0.156	0.158	0.218	0.326	0.222	0.282	0.400	0.469	0.573	0.475	0.390	0.375
real prices (2010 = 100)															
EU	0.698	0.690	0.726	0.750	0.788	0.759	0.718	0.714	0.678	0.544	0.442	0.417	0.390	0.409	0.410
US	0.537	0.614	0.610	0.595	0.535	0.535	0.542	0.480	0.456	0.569	0.792	0.770	0.591	0.425	0.502
world	0.227	0.249	0.201	0.196	0.186	0.248	0.362	0.233	0.274	0.415	0.469	0.526	0.441	0.368	0.354

Notes: EU: European Union negotiated import price for raw bulk sugar from ACP under Lome Conventions, cif European ports
US: nearby futures contract, cif
World: International Sugar Agreement (ISA) daily price, raw, fob and stowed at greater Caribbean ports
Source: World Bank

Table 15 Price forecasts for sugar, 2015-2025 (US$/kg)

Product/market	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Raw sugar												
United States[1]	0.557	0.507	0.494	0.494	0.494	0.494	0.494	0.494	0.494	0.494	0.494	0.494
world[2]	0.370	0.300	0.310	0.310	0.320	0.330	0.340	0.350	0.350	0.360	0.370	0.380
world[3]	0.365	0.347	0.389	0.362	0.348	0.351	0.360	0.370	0.386	0.375	0.364	
White sugar												
European Union[4]	0.660	0.689	0.628	0.542	0.547	0.542	0.559	0.575	0.581	0.606	0.628	
world[4]	0.466	0.475	0.503	0.487	0.464	0.460	0.474	0.488	0.520	0.542	0.561	
world[5]	0.397	0.415	0.467	0.455	0.441	0.436	0.430	0.440	0.452	0.447	0.434	

Notes:

1. New York, No. 16 contract; source U.S. Department of Agriculture, *Agricultural Projections to 2024*
2. International Sugar Agreement (ISA) daily price, raw, f.o.b. and stowed at greater Caribbean ports; World bank
3. ICE, No. 11 contract; source OECD-FAO, *Agricultural Outlook 2015-2024*
4. Source European Commission, *Prospects for EU Agricultural Markets and Income 2014-2024*
5. Futures contract No. 407, Euronext market, London; source OECD-FAO, *Agricultural Outlook 2015-2024*

Table 16 Assumptions for average price scenarios (US$/mt and mt)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Assumptions:										
EU price	0.453	0.413	0.357	0.360	0.357	0.367	0.378	0.382	0.398	0.413
US price	0.507	0.494	0.494	0.494	0.494	0.494	0.494	0.494	0.494	0.494
CARICOM price	0.420	0.434	0.434	0.448	0.462	0.476	0.490	0.490	0.504	0.518
world price	0.300	0.310	0.310	0.320	0.330	0.340	0.350	0.350	0.360	0.370
domestic price	0.551	0.827	0.827	0.827	0.827	0.827	0.827	0.827	0.827	0.827
exports to US	-	11,584	11,584	11,584	11,584	11,584	11,584	11,584	11,584	11,584
exports to CARICOM	-	6,667	13,333	20,000	20,000	20,000	20,000	20,000	20,000	20,000

Table 17 Estimates of production, exports and weighted average prices under different production scenarios

