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Executive Summary

Egypt has a large sweetener market that is supplied by an unusually diverse range of products: domestically produced cane sugar, beet sugar and high fructose corn syrup (HFCS) plus imports of raw sugar that is refined in Egypt as well as direct imports of white sugar. The sugar market is also highly regulated, with government policy setting beet, cane and sugar prices as well as the tariffs applied to imports of raw and white sugar. Moreover, the government owns all of the country’s cane mills, one of the two cane sugar refineries and has a majority stake in four of the country’s six dedicated beet factories.

The sugar sector is of strategic importance to Egypt in terms of rural employment and food security, as well as managing land and water usage. All of these factors are even more vital given Egypt’s reliance on the Nile for its water supply, its limited area suitable for agriculture, plus the needs of a growing population.

Sugar supply/demand balance

While Egypt produces sugar from both beet and cane, domestic production is only sufficient to meet around two thirds of consumption. The country is therefore a net importer of sugar, with annual imports having been a range of 0.8-1.3 million tonnes in recent years. Diagram E1 summarises how consumption, production and trade have evolved since 2008.

It should be noted that due to stock changes net imports plus production is not equal to consumption in every year. In particular, there was a sharp drawdown of stocks during 2016 in the run up to the currency devaluation. This had an important influence on government policy.

Policy and pricing

The dynamics of the world price cycle

The Brazilian cane sector is a major driver of world sugar prices because it accounts for 40-50% of global exports. Importantly, despite being the world’s largest producer and exporter of sugar, only around half of the cane produced in Brazil is used to produce sugar. The other half is used to produce ethanol, which is sold to fuel the country’s vehicle fleet.

In the long term, world sugar prices are closely linked to Brazil’s costs and the price of ethanol, which is driven principally by energy prices. However, prices also fluctuate above and below these benchmarks. These year-on-year movements are dictated by the balance between global supply and demand, which exhibit a clear cyclical pattern (Diagram E2).
This pattern reflects the perennial nature of the cane crop and results in successive periods of surplus and deficit. As in all markets, periods of surplus lead to an accumulation of stocks, which depress prices in relation to producers’ costs. The reverse is true during periods of deficit.

With the global balance expected to move into surplus in the 2017/18 crop year, we are currently in a period of depressed prices, with values falling towards parity with ethanol in Brazil to remove surplus sugar from the market. However, this can persist only in the short to medium term; with consumption growing and returns below producers’ costs, prices will eventually rise to encourage farmers to expand area and processors to build more capacity.

**Sugar policy in Egypt**

Given the volatility of world sugar prices, almost every government of a sugar producing country intervenes in its domestic market via various policy measures. Egypt is no exception, with two key objectives behind these interventions:

- Firstly, the government seeks to **support farm incomes** and maintain rural employment.
  - It does this primarily by setting the price of sugarcane and sugarbeet (as well as prices of competing crops, such as wheat).
  - The government also intervenes in fertiliser production and marketing (where it has partial ownership) via price restrictions to keep fertiliser prices low for farmers.

- Secondly, the government seeks to ensure an adequate and affordable supply of sugar to consumers throughout the country. This objective has to be balanced with the need to ensure processors receive a sugar price that allows them to cover their costs and pay the government-set prices for cane and beet.

The primary tool for achieving this second objective is setting and adjusting import duties on raw and white sugar to regulate internal prices (Diagrams E3 and E4). Although duty changes are ad hoc, there is a general pattern to the government’s behaviour.

- **When world sugar prices are low in relation to local producers’ costs**, it raises tariffs on raw and white sugar to prevent imports from competing with domestic sources of supply. In recent years, the government has set tariffs for white sugar at 20% and raw sugar around 10% at such times. This protects cane and beet sugar producers when they are marketing their sugar and allows them to pay farmers.

- **When world sugar prices are high in relation to local producers’ costs**, it sets a lower tariff on raw and white sugar. This is because the threat of imports undercutting local production is less and the government is instead concerned about affordability of sugar for consumers. Generally, tariffs have been dropped to around 10% for white sugar and 2% for raws at such times; however, during periods of very high prices they have also been removed completely. This minimises the impact on consumer prices during periods when the domestic industry was not under threat.

Generally, the duty on white sugar is higher than for raw to encourage domestic refining. In past years, duties have also been higher during the beet and cane processing seasons to provide protection to farmers and processors.

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1 Sugar cane is a perennial crop. Once planted, it is harvested over successive years. This cycle varies from country to country, but ranges from 2-7 years in most countries. By contrast, sugar beet (like grains and oilseeds) must be replanted every year.
Executive Summary

**Diagram E3: Average import tariff per month, 2011-2017**

- **Diagram E4: Egyptian duties on white and raw sugar, 2010-2017**

### Sugar pricing in Egypt

Diagrams E5 and E6 compare annual Egyptian ex-works sugar prices, converted to a delivered Cairo basis, versus three price benchmarks:

- Import parity white sugar, including duties.
- Import parity white sugar, without duties. This is relevant because the EU has duty-free access to the Egyptian market.
- Import parity raw sugar that is subsequently refined in Egypt. Imported raw sugar can be processed either at standalone refineries or at beet factories during the off-crop.

**Diagram E5: Egyptian wholesale sugar prices versus import parity, 2010-2017, EGP/tonne**

**Diagram E6: Egyptian wholesale sugar prices versus import parity, 2010-2017, US$/tonne**

The diagrams show prices in EGP and US$ respectively. They show that prices have traded within the band between import parity raw sugar and white sugar with duties for most of the time.
There was a notable break from the dynamics described above during 2016, when a sugar shortage occurred in many parts of Egypt. The roots of this problem stemmed from 2013, when a shortage of dollars in Egypt caused a divergence between the official pegged EGP/US$ exchange rate and the parallel rate. By mid-2016, the two rates had diverged significantly, discouraging traders from importing sugar to supply the local market and, for a period, incentivising exports. This resulted in a shortage of sugar, which was only brought to an end when the Egyptian currency was floated in November 2016. This resulted in a sharp devaluation, which in turn triggered a sharp rise in the price of sugar in Egypt, from around 5,000 EGP/tonne in October to 10,000/tonne in November. This resulted in the government briefly taking control of all distribution within the country. This has since been stopped; however, the government has retained a more active role in sugar marketing.

**Competitiveness of Egyptian supply**

**The situation in 2017**

Drawing together the cost calculations presented in Sections 3-5 of the main report, as well as the import parities derived above, we can evaluate the competitiveness of each supply source. Diagram E7 summarises the results of this analysis for 2017, differentiating between domestically-produced sugar (cane and beet) and imported sugar, with and without duties. We also separate out depreciation from the cash costs of production where relevant. These costs exclude any allowance for a return on capital employed.

**Diagram E7: Relative cost of current sources of supply to the Egyptian market, 2017**

- Beet sugar is currently the lowest-cost source of supply in the Egyptian market, despite the increase in local currency costs following the devaluation of the EGP.
- Cane sugar is much higher cost for the reasons outlined in Section 4 (namely price support for cane farmers and the small scale of milling).
Executive Summary

- While HFCS supplies only a small part of the total sugar market (around 80,000 tonnes on a sugar equivalent basis), it is relatively low cost because of the low price of its principal raw material, corn. Moreover, the starch processing sector has potential to expand market share and the current producer, National Company for Maize Products (NCMP), is currently in the process of being privatised.

- World sugar prices are currently low, meaning that white sugar imports have the potential to undercut sugarcane’s full cost of production if they enter Egypt duty-free. This is why the Egyptian government has imposed a tariff on white sugar from origins other than the EU.

- The competitiveness of imported raw sugar for refining depends on whether it is subject to a duty. Raw sugar currently enters duty free and, in this situation, is a competitive source of supply. However, if raw sugar is subject to a duty of 20% (as has been the case in the past when world prices have been low), its costs are similar to those of the cane sector.

**Long-run competitiveness of supply**

Looking ahead, the cost structure of each source of supply is likely to adjust over the coming years. This is for several reasons:

- Although wages have risen significantly in EGP since the devaluation in 2016, this increase is much less than the fall in the value of the currency (Diagram E8). This means wages have declined in dollar terms and are currently low by historical standards (Diagram E9). While this may persist for a period, further wage inflation is likely to erode this advantage over time.

- The margin on beets is currently below that of wheat in the Delta region, meaning prices will have to rise above their 2017 level to incentivise farmers to maintain beet area in the longer term (see Section 3).

- Finally, world wheat prices are currently weak, which reduces the competitive pressure on beets. While it is not guaranteed that wheat prices will be sustained at a higher level in the future, price volatility in agricultural markets means that there will be times when wheat prices are higher and this will have to be reflected in higher beet prices.
In view of likely future cost pressures, we have estimated the likely future cost structure of each supply source by making the following assumptions:

- Wages move to the level implied by the long-run real exchange rate.
- The beet price is set so that farmers receive the cost of growing beets in the Delta to reflect the higher wage cost, plus the return from farming wheat.

To illustrate the impact of higher wheat prices, we have presented a second scenario where the price of wheat rises by 20% to EGP4,525 per tonne. This in turn pushes the price of beet up to just over EGP780/tonne. Finally, we have also estimated beet and cane processing costs using adjusted wages. Combining these with the adjusted beet and cane price, we have derived the adjusted costs of producing beet and cane sugar.