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Production scenario 1: Maintain current area and yield										
Production	130,473	130,473	130,473	130,473	130,473	130,473	130,473	130,473	130,473	130,473
Exports	114,473	114,158	113,836	113,508	113,173	112,832	112,484	112,129	111,767	111,398
EU market	114,473	104,171	93,868	83,566	73,263	62,960	62,960	62,960	62,960	62,960
World surplus market	-	9,987	19,968	29,942	39,910	49,872	49,524	49,169	48,807	48,438
Weighted average price	0.465	0.523	0.498	0.524	0.525	0.536	0.548	0.552	0.567	0.581
Production scenario 2: Achieve SIRDI goals for yield (69 mt/ha) in 2018										
Production	130,473	158,432	186,391	214,349	214,349	214,349	214,349	214,349	214,349	214,349
Exports	114,473	142,116	169,753	197,384	197,049	196,708	196,360	196,005	195,643	195,274
EU market	114,473	104,171	93,868	83,566	73,263	62,960	62,960	62,960	62,960	62,960
World surplus market	-	37,946	75,885	113,818	123,786	133,747	133,399	133,044	132,683	132,314
Weighted average price	0.465	0.485	0.441	0.444	0.449	0.459	0.471	0.473	0.486	0.498
Production scenario 3: Achieve SDP goals for yield (88 mt/ha) and pol (15%) in 2022										
Production	130,473	161,539	192,604	223,669	254,734	285,799	316,864	347,929	347,929	347,929
Exports	114,473	145,223	175,966	206,703	237,434	268,157	298,875	329,585	329,223	328,854
EU market	114,473	104,171	93,868	83,566	73,263	62,960	62,960	62,960	62,960	62,960
World surplus market	-	41,052	82,098	123,138	164,171	205,197	235,914	266,624	266,263	265,894
Weighted average price	0.465	0.482	0.437	0.439	0.430	0.429	0.432	0.426	0.437	0.449

Table 18 Adjusted prices for sugar

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Nominal projected prices for sugar (US$/mt)										
EU	452.81	413.15	356.72	359.75	356.54	367.34	377.93	382.31	398.36	412.64
US	507.46	493.89	493.89	493.89	493.89	493.89	493.89	493.89	493.89	493.89
CARICOM	420.00	434.00	434.00	448.00	462.00	476.00	490.00	490.00	504.00	518.00
world surplus market	300.00	310.00	310.00	320.00	330.00	340.00	350.00	350.00	360.00	370.00
domestic market	551.00	827.00	827.00	827.00	827.00	827.00	827.00	827.00	827.00	827.00
Real projected prices for sugar (US$/mt)										
EU	452.81	407.04	346.26	344.04	335.93	340.98	345.63	344.47	353.63	360.89
US	507.46	486.59	479.40	472.31	465.33	458.46	451.68	445.01	438.43	431.95
CARICOM	420.00	427.59	421.27	428.43	435.29	441.85	448.13	441.50	447.41	453.04
world surplus market	300.00	305.42	300.91	306.02	310.92	315.61	320.09	315.36	319.58	323.60
domestic market	551.00	814.78	802.74	790.87	779.19	767.67	756.33	745.15	734.14	723.29
Real projected prices for sugar, adjusted for premium for Belize sugar minus export and handling charges (US$/mt)										
EU	455.29	399.64	325.73	323.03	313.17	319.32	324.97	323.55	334.69	343.53
US	489.58	467.52	459.92	452.44	445.06	437.79	430.63	423.57	416.62	409.77
CARICOM	373.20	380.79	374.47	381.63	388.49	395.05	401.33	394.70	400.61	406.24
world surplus market	253.20	258.62	254.11	259.22	264.12	268.81	273.29	268.56	272.78	276.80
domestic market	364.61	628.39	616.35	604.48	592.80	581.28	569.94	558.76	547.75	536.90
Adjusted real weighted average prices for sugar under different production scenarios (US$/mt)										
1. maintain yields	444.17	478.42	430.93	443.65	434.31	434.86	438.88	434.01	440.48	445.68
2. 69 mt/ha in 2018	444.17	439.63	377.88	371.48	367.71	369.88	374.08	369.27	374.85	379.59
3. 88 mt/ha and 15% pol in 2022	444.17	436.15	373.89	366.81	351.29	344.61	341.47	330.60	335.66	340.13

Table 19 Sugar cane and molasses production and sales under different production scenarios

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Sugar cane production, mt										
1. maintain yields	1,186,122	1,186,122	1,186,122	1,186,122	1,186,122	1,186,122	1,186,122	1,186,122	1,186,122	1,186,122
2. 69 mt/ha in 2018	1,186,122	1,440,291	1,694,460	1,948,629	1,948,629	1,948,629	1,948,629	1,948,629	1,948,629	1,948,629
3. 88 mt/ha and 15% pol in 2022	1,186,122	1,371,706	1,557,289	1,742,873	1,928,457	2,114,041	2,299,624	2,485,208	2,485,208	2,485,208
Molasses production, mt										
1. maintain yields	38,169	38,169	38,169	38,169	38,169	38,169	38,169	38,169	38,169	38,169
2. 69 mt/ha in 2018	38,169	46,348	54,527	62,706	62,706	62,706	62,706	62,706	62,706	62,706
3. 88 mt/ha and 15% pol in 2022	38,169	44,141	50,113	56,085	62,057	68,029	74,001	79,973	79,973	79,973
Molasses real net stripped value, US$										
1. maintain yields	3,030,235	3,030,235	3,030,235	3,030,235	3,030,235	3,030,235	3,030,235	3,030,235	3,030,235	3,030,235
2. 69 mt/ha in 2018	3,030,235	3,679,571	4,328,906	4,978,242	4,978,242	4,978,242	4,978,242	4,978,242	4,978,242	4,978,242
3. 88 mt/ha and 15% pol in 2022	3,030,235	3,504,353	3,978,471	4,452,590	4,926,708	5,400,826	5,874,945	6,349,063	6,349,063	6,349,063

Table 20 Net stripped value and real gross income under different scenarios

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total real net stripped value for sugar and molasses sales										
1. maintain yields	60,982,716	65,450,951	59,255,011	60,915,106	59,695,979	59,767,398	60,292,506	59,656,859	60,500,602	61,179,278
2. 69 mt/ha in 2018	60,982,716	73,330,901	74,762,526	84,605,512	83,797,322	84,261,927	85,162,904	84,130,492	85,327,908	86,344,026
3. 88 mt/ha and 15% pol in 2022	60,982,716	73,959,085	75,990,851	86,495,681	94,412,208	103,890,806	114,075,860	121,375,455	123,136,128	124,689,655
65% share for cane farmers										
1. maintain yields	39,638,765	42,543,118	38,515,757	39,594,819	38,802,386	38,848,809	39,190,129	38,776,958	39,325,391	39,766,531
2. 69 mt/ha in 2018	39,638,765	47,665,086	48,595,642	54,993,583	54,468,259	54,770,253	55,355,888	54,684,820	55,463,140	56,123,617
3. 88 mt/ha and 15% pol in 2022	39,638,765	48,073,406	49,394,053	56,222,193	61,367,935	67,529,024	74,149,309	78,894,046	80,038,483	81,048,276
Real gross income per mt of cane produced (US$)										
1. maintain yields	33.42	36.11	32.72	33.63	32.96	33.00	33.29	32.94	33.40	33.77
2. 69 mt/ha in 2018	33.42	33.34	28.93	28.47	28.20	28.35	28.65	28.31	28.71	29.05
3. 88 mt/ha and 15% pol in 2022	33.42	35.29	31.96	32.50	32.07	32.19	32.49	31.99	32.45	32.86
Real gross income per ha of cane (US$)										
1. maintain yields	1,403.59	1,516.76	1,374.16	1,412.37	1,384.31	1,385.95	1,398.04	1,383.41	1,402.82	1,418.45
2. 69 mt/ha in 2018	1,403.59	1,700.34	1,735.51	1,964.27	1,945.67	1,956.36	1,977.10	1,953.34	1,980.90	2,004.28
3. 88 mt/ha and 15% pol in 2022	1,403.59	1,714.20	1,762.58	2,005.98	2,189.81	2,409.58	2,645.62	2,815.25	2,855.77	2,891.53