We compare these long-run costs with current import parities in Diagram E10. This shows that beet sugar is expected to remain in a much stronger position to compete with imports than cane sugar. However, duty-free white sugar imports would squeeze margins for beet processors, especially if wheat prices were to increase. Meanwhile, the cane sector would remain uncompetitive even at a 20% duty on a full cost basis, although it would be able to cover its cash costs when competing with imported white sugar.

Diagram E10: Long term competitiveness of beet/cane sugar versus current prices

However, world prices are volatile and alter the import-parity benchmarks shown in Diagrams E7 and E10 (which are based on prices prevailing in 2017). Diagram E11 shows how the No.11 raw sugar price has moved in recent years, including its minimum and maximum yearly averages, as well as the period average, (13.1, 17.2 cents and 21.6 cents respectively).
Taking into account this volatility in world prices, Diagram E12 compares the competitiveness of domestic supplies at the three pricing benchmarks from Diagram E11 above. In the diagram, the adjusted costs of the beet and cane sectors are represented by the vertical lines.
The diagram highlights the vulnerability of the cane sector in the absence of import duties, even at high world sugar prices. Although the beet sector is more robust, it too would be vulnerable at low world prices (which are comparable to prices prevailing at the time of writing) in the absence of duties. If we assume that domestic prices reflect import parity over time, we estimate that during the period 2012-2017:

- Beet sugar would have covered its full costs 85% of the time, with world market prices falling below its costs 15% of the time.
- Cane sugar on the other hand would only have covered its costs 37% of the time.

**The impact of sugar market liberalisation**

Using the analysis presented above, we evaluate the impact of fully liberalising the Egyptian sugar sector, contrasting the outcome with the status quo. For purposes of this analysis, we have assumed that full liberalisation comprises:

- **Completely removing all import duties.**
- **Ceasing all direct government subsidies and transfers within the sugar industry, with cane and beet production operating under unsupported commercial conditions.** Social transfers, including any price subsidy for sugar sold through the ration system, are assumed to be unchanged.

**Summary of impact**

Table E1 summarises the expected outcome of liberalisation, as well as its impact versus the status quo. Overall, liberalisation would be expected to result in an overall net welfare saving, unless world prices are high. This is because in the low and average world price scenarios, domestic cane sugar is more expensive than imports from the world market. Nevertheless, there would be both winners and losers among stakeholders from such a liberalisation.

- Full liberalisation would be expected to result in the closure of the cane milling sector, as subsidies would be removed and duty-free import parity prices are estimated, on average, to be below cane’s cost of production. ESIIC is reported to employ 21,000 people (2012), a large percentage of whom are employed at cane mills.
- Cane farmers in Upper Egypt would lose the opportunity to produce cane for sugar production. The resulting loss on their income will depend on the returns they could earn from the next best crop.
- The beet sugar sector would also experience lower revenues. Given that beet prices are assumed to generate a similar return to farmers as the next best crop (wheat), the full impact of the lower domestic sugar price would be felt by processors. Nevertheless, we estimate that the sector would remain viable even at low world prices. However, this is unlikely to create an environment that would encourage future investment.
- The refining sector would also remain viable under a liberalised scenario, although its margins would be reduced. Furthermore, refiners would be more exposed to movements in the world white premium, which could be depressed by EU exports going forward.
- Government spending would fall slightly, as the state would no longer be subsidising the cane industry. However, the government, via its ownership of SIIC, would lose any profits it currently earns from its cane operations. Additionally government income from the beet sector — via its majority shareholding in four of the country’s six beet factories — would also drop and it would receive less revenue from import duties.
Executive Summary

- Consumers are expected to gain as a result of lower sugar prices. We estimate the total benefit of this to consumers to be more than US$100 million at average world prices (assuming a duty of 10% is levied at this price level).

Table E1: Summary of the expected impact of full liberalisation within the Egyptian sugar sector

<table>
<thead>
<tr>
<th>Summary of full liberalisation</th>
<th>Unit</th>
<th>Low price (13.1 cents/lb)</th>
<th>Average price (17.2 cents/lb)</th>
<th>High price (21.6 cents/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industry profitability:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cane industry profit/loss</td>
<td>US$ million</td>
<td>-107</td>
<td>-19</td>
<td>75</td>
</tr>
<tr>
<td>Beet industry profit/loss</td>
<td>US$ million</td>
<td>10</td>
<td>119</td>
<td>237</td>
</tr>
<tr>
<td>Refining profit/loss</td>
<td>US$ million</td>
<td>67</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>Government subsidy to cane industry</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Government revenue from duties</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Total cost to consumers from duties</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Extra margin for cane farmers</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Impact versus status quo:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall in cane industry profits</td>
<td>US$ million</td>
<td>0</td>
<td>-30</td>
<td>-135</td>
</tr>
<tr>
<td>Fall in beet industry profitability</td>
<td>US$ million</td>
<td>-99</td>
<td>-61</td>
<td>-74</td>
</tr>
<tr>
<td>Change in refining profitability</td>
<td>US$ million</td>
<td>-64</td>
<td>-27</td>
<td>-37</td>
</tr>
<tr>
<td><strong>Change in industry profitability</strong></td>
<td>US$ million</td>
<td>-163</td>
<td>-118</td>
<td>-246</td>
</tr>
<tr>
<td>Saving from government subsidies</td>
<td>US$ million</td>
<td>27</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Loss of duty revenue</td>
<td>US$ million</td>
<td>-7</td>
<td>-10</td>
<td>-12</td>
</tr>
<tr>
<td><strong>Change in net government revenue</strong></td>
<td>US$ million</td>
<td>20</td>
<td>-10</td>
<td>-12</td>
</tr>
<tr>
<td><strong>Total saving to consumers</strong></td>
<td>US$ million</td>
<td>285</td>
<td>178</td>
<td>215</td>
</tr>
<tr>
<td><strong>Margin lost to cane farmers switching crops</strong></td>
<td>US$ million</td>
<td>0 to -22</td>
<td>0 to -22</td>
<td>0 to -22</td>
</tr>
<tr>
<td><strong>Overall financial impact</strong></td>
<td>US$ million</td>
<td>149 to 127</td>
<td>60 to 38</td>
<td>-31 to -53</td>
</tr>
</tbody>
</table>

In addition, there are benefits and costs that are harder to quantify, such as potential water savings and the foreign exchange requirement to import nearly one million tonnes more sugar (assuming the cessation of cane farming). However, the net impact on Egypt’s trade account would also depend on which alternative crop is produced, which will either be exported to earn foreign exchange (e.g. horticultural products or fruits) or displace imports if consumed locally, both of which would benefit trade accounts.

Policy options

The analysis above indicates that the full liberalisation of the sector would almost certainly result in lower sugar output, with the cane sector in particular under threat. It may also discourage further investment in the beet sector. While our analysis points to an overall net welfare gain from liberalisation, such a move would undoubtedly have significant economic and social impacts, particularly in Upper Egypt. Furthermore, it is important to remember that virtually all sugar industries globally benefit from some form of government support. With this in mind, the government may wish to partially liberalise the sector, rather than remove its influence completely.

In Section 7, we consider a number of policy options that could be pursued by the government to encourage the sugar sector to continue to develop, while minimising the additional burden placed on consumers. These policies include:
• Measures to help improve the efficiency of the domestic sugar sector, thereby lowering the amount of support that it requires to remain viable.

• Offering a level of protection from the volatile world market that would create an environment that is more conducive to investment in the beet sector.

Cane sector

While the cane sugar sector is currently uncompetitive with duty-free imports, there is potential for the sector’s reliance on duties to be reduced, even if it cannot compete in a fully liberalised market. Three measures that could be considered are:

• **The introduction of a quality-based cane payments system.** Cane farmers are currently paid according to the weight of cane delivered to the mill, with no allowance made for the sucrose content of the cane. This is in contrast to most other cane industries (including Brazil and Thailand, the world export leaders) and Egypt’s beet sector, which pay premiums to farmers who deliver higher quality cane/beet. A quality-based payment system would raise cane sugar content and therefore factory recovery rates, lowering costs of production. It would also incentivise farmers to improve the efficiency of water and fertiliser usage.

• **A programme of mill modernisation and/or rationalisation.** Currently the average scale of milling in Egypt is small, which raises unit costs for cane. A programme of mill modernisation and rationalisation could allow unit costs to be reduced considerably by gaining economies of scale, updating equipment and reducing labour costs.

• **Reviewing current irrigation systems.** The use of flood irrigation results in large quantities of water being used the cane sector. This could be addressed by the adoption of drip irrigation. A full cost-benefit analysis of the adoption of drip is recommended to help inform the best way forward.

Beet sector

The beet sector is in a stronger position than the cane sector, but it must be able to make a reasonable return on capital employed if it is to attract further investment. While this is likely to require some protection from imports, from government’s perspective, it is important that the burden on consumers is not excessive.

Based on current performance, and assuming a world price of 17 cents/lb (our average price scenario), we estimate that a tariff of around 10% on imports would be sufficient to encourage investment in the beet sector (assuming a 10% return is adequate for investors). If world prices were to trade above 20 cents/lb on a consistent basis, no protection would be required. However, at low world prices, even a 20% duty would not be enough to achieve a 10% return.