Table 11 Real net income for cane

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Real net income per mt of cane produced (US$)										
1. maintain yields	(11.60)	(8.91)	(12.30)	(11.39)	(12.06)	(12.02)	(11.73)	(12.08)	(11.62)	(11.25)
2. 69 mt/ha in 2018	(11.60)	(0.52)	(4.90)	(5.53)	(5.93)	(5.91)	(5.73)	(5.95)	(5.66)	(5.44)
3. 88 mt/ha and 15% pol in 2022	(11.60)	3.93	2.44	4.41	2.37	1.09	0.13	(1.19)	(0.88)	(0.61)
Real net income per ha of cane (US$)										
1. maintain yields	(487.28)	(374.11)	(516.72)	(478.51)	(506.57)	(504.92)	(492.84)	(507.47)	(488.05)	(472.43)
2. 69 mt/ha in 2018	(487.28)	(26.49)	(294.30)	(381.29)	(409.35)	(407.71)	(395.62)	(410.25)	(390.83)	(375.21)
3. 88 mt/ha and 15% pol in 2022	(487.28)	190.88	134.62	271.97	161.95	81.23	10.54	(104.63)	(77.07)	(53.69)
Real net income per ha of cane with reductions in harvest, transport and export costs under production scenario 3 (US$)										
40% reduction in harvest and transport costs (HTC)	(487.28)	461.15	441.47	615.38	541.93	497.77	463.66	385.04	412.60	435.99
30% reduction in export and handling charges (EHC)	(487.28)	266.97	206.16	338.95	222.24	134.82	64.19	(50.95)	(23.34)	0.09
Reduction in HTC and EHC	(487.28)	537.25	513.01	682.36	602.22	551.37	517.30	438.73	466.34	489.77

Table 22 World Bank Policy recommendations for agricultural diversification

Agronomic, Economic, and policy factors for diversification		
Agronomic/Technical	Economic	Government Policy
• Climate and soil type (irrigation, topography, fertility, drainage, etc.) • Availability of required inputs (fertilizer, credit, tractors, feed grain) • Plant/seed and animal stock of high genetic quality • Management techniques and quality managers • Appropriate scale and organizational form (incl. no monopolies) • Abundance of labor, or appropriate mechanical technologies	• Means for risk management • Flow of market signals and communication and information systems • Means for vertical diversification • Venture capital and entrepreneurship • Transparency of input and output prices • Information on export standards, market demand and relative profitability • Efficient marketing systems	• Non-distortionary policy that discriminates among crops • Broad based demand driven efficient research and extension programs, without any bias for major crops or against high-value crops • Contract farming opportunities • Available market strategies to reduce production and marketing risk and costs • Rural credit, and markets for other inputs • Off-farm employment opportunities • Marketing systems (including satisfying quality standards) • Involvement of the private sector

Structure for planning and implementing diversification programs

Generic activities areas	Specific elements
Diversification feasibility	SWOT (strengths, weaknesses, opportunities, threats) analysis including evaluation of consumer demand, and analysis on available agronomic resources and off-farm employment opportunities.
Policy environment	Land and water policies, food security, price support and input subsidy policies, policy environment that is crop-neutral, equality of access to assets, vulnerability management, economic and market liberalization, and decentralization.
Input markets, infrastructure systems, and market access	Systems for meeting quality and safety requirements, investment in processing and value adding, investment of transport on transporting and food persevering technologies, options for contract farming, venture capital, credit markets, fertilizer, seed, and technologies supply, irrigation and drainage.
Private sector participation and supply chain coordination	Cooperation with NGOS, investment by and participation of the private sector, rural producer organizations and community groups, risk management tools, communication and logistical

	systems.
Research and extension systems	Integrated management systems (for example, ICM, IPM) and conservation tillage, demand driven site-specific research on wide raining agricultural products, increasing productivity, crop/livestock integration, natural resource use efficiency, intensification, and systems for market, technology, and grading-system information flow.
Natural resources	Sustainable land and water management systems, protection of biodiversity, biosecurity, government regulation, taxes and incentive systems to internalize externalities, appropriate technologies to conserve the environment.
Source: World Bank, 2004	

Figure 2 Corozal District land potential for diversification

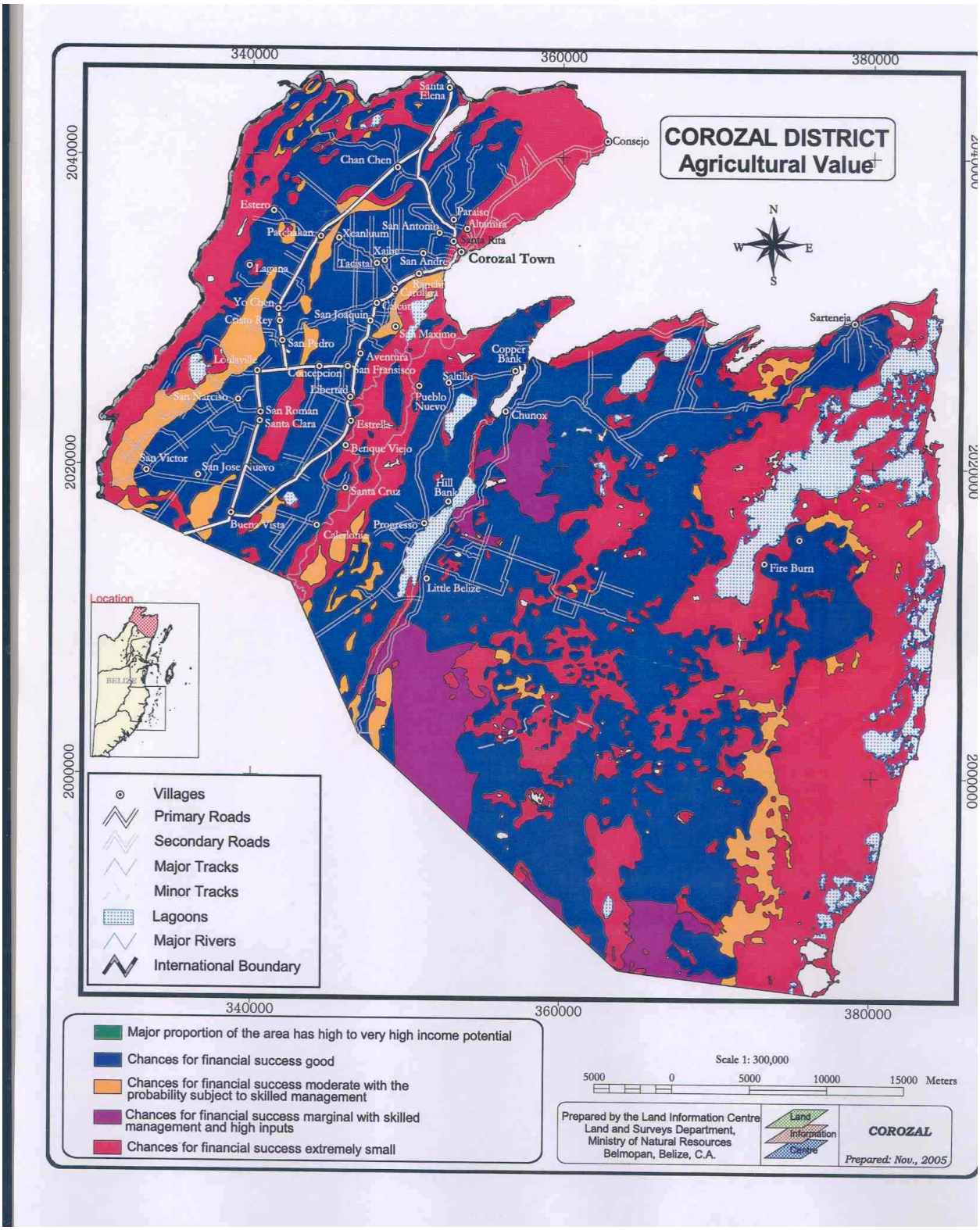

Figure 23 Orange Walk district land potential for diversification

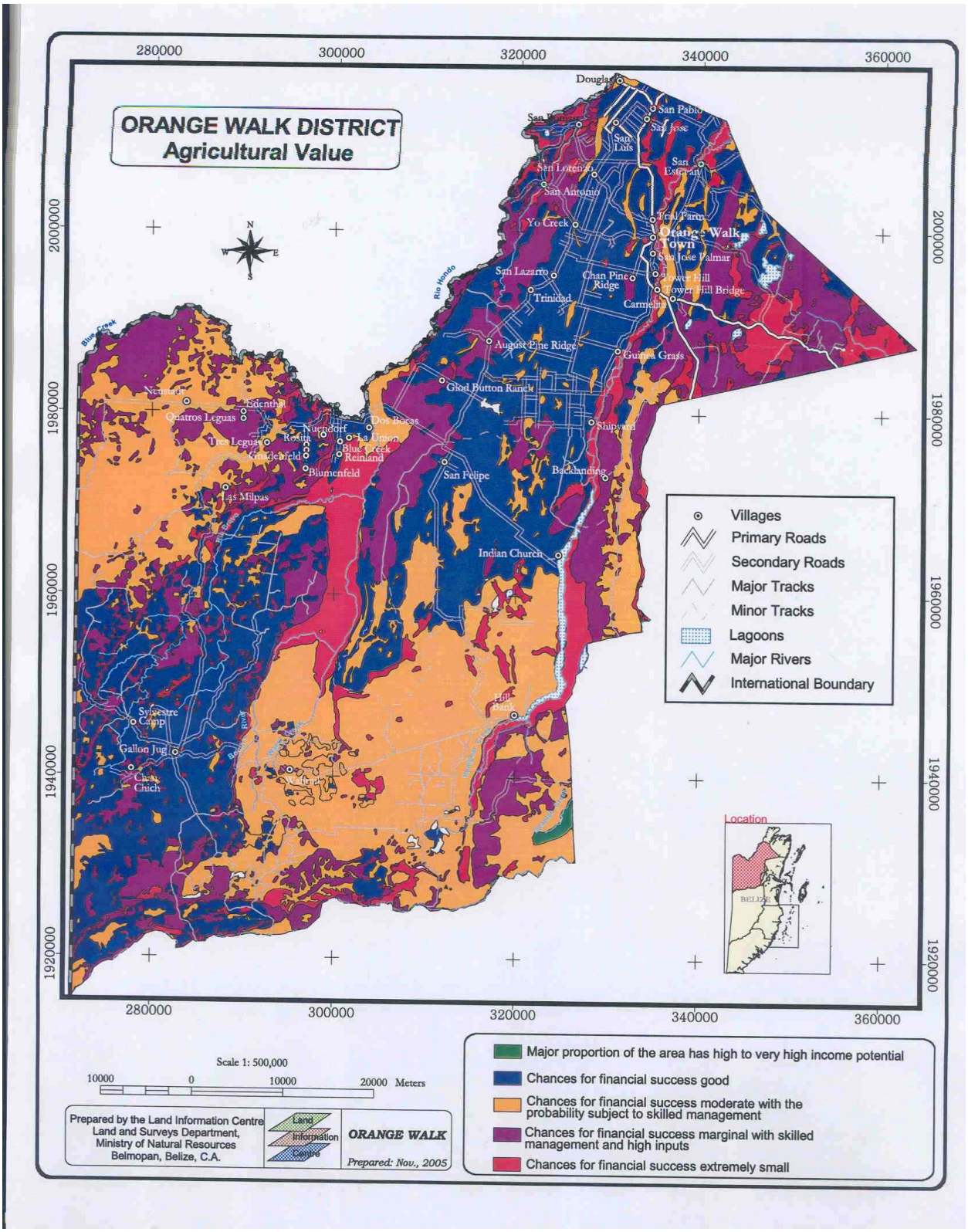

Table 23 Number of graduated students in recent years by major, University of Belize

	January 2013	June 2013	January 2014	June 2014	February 2015	June 2015
Total graduates	480	471	481	447	446	460
Business Science	47	88	72	56	61	66
Tourism Studies	5	6	12	10	9	10
Management	52	39	47	40	44	50
Accounting	22	9	32	27	23	34
Tourism Management	6	9	7	14	5	5
Natural Resources Management	25	28	17	28	18	23
Agriculture	2	5	13	7	5	6

Source: University of Belize

APPENDIX C. QUALITY PARAMETERS FOR SUGAR CANE

Extracted from "Harvesting criteria: sugar cane", Agropedia, accessed at: http://agropedia.iitk.ac.in/content/harvesting-criteria-sugarcane

Important sugarcane quality parameters for assessing cane maturity are the juice Brix, pol or sucrose percentage, and purity.