<table>
<thead>
<tr>
<th>Table E2: Pre-tax internal rate of return from investing in the beet sector at different levels of import duty and world price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low price (13.1 cents/lb)</td>
</tr>
<tr>
<td>Beet factory IRR, duty free</td>
</tr>
<tr>
<td>Beet factory IRR, 10% duty</td>
</tr>
<tr>
<td>Beet factory IRR, 20% duty</td>
</tr>
</tbody>
</table>

These rates of return could be higher if the performance of the beet sector improves in the future. Field performance in Egypt is poor compared to some other beet industries (see Section 3 for details). Part of this is attributable to the climate, with beet varieties less suited to...
the conditions of Egypt compared to Northern Europe; however, other industries have made performance gains under similar conditions. The best example is Morocco, which has made great strides in improving field performance in recent years, driven by the organisation of growers into production units and the adoption of monogerm seeds.

**Trade policy**

**Import duties**

Our analysis suggests that an import tariff will be required if the cane industry is to remain viable and the beet sector is to expand further. While the government has been adjusting tariffs on an *ad hoc* basis in response to changing market conditions, a more formal structure would provide greater encouragement for further private sector investment in the sector. In this area, there is the potential to learn from the experience of other countries.

- Russia has shown that variable import duties, which automatically adjust depending on the level of world prices, can help to attract investment by providing transparency while minimising the burden placed on consumers.

- An alternative model is provided by Colombia, which uses a price band system to reduce the impact of volatility of world prices, as well as to provide protection against imports. A variable import duty softens price fluctuations by reducing the duty when sugar prices rise above a reference price, and raises them if prices drop below it. In this way, the policy helps to create a balance between offering reasonable support for growers, while at the same time lowering the price paid by consumers when the world sugar price is high.

Whichever model is chosen, the impact on consumers could also be reduced by applying lower tariffs during the off-crop after domestic sugar has been marketed.

**Policy towards EU imports**

If import duties are to provide an effective way of supporting local prices, it is important that any loopholes are closed. One potential issue is the current policy that grants unlimited duty-free access to sugar originating from the EU. While EU exports have effectively been limited in the past, from October 2017, the level of EU exports will no longer be constrained by the current WTO limit of 1.4 million tonnes. This means that much larger amounts of EU sugar could be shipped to Egypt in the future, potentially destabilising the government’s policy, particularly if importers invest to develop more sophisticated supply chains.

**Policy towards the refining sector**

Historically, the government has offered lower duties on raw sugar than whites to encourage domestic refining of imported raw sugar. This tariff differential has encouraged investment in the sector, although this was now almost 10 years ago. A key issue is whether the government wishes to continue to offer a tariff advantage to refiners. There are several reasons for doing so, including the promotion of value addition in country and the threat to refining margins posed by the re-emergence of the EU as a major exporter. However, this would need to be managed in a way that does not undermine support for the domestic sugar sector.
Section 1: Introduction

Egypt has a large sweetener market that is supplied by an unusually diverse range of products: domestically produced cane sugar, beet sugar and high fructose corn syrup (HFCS) plus imports of raw sugar that is refined in Egypt as well as direct imports of white sugar. The sugar market is also highly regulated with government policy setting beet, cane and sugar prices as well as the tariffs applied to imports of raw and white sugar. Moreover, the government owns all of the country’s cane mills, one of the two cane sugar refineries and has a majority stake in four of the country’s six dedicated beet factories.

In this section, we provide an overview of the Egyptian sugar industry, its sugar supply and demand balance and the different sources of production and consumption of sweeteners. We also present an overview of government policy towards the sector and the rationale driving policy changes. We finish with an analysis of the socioeconomic importance of sugar to Egypt.

Supply and demand balance

Diagram 1.1: Egyptian sugar consumption, production and net imports, 2008-2016

While Egypt produces sugar from both beet and cane, domestic production is only sufficient to meet around two thirds of consumption. The country is therefore a net importer of sugar, with annual imports having been in a range of 0.8-1.3 million tonnes in recent years. Diagram 1.1 summarises how consumption and production have evolved since 2008.

It should be noted that due to stock changes net imports plus production is not equal consumption in every year. In particular, there was a sharp drawdown of stocks in 2016, in the run up to the currency devaluation. This had an important influence on government policy and is discussed in detail below.

Demand

Sweetener consumption growth in Egypt has been strong in recent years (Diagram 1.2), driven by a rapidly expanding population (at 2.0-2.2% annually) as well as by growth in per capita demand, although this has slowed since 2014. In general, per capita consumption grows as incomes rise, as well as when urbanisation increases, which lead people to consume more beverages, processed foods and confectionery.

In total, consumption growth averaged 3.5% annually over the past seven years, leading to a total demand for caloric sweeteners of just under 3.4 million tonnes in 2016. This is demand for sugar and HFCS (a liquid sweetener that is produced from corn starch), which supplies a portion of the market. While it is not a perfect substitute in all applications (as it is a liquid), HFCS competes with sugar in certain end uses, particularly in the beverage sector and in some confectionery products.

At 36 kg per capita, annual sugar consumption in Egypt is high by global standards, though comparable to other countries in the MENA region (Diagram 1.3). Additionally, there is no sign that Egypt has hit the point where consumers switch away from sugar as incomes rise. This suggests future growth will be positively correlated with increases in household income.
Sweetener consumption in Egypt can be divided into three broad categories:

- **Industrial demand**, which includes demand from food processors, drinks companies and some other non-food end uses, such as the pharmaceutical industry.

- **Retail demand**, which includes tabletop demand from Egyptian families independent of the Smart Card (ration) system, as well as some small businesses, such as bakeries.

- Lastly, demand from the **government ration system**, which supplies essential commodities (including sugar) to an estimated 71 million people, or 78% of the Egyptian population, with eligibility assessed by income. The system provides five loaves of bread per person per day plus EGP 50 per month, which can be spent on approved goods, including sugar.

**Supply**

The supply of caloric sweeteners in Egypt falls into three broad categories: domestically-produces beet and cane sugar, imported sugar and HFCS. Around one million tonnes of sugar per year is produced from sugarcane within Egypt, and around 1.3 million tonnes of sugar is produced from beets. Together, beet and cane sugar meet more than half of Egypt’s consumption needs (Diagram 1.5). Diagram 1.6 summarises how the two sources of supply have evolved in recent years, with beet sugar providing all the growth in output. In contrast, cane sugar production has remained flat at around one million tonnes. The main reason for this is concerns around water usage in Upper Egypt.
On top of this domestic production, annual raw sugar imports for refining averaged close to a million tonnes, as well as around 150,000 tonnes of imported white sugar. Finally, HFCS production was in the region of 90,000 tonnes, on a sugar equivalent basis.

Table 1.1 lists the operational production units in Egypt.

**Diagram 1.5: Caloric sweetener supply by source, 2014-2016 average**

<table>
<thead>
<tr>
<th>Source</th>
<th>Quantity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beet sugar</td>
<td>1,300 kt</td>
<td>36%</td>
</tr>
<tr>
<td>Cane sugar</td>
<td>1,000 kt</td>
<td>27%</td>
</tr>
<tr>
<td>Raw imports (for domestic market)</td>
<td>960 kt</td>
<td>30%</td>
</tr>
<tr>
<td>White imports, 150 kt</td>
<td>90 kt</td>
<td>3%</td>
</tr>
<tr>
<td>HFCS, 90 kt</td>
<td>90 kt</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Diagram 1.6: Cane vs beet production in Egypt, 2001-2017**

- Cane sugar
- Beet sugar

**Table 1.1: Summary of industry ownership within Egypt**

<table>
<thead>
<tr>
<th>Type</th>
<th>Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cane mills</td>
<td></td>
</tr>
<tr>
<td>Abu Kerkas</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Gerga</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Nag hammadi</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Deshna</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Qus</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Arment</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Edfu</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Kom Ombo</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Beet factories</td>
<td></td>
</tr>
<tr>
<td>Delta</td>
<td>ESIIC majority, minority private</td>
</tr>
<tr>
<td>Dakahleya</td>
<td>ESIIC majority, minority private</td>
</tr>
<tr>
<td>Fayoum</td>
<td>ESIIC majority, minority private</td>
</tr>
<tr>
<td>Nubarya</td>
<td>ESIIC majority, minority private</td>
</tr>
<tr>
<td>Nile</td>
<td>Private</td>
</tr>
<tr>
<td>Alexandria</td>
<td>Private</td>
</tr>
<tr>
<td>Refineries</td>
<td></td>
</tr>
<tr>
<td>Hawamdiya</td>
<td>ESIIC</td>
</tr>
<tr>
<td>Sokhna</td>
<td>Private</td>
</tr>
<tr>
<td>HFCS</td>
<td></td>
</tr>
<tr>
<td>National Company for Maize Products</td>
<td>Public, being privatised</td>
</tr>
</tbody>
</table>

**Domestic sugar**

Egypt is one of a handful of countries in the world that has the climatic conditions to grow both sugarcane and sugarbeet. Beet is grown primarily in the Delta region, while cane is grown in Upper Egypt. There is one factory that processes both beet and cane in Middle Egypt. These two production sectors also underpin the Egyptian government’s sugar policy.
While both sugarbeet and sugarcane produce an almost identical end-product (with the only difference being driven by the quality of equipment used by factories/mills), their individual circumstances, cost structures and pressures are very different. We analyse each crop in turn in detail in Sections 3 and 4.

**Imported sugar**

Because local production of sugar is insufficient to meet demand, the difference is imported:

- Egypt has two standalone refineries which process imported raw sugar into white sugar:
  - Hawamdiya, which is located close to Cairo and controlled by the government-owned Egyptian Sugar and Integrated Industries Company (ESIIC). Hawamdiya largely supplies the sugar sold via the Smart Card system.
  - United Sugar Company Egypt (USCE), which is located in the free zone of the port of Ain Sokhna on the Red Sea coast. The refinery supplies the domestic market and re-exports sugar to international markets depending on market conditions.
- In addition, some of Egypt’s beet factories refine raw sugar in the periods when they are not processing sugarbeet. This has also happened in exceptional circumstances at cane mills; however, generally it is not commercially viable.
- Egypt also imports white sugar for direct consumption. These imports are often subject to a higher tariff compared to raw sugar to encourage domestic refining. This means the country imports much less white sugar than raw imports. However, in times of high world prices or supply shortages, white sugar tariffs have been waived. In addition, the EU has unlimited duty-free access to the Egyptian sugar market (we discuss this issue, and its implications for future policy options, in greater detail later in Section 7).

**HFCS**

Egypt also produces starch-based sweeteners from corn (most of which is imported). This includes approximately 120,000 tonnes of HFCS, which is equivalent to around 90,000 tonnes of sugar.

**Policy**

Egyptian government policy towards the sugar sector has several objectives and uses a number of tools to achieve them (which are discussed in greater detail in Section 2):

- Firstly, the government seeks to support farm incomes and maintain rural employment.
  - It does this primarily by setting the price of sugarcane and sugarbeet (as well as prices of competing crops, such as wheat).
  - The government also intervenes in fertiliser production and marketing (where it has partial ownership) via price restrictions to keep fertiliser prices low for farmers.
- Secondly, the government seeks to ensure an adequate and affordable supply of sugar to consumers throughout the country. This objective has to be balanced with the need to ensure processors receive a sugar price that allows them to cover their costs and pay the government-set prices for cane and beet.
The primary tool for this is setting and adjusting import duties on raw and white sugar to regulate internal prices. Generally the duty on white sugar is higher than the duty for raw sugar to encourage domestic refining. In past years, duties have also been higher during the beet and cane processing seasons to provide protection to farmers and processors. However, in times of high world prices or short local supply, duties have also been cut, or even removed, to ensure affordable prices for consumers.

Policy in 2016

Following sugar shortages in 2016, the government took additional steps to try to ensure adequate supplies, on top of the core measures discussed above. As we discuss in Section 2, these initiatives were taken as a result of shortages that arose due to currency distortions between the official and parallel exchange rate.

- Export duties were imposed. Initially, they were set at EGP 900/tonne in May 2016 but later raised to EGP 3,000/tonne in April 2017. These duties aimed to prevent the export of sugar, which was taking advantage of the difference between the official and parallel exchange rates. In addition, import duties on raw sugar were waived.

- The Ministry of Supply and Internal Trade (MoSIT) took direct control of sugar distribution for a period of time, and started seizing stocks held by retailers, wholesalers and industrial users who were accused of hoarding sugar. These measures did not resolve supply shortages, because local prices remained below the cost of imported sugar purchased at the unofficial exchange rate. This issue was resolved only following the devaluation of the Egyptian pound, which eliminated this distortion and resulted in greater liquidity in the foreign exchange market.

- The MoSIT no longer directly controls all distribution; however, it still plays a larger role in setting prices and balancing the market compared to previous years. As of March, MoSIT sets the ex-works prices at which government-owned beet and cane processors sell their sugar. While private suppliers are free to set their own price, competition with the government supplies ensures that the MoSIT is, in practice, the price setter in the Egyptian market.

- Finally, the MoSIT supplies government controlled beet factories with raw sugar that is imported for refining to ensure the deficit is covered. Previously this refining was carried out by private traders entering into deals with the factories, rather than under the direct control of the government.

Socioeconomic importance of the sugar sector

The sugar sector is of strategic importance to Egypt in terms of rural employment and food security, as well as managing land and water usage. All of these factors are even more vital given Egypt's reliance on the Nile and limited area suitable for agriculture, combined with a growing population.

In 2012, it was estimated that sugar crops were grown by 309,000 farmers across Egypt, as well as providing employment to a further 30,000 workers at the factories and mills processing the crops. In turn, sugar crops accounted for 7.5% of Egypt's total agricultural area, and 10% of agricultural GDP. These farms are mostly smallholdings, with about half of plots growing sugar being smaller than 1 feddan (0.42 hectares) in the Delta according to estimates provided by factories, as land is split during the process of inheritance under Egyptian law.
Support for sugar farmers therefore ties into Egypt’s efforts to increase rural incomes, ease the pressures of urbanisation and provide employment. In particular, Upper Egypt, where cane is grown, experiences high poverty rates and is therefore a key target for Egyptian government policy.

**Water consumption**

Due to its reliance on the Nile, water is a resource that needs to be carefully managed in Egypt. This has deep implications for the sugar industry, as sugarcane in particular is a water-intensive crop, with a high irrigation requirement (Diagram 1.7).

![Diagram 1.7: Annual irrigation requirement for key crops in Egypt](image)

In 2015, cane and beet accounted for around 11% of all irrigation water used in Egypt and, given the existing stresses on the Nile, production of cane needs to be balanced against the alternate uses for the water it consumes.

For this reason, the Egyptian government has currently restricted the expansion of cane, limiting the area to its current size to make use of installed capacity. Instead, it has focused on the expansion of beet sugar, with its lower water requirement.

However, calculating the exact water consumption of each crop is more complex, as only part of the water applied is consumed either by transpiration in plants or through evaporation from standing water. The rest returns to the Nile, and can then be used again. This means that actual water consumption of each crop is lower than the values listed above.

While calculating exact consumption is difficult, the following points can be made:

- Water consumption is higher in Upper Egypt, where temperatures are higher.
- Forms of irrigation which result in standing water, such as flood irrigation, have higher water losses due to evaporation. However, after the canopy develops on cane and provides shade, the water loss drops significantly, even with the same volume of water applied.
- Systems of irrigation with lower requirements (such as drip) will reduce losses as evaporation is lower; however, the saving is less than these headline numbers imply as some of the water “loss” from flood irrigation returns to the Nile and is subsequently used again down-river. Therefore, simply because drip irrigation has a third of the requirement of flood, it does not follow that three times the area can be planted for the same water consumption.
Section 2: The World Market and Egyptian Policy

In this section, we discuss recent developments in the world sugar market and explain the key drivers of prices and the factors behind the cyclical nature of the market. We then discuss how the Egyptian government has structured its sugar policy in recent years to achieve its objectives in view of world price volatility. Finally, we assess the potential impact of the EU market reform, which was implemented in October 2017, on the Egyptian sugar market.

The world market

The dynamics of world raw sugar prices

Sugar is a very volatile commodity, with the No.11 contract (the global benchmark of raw sugar; the No.5 contract refers to refined sugar) trading as low as US$240/tonne (10 cents/lb) and as high as US$780/tonne (35 cents/lb) within only the last few years (Diagram 2.1). However, there is an underlying logic to the movement of prices:

- In the medium to long term, prices trade around the cost of production of key exporters, the most important of which is Brazil. This influences the level of prices.
- In the short to medium term prices trade above or below this cost of production depending on whether the world sugar balance is in surplus or deficit. This drives the price cycle.

Therefore, while the cost of production is an important benchmark, prices can display significant volatility in the short term depending on supply and demand. Too much sugar production and prices fall until sugar is put into storage and area under cane and beet is eventually switched to grow other crops. On the other hand, too little production prices drives prices up until stocks are released and eventually more land is planted to beet and cane. The impact of these surpluses and deficits is large because production can take years to adjust to price signals.

Diagram 2.1: No.11/ No.5 world raw/refined sugar prices, 2009-2017

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The dynamics of the world price level

Brazil’s cost of production

The main determinant of the long-term level of raw sugar prices is the cost of producing sugar, in particular in Brazil, which is the world’s largest exporter, lowest cost producer and, as such, the price maker in the world market. Brazil is a low cost producer thanks to its excellent climate for growing cane, very large scale of operations in both field and milling operations and long season length, all of which help to lower unit costs.

Brazil’s role as price-maker is evident from Diagram 2.2, which compares world prices of raw sugar with the evolution of the cost of producing raw sugar in Centre/South Brazil (the country’s dominant sugar-producing region).

- Our estimate of costs represent full production costs (including an allowance for return on capital employed) and are presented in US dollars on a free on board (f.o.b.) basis, i.e., including the cost of transporting raw sugar from the mill to the port and loading it onto a vessel (known as fobbing costs).

- The price is the ICE No.11 futures contract, which is quoted in US dollars on an f.o.b. basis.

- The diagram also includes an index of Brazil’s real exchange rate (using 2000 as the base year). As we discuss below, this indicates that Brazil’s costs and world raw sugar prices have tracked movements in the country’s currency over time. More recently, Brazil’s costs and world sugar prices have fallen as Brazil’s currency has weakened.

Diagram 2.2: Sugar production in Centre/South Brazil vs. world raw sugar prices in US dollars (2017/18 costs estimated)
Brazil's fuel pricing policy

Brazil's production costs are not the only long term driver of world sugar prices. Another, more complex influence is the price of ethanol in Brazil.

All cane mills in Brazil that produce sugar also produce ethanol. They also have some flexibility to alter their output of these two products depending on the relative returns from each. This ability of Brazilian millers to alter their raw sugar and ethanol production volumes according to the relative returns from each product means that raw sugar and ethanol prices in Brazil are correlated over time. In years when the sugar market is short of sugar, its price rises to a premium over ethanol to encourage millers to maximise their sugar output. The opposite is true when the world sugar market is oversupplied.