Juice Brix: *Juice Brix refers to the total solids content present in the juice expressed in percentage. Brix includes sugars as well as non-sugars. Brix can be measured in the field itself in the standing cane crop using a Hand Refractometer or Hand Refractometer Brix or HR Brix. In the field using a pierce, collect composite juice samples from several canes. Then place a drop of the composite juice sample in the Hand Refractometer and measure the Brix reading. The circular field gets darkened relative to the Brix level, which could be easily read. The HR Brix meter has graduations from 0 to 32 per cent. The HR Brix readings can be separately taken from both top and bottom. A narrow range indicates ripeness of the cane, while a wide difference indicates that the cane is yet too ripe. While, if the bottom portion of the cane has lower Brix value than the top, it means that the cane is over-ripened and reversion of sugar is taking place.*

Juice Sucrose or Pol Per Cent*: The juice sucrose per cent is the actual cane sugar present in the juice. It is determined by using a polarimeter, hence sucrose per cent is also referred to as pol per cent. For all practical purposes pol % and sucrose % are synonyms. Now a days an instrument called sucrolyser is also available for determining sucrose % in juice.*

Commercial Cane Sugar: *The commercial cane sugar (CCS) refers to the total recoverable sugar percent in the cane. This could be calculated by the following formula:*

CCS (tons/ha) = [Yield (tons/ha) x Sugar Recovery (%)] /100

Sugar Recovery (%) = [S - 0.4 (B - S)] x 0.73

Where, S = Sucrose % in juice and B = Corrected Brix (%)

The Sugar Industry Control Board (SICB) is comprised of a senior official of the Ministry of Agriculture or his nominee; the Chief Agricultural Officer, or his nominee; representatives from cane farmer associations; two representatives from sugar mill(s); two independent members who are named by the Minister of Agriculture but are not connected to the sugar industry; and one member nominated by the sugar mill(s) and cane farmers. The price sharing agreement is formalized in the SICB. For each ton of sugar exported, a check-off of BZ$11 (US$5.50) goes to the Sugar Industry Development Fund, which finances the SICB, SIRDI, and the SCPC.

The Sugar Cane Production Committee (SCPC) is a subcommittee of the SICB. It maintains a registry of cane farmers, officially assigns sugar cane quotas for farmers, facilitates communication between the sugar mill and harvesting groups for logistical purposes, and oversees sugar cane quality. Sugar cane quality is determined not on an individual farmer basis, but on the basis of the cane from the entire Quality Test Group (QTG), with quality tested for each block of approximately 200-300 short tons from the group. There are 19 QTG. Each association forms their test groups, and harvest is programmed by test group. At the end of the harvest, each farmer can decide if he or she wishes to continue in the same QTG or join another for the next crop year. However, the individual quality incentive is diluted by the use of these QTG. Weekes (2015) recommends individual load sampling, which is used in neighboring countries such as El Salvador and permits quality assessments for each farmer, although this should be introduced cautiously, given difficulties of a previous attempt to introduce individual sampling in 2009 (EC, 2011b).

The Sugar Industry Research and Development Institute (SIRDI) was established in 2009 and falls under the mandate of the SICB. Its main area of activity is training cane farmers, using Farmer Field Schools, where farming leaders receive special training and share knowledge with a group of neighboring farmers. Their curriculum includes soil preparation, cane varieties, cane planting, credit management, and integrated pest management. Through its Sugar Industry Management Information System (SIMIS), SIRDI is also creating a database of cane farms and farmers, which is currently 92% complete. Given this new source of information, which also functions as the new cane farmer registry, in practice, it is SIRDI that allocates cane delivery quotas among farmers, even though it is under the official purview of the SCPC.

3.1.4 Cane farmer associations

The cane farmer associations include the Belize Sugar Cane Farmer Association (BSCFA), which has 4,142 members (76% of farmers) and represents approximately 66% of national production and 59% of area. Members contribute BZ$1 (US$0.50) per ton of cane delivered to finance the association´s activities. The association also facilitates sales of fertilizer to members, both on credit and as cash sales.

In recent years, two new cane farmer organizations have been formed, after internal disputes particularly related to the price sharing agreement. The Corozal Sugar Cane Producer Association has 349 members (6.4%) mainly from the Corozal district, who farm 2,025 ha of sugar cane (%?) and possess a similar area that is not currently cultivated. In the previous harvest, these farmers were able to

produce 92,617 mt of cane, 6.3% of the national crop. The other organization, the Progressive Sugar Cane Producers Association was formed in 2015 by 955 farmers, and produced 18.6% of the sugar cane crop in 2015.

Despite a strong initial conflict, the cane producer associations have begun to improve their relationship, seeing that the challenges for 2017 are the same for all.