The relationship between raw sugar and ethanol prices is shown in Diagram 2.3, which depicts the ex-mill prices Brazilian millers have earned from each product since 2005. To allow raw sugar and ethanol to be compared like for like, ethanol prices are expressed on a (raw) sugar equivalent basis.

Diagram 2.3: Sugar vs. hydrous ethanol prices, ex-mill Brazil, expressed on a sugar-equivalent basis

The significance of this relationship is that there is a link between ethanol prices in Brazil and world raw sugar prices. This is important because Brazilian ethanol prices are determined within Brazil's fuel market, where the government has a strong influence over local gasoline prices. In an effort to control inflation, gasoline prices have historically been held very stable in local currency terms. However, since October 2016, Brazil's government-controlled oil company, Petrobras, has started to price gasoline in line with the cost of importing gasoline from the world market. This means there is now a much stronger link between world sugar prices and world oil/gasoline prices.

The dynamics of the world price cycle

Diagrams 2.2 and 2.3 show that, while world sugar prices are closely linked to Brazil's costs and the price of ethanol, they also fluctuate above and below them. These year-on-year movements are dictated by the balance between global supply and demand, which exhibit a clear cyclical pattern (Diagram 2.4).
This pattern reflects the perennial nature of the cane crop and results in successive periods of surplus and deficit. As in all markets, periods of surplus lead to an accumulation of stocks, which depress prices in relation to producers’ costs. The reverse is true during periods of deficit.

With the global balance expected to move into surplus in the 2017/18 crop year, we are currently in a depressed period of pricing, with prices falling towards ethanol parity in order to remove the surplus sugar from the market. However, this can only persist in the short to medium term; with consumption growing and returns below the cost of production, prices will eventually rise to encourage more capacity to be built.

Sugar policy in Egypt

Given the volatility of world sugar prices, almost every government of a sugar producing country intervenes via various policy measures in its domestic market. Egypt is no exception, with two key objectives behind these interventions:

- Firstly, maintaining rural incomes and employment for both cane farmers in Upper Egypt and beet farmers in the Delta, aiming to reduce rural poverty and ease the pressure of urbanisation.
- Secondly, the Egyptian government must maintain reliable supplies of sugar at affordable prices, given its importance in the diet of the general population.

These two objectives are sometimes in conflict. For example, high prices of cane and beet translate into higher sugar prices for consumers and so impact affordability; if cane and beet prices are not high enough, the viability of local sugar production is threatened. There is therefore a degree of tension in the policy: prices must be high enough to keep producers operating, but low enough for the population to afford.

Trade policy

The primary way the Egyptian government manages the impact of world market prices is via import duties. Local sugar production supplies only around two-thirds of local demand, so the country relies on imports to meet the balance of its needs. However, if world prices are low, imported sugar has the potential to undercut Egyptian production and threaten local sales, which is why the government levies duties on imports when world prices are low. We evaluate the competitiveness of the different forms of Egyptian sugar supply vis-à-vis imports in Section 6.

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1 Sugar cane is a perennial crop. Once planted, it is harvested over successive years. This cycle varies from country to country, but ranges from 2-7 years in most countries. By contrast, sugar beet (like grains and oilseeds) must be replanted every year.
Structure of tariffs

Egypt's maximum bound tariff on sugar was agreed to be 20% at the Uruguay Round of trade negotiations. In practice, the government varies the tariff between 0-20% to target the two objectives of sustainable beet and cane sugar production and sugar affordability.

- **The government generally applies a higher tariff during the processing season** compared to the off-crop (Diagram 2.5). This ensures that prices in the local market are supported when producers are marketing their sugar, and are therefore able to pay farmers, while making it easier for imports to enter the country during the off-crop to balance the market.

- **The government applies a lower average import duty on raw compared to white sugar** (Diagram 2.5). This is a common measure in markets with refining capacity, and means that the value added activity of processing imported raw sugar occurs within Egypt rather than importing finished refined sugar.

- Additionally, **Egypt adjusts the overall level of raw/white tariffs depending upon the prevailing world price**.
  - When world sugar prices are low in relation to local producers' costs, it raises tariffs on raw and white sugar to prevent imports from competing with domestic sources of supply. In recent years, the government has set tariffs for white sugar at 20% and raw sugar around 10% at such times. This protects cane and beet sugar producers when they are marketing their sugar and allows them to pay farmers.

[Diagram 2.5: Average import tariff per month, 2011-2017]

- When world sugar prices are high in relation to local producers' costs, it sets a lower tariff on raw and white sugar. This is because the threat from imports undercutting local production is less and the government is instead concerned about affordability. Generally, tariffs have been dropped to around 10% for white sugar and 2% for raws at such times, however during periods of very high prices they have also been removed completely. This minimised the impact on consumer prices during periods when the domestic industry was not under threat.

- **Finally, Egypt has removed import duties on sugar altogether in times of shortage.** This happened most recently in June 2016, when a rise in world sugar prices combined with a US dollar shortage caused the Egyptian sugar market to run low on sugar.

On top of import tariffs, Egypt also currently applies an export tariff on domestic sugar, set at EGP900 per tonne in May 2016 and raised to EGP3,000 per tonne in April 2017. This measure was also aimed at addressing the shortage.

In a deficit market, such export tariffs would not usually be necessary, as domestic prices should trade above world prices reflecting the cost of importing sugar. However, the dual exchange rate that prevailed at the time allowed exports to be viable. With the Egyptian currency now freely floating, this dual rate no longer exists and exports are no longer viable.
It should be noted that sugar refined at the Sokhna refinery is not subject to export duties, as it operates in a free zone. Similarly, Sokhna only pays the tariff on raw sugar used to supply the Egyptian market; if production is exported, duties are waived.

Industry policy

On top of managing sugar imports and exports, the government also intervenes in the sugar industry directly, at both the field and factory level:

Field interventions

- To support farmers, the government sets the prices of both sugarcane and sugarbeet. These are set at levels to cover farmers’ costs. In the case of beet (which competes for land with other crops, notably wheat), the price is also set to ensure beet price is competitive with the government-set wheat price. Further discussion of beet and cane prices is presented in Sections 3 and 4.
- The Egyptian government also keeps nitrogen fertiliser prices low, in order to ensure input costs are affordable for farmers.
- On top of this, fuel and electricity are subsidised for farmers, and water is free. This reduces the cost of irrigation, required for all agricultural land in Egypt.
- In 2015 and 2016, when low sugar prices resulted in the state-owned cane industry struggling to make a profit, the government directly intervened by paying part of the cane price. This amounted to EGP100/tonne of the EGP400/tonne cane price, or US$71 and 51 million in total for 2015 and 2016 respectively, at prevailing exchange rates.

Factory interventions

- To provide control over production, the government owns all cane mills, a standalone refinery (Hawamdiya) and has controlling stakes in four beet factories. This allows the government to maintain production in areas where employment is a policy objective independent of commercial pressures, as well as ensure its ration system is well supplied with sugar. We discuss this ownership structure in more detail below.
- Additionally, the government has an equity stake in Al Nouran’s factory, which is currently under construction.
- Natural gas used by factories is also subsidised, although the government has reduced the value of this subsidy in recent years.

Government ownership is co-ordinated by the state-owned Egyptian Sugar and Integrated Industries Company (ESIIC). In contrast to the cane mills, these beet factories run as independent accounting and business units with an individual responsibility over costs and profitability, although there is central oversight (for example investments over EGP50,000 must first be approved by ESIIC). Additionally, ESIIC controls other agricultural processing operations, which are not directly relevant to the sugar market.

As part of the government taking a more active role in balancing supply and demand, government-owned beet factories are now being provided with raw sugar by ESIIC directly for refining in the off-crop to ensure supplies for the market. Previously this refining was driven by private traders who supplied raw sugar, paid a tolling fee to the factory and received refined sugar in return ready for consumption. However this broke down in 2016, due to margins being too low and the supply of dollars too tight.
Section 2: The World Market and Egyptian Policy

Market measures

On top of intervening in production, the Egyptian government also plays a role in the sugar market itself.

The government ration system

One of the key market interventions within Egypt is the ration card system run by the Ministry of Supply and Internal Trade (or MoSIT), which provides coverage to 71 million people, or 78% of the total population. Claimants are granted five loaves of bread a day, plus a stipend of EGP50 per month. This money is loaded onto a card, able to be spent on a variety of products, including sugar, priced at below market rates. For example, sugar under the scheme was sold at EGP8 per kg at MoSIT shops in March 2017, versus EGP10 for other consumers\(^2\), with each ration card holder eligible to purchase 1kg per person per month at the subsidised rate. However, more recently, prices for subsidised sugar have been set closer to market levels, with prices raised to EGP10 in July and reduced to EGP9.5 in September to track changes in free market sugar and supply pressures\(^3\).

Sugar consumption under the scheme accounts for around 1.2 million tonnes of demand annually (just over one third of total consumption in Egypt), including both subsidised and non-subsidised sales. It mostly takes sugar produced at the government owned cane sugar mills, with the difference supplied from refining imported raw sugar, produced primarily at ESIIC’s Hawamdiya refinery. Conversely, Egypt’s beet sugar production is generally of higher quality than that of the cane mills. As a result, it tends to be sold to end users who are willing to pay a premium for a higher quality product, for example carbonated drinks producers.

Distribution and marketing

During the sugar market shortage which occurred in late 2016, the Egyptian government briefly took control of all distribution within the country in an attempt to ensure adequate supplies reached all regions. This has since been stopped; however, the government has retained a more active role in sugar marketing.

Since March 2017, all sugar sold from mills and factories under ESIIC control had their prices set at government mandated levels. Initially these were EGP9,250 per tonne when selling to packing companies and EGP10,500 for industrial users; however, prices were subsequently dropped in May to EGP9,000 and EGP9,250, respectively. Additionally, packing companies are now required by law to mark all products with the sale price on the packaging itself.

While the two operating private beet factories are exempt from these price controls, in practical terms the mandated prices set the level of prices for all sales.

The impact of the EU market reform on Egyptian policy objectives

Looking ahead, an important consideration for Egyptian sugar policy makers is the reform of the EU sugar market, which took place on October 2017. This development is important because the EU has unlimited duty-free access to the Egyptian sugar market as part of an association agreement.


Current situation

The EU is currently governed by a system of quotas that restrict domestic sales of sugar. The EU also grants preferential access for imports to supply a portion of its market. At the same time, sugar exports are capped by a WTO limit of 1.37 million tonnes. In addition, production of high fructose syrups (known locally as isoglucose) is restricted under a quota of 0.7 million tonnes, white sugar equivalent.

With annual sugar consumption estimated at around 16.5-17.0 million tonnes, white value, and domestic beet sugar production limited to around 13.5 million tonnes, this leaves the EU with a net import requirement of around 3.0-3.5 million tonnes each year.

The EU sugar market landscape after 2017

On October 2017, production quotas were abolished and minimum prices removed. This means that the EU is no longer restricted by the WTO limit on exports. The removal of restrictions on output means production will expand and the EU market will become much more competitive.

Beet sugar producers have responded by expanding their production sharply in 2017/18 in an effort to increase the utilisation of their factories and reduce unit costs. While the crop has only started to be harvested at the time of writing, current beet yields look excellent and, alongside the expansion in isoglucose production, this is expected to push the EU market into surplus. This has the following implications:

- Exports of sugar from the EU are likely to expand in 2017/18, alongside a corresponding fall in domestic EU prices.
- This additional EU sugar will most likely target markets in the Mediterranean, Middle East and West Africa, competing with sugar from re-exporting refineries in the region and exports from Brazil, all of which are priced close to world market levels.
- Should Egypt offer a premium above world market sugar, it would become an attractive market for exports given that sugar from EU origins has duty-free access. EU exports could therefore reduce the volume of local refining and, if imports were to exceed the country’s requirements, depress local prices.
- In future, crop years EU sugar production will fluctuate, depending upon weather and planting decisions. Therefore the pressure on the Egyptian market is likely to be variable, and not necessarily present in all years.
- Nevertheless, EU reform does present a challenge to Egyptian policy, because of the potential for EU sugar to undermine the effectiveness of tariff protection. Industry sources have indicated that some form of limitation will apply to imports in practice, however this is not referred to in any official policy documents.
In this section, we discuss the performance of sugarbeet, the largest source of sugar production within Egypt.

**Introduction to the beet sector**

Sugarbeet, like cane, is a crop that produces and stores sucrose, and once processed makes a very similar end product, sugar.

As sugarbeet prefers cooler conditions, it is planted predominantly in the cooler Delta region (Map 3.1). As rainfall in Egypt is low, beet farms must be irrigated. This makes the crop more resistant to weather shocks, but also results in higher field costs.

**Map 3.1: Map of Egyptian beet sugar factories**

The vast majority of beets are grown by independent farmers, who are contracted by the factories directly. Grown on 215,000 hectares in 2017 (513,000 feddan), the crop is an important source of income to over 100,000 farmers, as well as many others in the processing sector. With the fragmented structure of land ownership in Egypt, there are many small farms with a plot size of less than one hectare devoted to beets (although other crops may be planted by farmers).

On top of these independent farms, beets are also cultivated on land rented by the privately-owned factories. In the case of Alexandria and Nile sugar, these plots account for approximately 10% of the area supplying each factory, with sufficient land for expansions often difficult to acquire. However, a new factory (controlled by a private company, Al-Nouran) plans to supply around half their beets from land they rent directly once operational in 2018, with the ultimate aim of supplying as much of their operations as possible from their own agriculture.

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The contents of this study must remain confidential within the subscribing organisation.
Sugarbeet grows for around seven months of the year during the winter period. To limit pest pressure, beets should not be planted on the same plot for the following three years. This production cycle allows for multiple cropping within the same year and also requires beet to be grown in rotation with other crops. As a winter crop, it competes primarily with wheat, rather than maize and rice (which are planted in the summer).

These characteristics of the beet sector have some important implications:

- Due to the need to leave a three-year gap between crops, sugarbeet can only be planted on a quarter of available farmland in a given year. This means that beet factories have to contract and transport beets over a greater distance compared to cane factories of comparable size.
- As beets are harvested and replanted annually, farmers have the choice between planting wheat and sugarbeet before each season. In order for beet processors to secure an adequate supply of beets, they must therefore offer farmers remunerative prices compared to wheat every year.

Egypt currently has seven operational beet factories. Five of these are majority owned by the government via ESIIC (Noubaria, Delta, Dakahlia, Fayoum and Abu Kerkas); while two are privately owned (Alexandria sugar and Nile sugar). A third private factory, owned by Al Nouran, is currently under construction and expected to start processing beets in early 2018. The factory has a minority public stake, including investments from public banks.

On top of direct ownership, the government plays a large part in the beet sector by determining the prices of beets and its principal competing crop, wheat. Currently, the price is based around:

- A base level, set at EGP400 per tonne of beets in the 2017 crop.
- A bonus/penalty for EGP25 per tonne for each percentage point of sucrose content above/below 16% in delivered beets. This encourages farmers to target sugar content rather than just weight, important for maximising factory performance.
- An early delivery premium of EGP120 per tonne, falling by EGP10 per week up until April 30th, when it reaches its minimum of EGP20 per tonne. This is to ensure steady beet supplies to factories early in the season when beet sucrose content is lower.

On top of these mandated beet prices, public and private factories offer further incentives to farmers, including providing seeds, fertilisers and technical advice. These are sometimes used by factories to encourage farmers to plant beets when the government set price falls below parity with wheat revenues, as well as to compete with other factories for limited beet area.

**Egyptian agro-climate**

The climate in which beet is grown is important for its performance, both at the field and factory level. Diagrams 3.1-3.6 compare climate (temperature and rainfall) in the Delta region with climates in several other broadly comparable regional industries (Morocco, Italy and Spain), as well as in two of the world’s leading beet growing countries, France and Germany.

Compared to other industries, beets in Egypt are grown under much hotter conditions. Additionally rainfall is very low, requiring extensive irrigation (which is also the case in Morocco, Italy and Spain, but not in France and Germany). Climate impacts beet performance in the following ways:

- Beet yields and sucrose content are closely linked with the climate beets are grown under, alongside farming techniques. A hot climate tends to result in beets with low sucrose content.
A deficit of rain, particularly in periods of hot weather when beets have their full canopy (and so the highest water losses from evapotranspiration) is bad for beet growth. This can be offset with irrigation, but this comes with a cost that must be recovered in the form of improved performance.

Hot temperatures can increase the prevalence of pests, which destroy seedlings early in the crop, resulting in poor plant density and, ultimately, reduced yields.

Warm temperatures during the harvest period prevent beets being stored after harvesting (which is common in most of Europe). This requires efficient planning and logistics to ensure beets are transported to factories and processed quickly after harvesting to minimise post-harvest sucrose losses.

Field performance

Over the last 15 years, the area of beet planted within Egypt has expanded sharply (Diagram 3.7), corresponding with an expansion from four factories to seven. The majority of these beets are grown in the Delta (Diagram 3.8), while a smaller area in Middle Egypt supplies beets to Fayoum and Abu Kerkas (which contracts the smallest area of beets as the factory also processes cane). Competition for beets is much more intense in the Delta, and is expected to intensify with the opening of the opening of Al Nouran’s factory.

Performance metrics

The field performance of beets, both against domestic wheat production and other sugar producing countries, determine its competitiveness as a crop. This is because sugarbeet in Egypt must not only compete with other sources of sugar, but also with alternative uses for the land on which it is grown.

Diagram 3.9 summarises the performance of Egyptian beet yields (tonnes of beets produced per hectare) versus local wheat yields, and beet yields in the EU, since 1990. Before 2000, the difference in performance growth between the three was small. However, since then, beet performance in Egypt has stagnated and even fallen. By contrast, beet yields in the EU have shown protracted growth over the entire period, following improvements in seed breeding and advances in cultivation techniques.
This is also the case when Egypt is compared to Morocco, the only other North African country that grows sugarbeet. Diagrams 3.10 to 3.12 show Egypt’s beet field performance versus other irrigated Mediterranean industries, as well as examples of global best practice, France and Germany.

**Diagram 3.9: Egyptian beet yields vs wheat yields, 1990-2017**

**Diagram 3.10: Beet yields – Egypt vs world averages, 2013-2016**

**Diagram 3.11: Beet sucrose content – Egypt vs world averages, 2013-2016**

**Diagram 3.12: Beet sugar yield – Egypt vs world averages, 2013-2016**

Despite using irrigation, Egypt achieves lower beet and sugar yields that other industries, whether or not they use irrigation.
There are a number of reasons for this weak performance:

- Egypt’s climate is hot and dry, even compared to areas where beet is grown in Morocco. Low rainfall is offset by irrigation, but beet seeds are purchased from Europe and have not been adapted specifically to Egypt’s climate\(^1\).

- On top of this, pest pressures are high in Egypt, particularly for beets that are planted early in the planting period. This results in poor crop establishment, with the density of surviving beet plants averaging 55-60,000 per hectare. This compares to 95,000-100,000 in Europe and has huge implications for yields. Additionally, high pest pressure requires farmers to use lower-yielding multigerm seeds (which also come with higher labour costs as they produce multiple shoots that must be subsequently thinned by hand). Pesticides are used to reduce damage, both as seed coatings and as foliar sprays, but these are reported to be poorly adjusted against some of Egypt’s pests.

**Regional performance**

Diagrams 3.13 and 3.14 summarise the beet yields and sucrose content of beets reported by factory over the last three years, distinguishing between those in the Delta (marked in blue) and Fayoum/Abu Kerkas located in Middle Egypt.

Overall, beet yields are similar between the Delta factories, as well as in Fayoum, with Abu Kerkas as a clear outlier due to its significantly hotter climate. High temperatures also mean that Abu Kerkas achieves much lower sucrose content in its beet, an issue that extends to Fayoum, but to a lesser degree.

**Diagram 3.13: Beet yields by factory, 2015-2017**

**Diagram 3.14: Sucrose content by factory, 2015-2017**

**Performance by field type**

In addition to regional variation, performance also varies by type of farm. Diagram 3.15 summarises these results, displaying the range of average yields provided to us in field visits and taken from recent reports (while individual farmers achieve levels above or below these ranges).

----

\(^1\) The size of the Egyptian market is too small to justify the cost of specific seed breeding needed to suit local conditions.
Overall, the yields achieved on land farmed by companies directly (between 40-65 tonnes/hectare), are often above those of independent farmers, at (35-45 tonnes/ hectare).

There are a number of explanations for this:

- Factory estates tend to be larger scale, allowing them to mechanise more effectively.
- Factory estates are also better funded, increasing the availability of inputs and technical support.

In addition to independent farmers and factory-farmed estates, we have also included yields achieved on test plots, which range from 75-85 tonnes per hectare. While these are only illustrative, as test plots operate under non-commercial conditions and cannot always be scaled, such plots at least indicate that there is potential for further improvements.

**Diagram 3.15: Range of reported average beet yields in Egypt by type of farm, 2015-2017**

Field costs

Cost of beets

Owing to a fragmented ownership structure (due to land being split as part of inheritances), average plot sizes are small for independent growers. This limits the effectiveness of mechanisation and economies of scale, and means that Egyptian agriculture is labour intensive.

The cost of beet production presented below covers all the costs associated with planting in a season, and includes the following elements:

- **Labour**, which covers the cost of wages in field operations, including planting, thinning of excess plants from multigerm seeds, weeding, irrigation and harvesting. In 2017, these costs were estimated at EGP 3,250/feddan, with an assumed wage of EGP80 per 6 hour shift. These costs are paid either by the farmer to hired field workers or treated as an opportunity cost of the wages they could have earned by working elsewhere.

- **Inputs**, which cover the cost of fertilisers, seeds and pesticides. As farmers do not pay for the water they use, water costs are not included. Normally the cost of fuel for irrigation is included here too; however, in Egyptian reporting it is included under capital (and we have preserved this approach). In total, input costs are estimated to be EGP1,360/feddan in 2017.
Section 3: The Beet Sugar Sector

- **Capital**, which covers the cost of either hiring or buying/maintaining/operating machinery. This includes machinery used in land preparation, irrigation and harvesting, and was estimated to be EGP 1,325/feddan in 2017.

- **Rent.** Farmers either rent land or own it. We include land rent in both cases, as it represents the opportunity cost of land that is owned by a farmer. The rent shown below is for seven months, the average period when the beet is in the ground from sowing to harvest.

It is important to note that not all of the crop costs above are paid for by the farmer, with some of the inputs provided by the factories as an incentive (particularly seeds and fertilisers).

Table 3.1 summarises these direct costs for the recent 2017 crop season:

**Table 3.1: Beet cost in Egypt by region, 2017 crop**

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Delta</th>
<th>Fayoum</th>
<th>Abu Kerkas</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Labour</td>
<td>EGP per feddan</td>
<td>3,250</td>
<td>3,250</td>
<td>3,250</td>
</tr>
<tr>
<td>B. Inputs</td>
<td>EGP per feddan</td>
<td>2,220</td>
<td>2,220</td>
<td>2,220</td>
</tr>
<tr>
<td>B.1 Paid by the farmer:</td>
<td>EGP per feddan</td>
<td>1,640</td>
<td>1,640</td>
<td>1,640</td>
</tr>
<tr>
<td>B.2 Paid by the factory:</td>
<td>EGP per feddan</td>
<td>580</td>
<td>580</td>
<td>580</td>
</tr>
<tr>
<td>C. Capital (machinery)</td>
<td>EGP per feddan</td>
<td>1,345</td>
<td>1,345</td>
<td>1,345</td>
</tr>
<tr>
<td>D. Land rent</td>
<td>EGP per feddan</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>E. Beet cost (A+B+C+D)</td>
<td>EGP per feddan</td>
<td>10,815</td>
<td>10,815</td>
<td>10,815</td>
</tr>
<tr>
<td>F. Beet yield</td>
<td>Tonnes per feddan</td>
<td>16.6</td>
<td>16.9</td>
<td>26.1</td>
</tr>
<tr>
<td>G. Cost per tonne of beets (E/F)</td>
<td>EGP per tonne</td>
<td>650</td>
<td>640</td>
<td>414</td>
</tr>
</tbody>
</table>

**Note:** Figures in italics are estimated from other regions.

**Beet supply price**

The price needed to encourage farmers to grow beets reflects not only the cost of growing beets, but also the return from the next best alternative crop. In most beet growing areas, the major broad acre alternative is wheat. In order to encourage farmers to grow beets, the price needs to be high enough to cover their costs and offer at least the same profit that they would achieve from producing wheat. This calculation can be summarised below and we refer to it as the ‘beet supply price’.

\[
\text{Beet cost} + \text{Wheat revenue} - \text{Wheat cost} = \text{Beet supply price}
\]

Table 3.2 presents our estimate of the returns from growing wheat in the different beet-growing areas. Note that land rent is excluded since this is payable regardless of the crop planted.
Table 3.2: Egyptian wheat margin by region, 2017

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Delta</th>
<th>Region</th>
<th>Fayoum</th>
<th>Abu Kerkas</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. Wheat yield</td>
<td>Tonnes per feddan</td>
<td>2.8</td>
<td>2.7</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>I. Wheat price</td>
<td>EGP per tonne</td>
<td>3,770</td>
<td>3,770</td>
<td>3,770</td>
<td></td>
</tr>
<tr>
<td>J. Wheat revenue (H*I)</td>
<td>EGP per feddan</td>
<td>10,600</td>
<td>10,200</td>
<td>11,000</td>
<td></td>
</tr>
<tr>
<td>K. Labour</td>
<td>EGP per feddan</td>
<td>2,320</td>
<td>2,320</td>
<td>2,320</td>
<td></td>
</tr>
<tr>
<td>L. Inputs</td>
<td>EGP per feddan</td>
<td>1,780</td>
<td>1,780</td>
<td>1,780</td>
<td></td>
</tr>
<tr>
<td>M. Capital</td>
<td>EGP per feddan</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>N. Wheat cost (K+L+M)</td>
<td>EGP per feddan</td>
<td>6,100</td>
<td>6,100</td>
<td>6,100</td>
<td></td>
</tr>
<tr>
<td>O. Wheat margin (J-N)</td>
<td>EGP per feddan</td>
<td>4,500</td>
<td>4,100</td>
<td>4,900</td>
<td></td>
</tr>
<tr>
<td>P. Beet yield</td>
<td>Tonnes per feddan</td>
<td>16.6</td>
<td>16.9</td>
<td>26.1</td>
<td></td>
</tr>
<tr>
<td>Q. Wheat margin per tonne of beets (O/P)</td>
<td>EGP per tonne</td>
<td>271</td>
<td>243</td>
<td>188</td>
<td></td>
</tr>
</tbody>
</table>

Based on this margin, and our estimate of the cost of growing beets, Table 3.3 presents the supply price of growing beets. In the calculation, we have also split out the costs paid by the factory, as the supply price only needs to cover the costs incurred by the farmer. For example, factories and farmers split the cost of seeds equally, with the farmer’s share of seed costs deducted from the beet price they are paid upon delivery.

Table 3.3: Beet supply price, 2017

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Delta</th>
<th>Region</th>
<th>Fayoum</th>
<th>Abu Kerkas</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. Beet cost minus rent (E-D)</td>
<td>EGP per feddan</td>
<td>6,815</td>
<td>6,815</td>
<td>6,815</td>
<td></td>
</tr>
<tr>
<td>O. Wheat margin (J-N)</td>
<td>EGP per feddan</td>
<td>4,500</td>
<td>4,100</td>
<td>4,900</td>
<td></td>
</tr>
<tr>
<td>S. Supply price of beets (R+O)</td>
<td>EGP per feddan</td>
<td>11,315</td>
<td>10,915</td>
<td>11,715</td>
<td></td>
</tr>
<tr>
<td>B.2 Costs paid by the factory</td>
<td>EGP per feddan</td>
<td>580</td>
<td>580</td>
<td>580</td>
<td></td>
</tr>
<tr>
<td>T. Supply price of beets to farmer (S-B.2)</td>
<td>EGP per feddan</td>
<td>10,735</td>
<td>10,335</td>
<td>11,135</td>
<td></td>
</tr>
<tr>
<td>F. Beet yield</td>
<td>Tonnes per feddan</td>
<td>16.6</td>
<td>16.9</td>
<td>26.1</td>
<td></td>
</tr>
<tr>
<td>U. Farmer's supply price per tonne of beets (T/F)</td>
<td>EGP per tonne</td>
<td>646</td>
<td>612</td>
<td>427</td>
<td></td>
</tr>
</tbody>
</table>

**Field cost drivers**

Based on the calculations above, the price of beets is determined by the following factors:

- **The ratio of beet to wheat yields.** As beet must compete with wheat for area, the more productive beet is versus wheat, the lower the price needed to encourage farmers to grow the crop. Diagram 3.16 summarises this ratio for the key regions, while Diagram 3.17 displays the trend in beet/wheat yield for Egypt as a whole since 2001.
  - The competitiveness of beet versus wheat varies from region to region, with Minya in Middle Egypt experiencing higher beet/wheat yield ratios (Diagram 3.16). However, due to higher temperatures this governorate also experiences lower sucrose content.
  - One important point to note is that, particularly in the last decade, beet has failed to keep up with improvements in wheat yields, resulting in a deterioration of its competitiveness in the crop rotation (Diagram 3.17).
The price of wheat, which is set by the government. The higher the wheat price, the higher the beet price must be in order to encourage farmers to plant sugarbeet. World wheat prices in EGP terms were flat up to 2016 (Diagram 3.18), rising only in 2017 in response to the devaluation. The Egyptian government has also moved to a system of closely linking the wheat price it pays to farmers to the cost of imports. This has improved the competitiveness of beet.

The price of inputs, wages and capital. With beet and wheat using similar inputs but in different quantities, changes in the cost of inputs, wages and capital have some influence on the relative attractiveness of each crop. In particular, beet is more labour intensive, so more exposed to wage increases. However, with the recent devaluation, margins for wheat have been hit harder than for beet, as it uses relatively more imported machinery and inputs.

Diagram 3.19 summarises how the total cost of beet production has evolved since 2012. The recent devaluation has sharply increased all costs in EGP terms, leading to inflation in both direct costs of production and the price of wheat, the impacts of which are still being felt, with the 2017 beet price below the cost of supply calculated above, suggesting it will need to rise.
Factory performance

Diagram 3.20 summarises how beets processed per factory have evolved over time at Egypt’s beet factories, alongside total sugar production. In the early 1990s, only 100,000 tonnes of sugar were produced from under one million tonnes of beets, with just Delta Sugar in operation. This rose to 1.0 million tonnes of sugar (produced from 7.5 million tonnes of beets) by 2014 and around 1.3 million tonnes of sugar (from 9.0 million tonnes of beets) from 2014 with the opening of Alexandria Sugar.

Performance metrics

Processing beets is a capital intensive process, which has high fixed costs and benefits from economies of scale. Therefore, an efficient beet factory must be both large and achieve a high level of capacity utilisation. On top of this, a beet factory must recover as much of the sucrose contained within beets as possible.

Diagram 3.20: Evolution of beet processing by factory, 1991-2017

Generally, Egyptian beet factories perform well on these performance measures when compared to industries where beets are grown under similar conditions, such as Morocco and Italy (Diagrams 3.21-3.26) as well the examples of global best practice, France and Germany:

- Overall slicing capacity per factory is reasonable, above many local producers and close to that of France and Germany.
- Due to the climate of Egypt (where frost damage in the processing season is not a problem) the beet harvesting season is long compared to other countries (Diagram 3.22), a positive factor for processors. However, it should be noted that the EU countries have, until now, been constrained by production quotas that have limited their output and therefore their season length. Following the removal of quotas in October 2017, processing seasons will increase sharply in France and Germany, reaching 120-140 days.
• Long seasons, combined with a good average size, result in high average sugar production per factory, which is positive for keeping unit fixed costs low.

• One metric where Egypt falls behind other industries is in average sucrose extraction (which measures how much of the sucrose contained within each beet is recovered in the form of crystal sugar). Egyptian producers currently average 77%, versus around 90% in France and Germany and around 80-85% in Morocco and Italy. Not only does this represent a significant loss of sugar, it lowers effective use of installed slicing capacity and raises processing costs.
  – Part of the reason for this is Egypt’s climate, where high temperatures during the harvest period lower the quality (juice purity) of beets. In industries where temperatures are lower, these losses are reduced.
  – Other factors that may influence this, but cannot be verified in this report, include poor post-harvest handling and processes inefficiencies.
Diagram 3.25: Average sucrose extraction, 2014/15-2016/17

Diagram 3.26: Beet sugar production per tonne of beet – Egypt vs world averages, 2013-2016

Private/public sector performance

Where possible, we have compared performance metrics between the factories with a government controlling stake and private producers, with the results shown in Diagram 3.27. We have excluded Abu Kerkas, which processes both cane and beet.

Overall, the private sector currently has a lower average slicing capacity than those that are publically owned. In particular, the scale of operations at Delta and Dakahleya is high. The gap will close when the Al-Nouran factory starts producing, with the first production line able to slice 12,000 tonnes of beet per day (or approximately 200,000 tonnes of sugar a year) and further expansion planned.

However, net operating days (total beets sliced/daily capacity) at public and private factories are broadly similar, indicating little difference in capacity utilisation.

Finally, agricultural yields on the land supplying private and public factories are also broadly similar, averaging 39 and 41 tonnes per hectare, respectively, from 2015 to 2017.

Cost competitiveness

Methodology

To derive estimates of the ex-works cost of producing beet sugar within Egypt, we have taken account of the following elements:

\[ \text{Beet cost} + \text{Transport cost to factory} + \text{Processing cost/deprediation} - \text{By-product credits} = \text{Cost of supply, ex works}. \]
Our methodology for deriving each of these cost elements is explained below.

**Beet cost**

The cost of beet is the price the factory pays to farmers per tonne, plus the cost of any direct support provided in the form of seeds and inputs. This has been calculated above.

**Transport to factory**

Once harvested, the cost of moving beets from field to factory is determined by the distance between the two. Beet factories in areas of dense beet plantings benefit from lower transport costs, while those near competitors will need to go further in order to secure enough beets to fill their capacity. These vary between EGP50-100 per tonne on average.

**Processing cost/depreciation**

We have estimated the processing cost to produce a tonne of sugar based upon figures provided to us during our field visit to Egypt. These costs cover labour, energy, chemicals, repairs & maintenance and bagging. Labour costs have been adjusted from region to region depending upon the scale of production in each, differences in energy consumption reflect variations in the amount of beets needed to produce a tonne of sugar, while bagging costs/chemical consumption has been assumed to be uniform.

By far the largest single operating cost is energy. We assume gas consumption of 40m³ per tonne of beet and a price of EGP3.18/m³. This equates to EGP130 per tonne of beet (or EGP900-1,050 per tonne of sugar, depending upon the sugar recovery rate). Other operating costs, including labour and inputs, average EGP1,250 per tonne of sugar.

Depreciation has been calculated based upon an average life-of-equipment period of 22.5 years, and a representative replacement cost of capital depending upon the scale of factory, split per tonne of sugar produced. For a 10,000 tonnes per day factory, we assume a replacement cost of US$250 million. Using a 22.5 year average depreciation period and an annual sugar output of 153,000 tonnes, this translates into an annual depreciation charge of US$72 per tonne of sugar (EGP1350/tonne), which we then scale to size of each factory allowing for economies of scale. This allows a comparison with other sugar producers worldwide and, while some older factories may be mostly depreciated, higher maintenance costs typically offset some of these gains. As Table 3.4 shows, we estimate depreciation cost falls to be within a range of EGP1,160-1,400 per tonne for the different regions.

**Table 3.4: Beet sugar cost of production by source (EGP per tonne sugar, unless otherwise stated)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Delta area</th>
<th>Fayoum</th>
<th>Abu Kerkas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average price of beets (per tonne beet)</td>
<td>538</td>
<td>538</td>
<td>538</td>
</tr>
<tr>
<td>Cost of field support (per tonne beet)</td>
<td>35</td>
<td>34</td>
<td>22</td>
</tr>
<tr>
<td>Transportation to factory (per tonne beet)</td>
<td>75</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Cost of delivered beets (per tonne beet)</td>
<td>648</td>
<td>623</td>
<td>610</td>
</tr>
<tr>
<td>Tonnes of beet/tonnes of sugar</td>
<td>6.8</td>
<td>7.2</td>
<td>7.8</td>
</tr>
<tr>
<td>Raw material cost per tonne of sugar</td>
<td>4,417</td>
<td>4,478</td>
<td>4,735</td>
</tr>
<tr>
<td><strong>Processing cost</strong></td>
<td>2,103</td>
<td>2,150</td>
<td>2,471</td>
</tr>
<tr>
<td><strong>Depreciation</strong></td>
<td>1,156</td>
<td>1,170</td>
<td>1,394</td>
</tr>
<tr>
<td><strong>By-product credits</strong></td>
<td>-1,619</td>
<td>-1,673</td>
<td>-1,753</td>
</tr>
<tr>
<td><strong>Total ex-factory cost /tonne</strong></td>
<td>6,057</td>
<td>6,126</td>
<td>6,846</td>
</tr>
</tbody>
</table>

**Note:** Figures in italics are estimated.
**By-product credits**

Credits for the by-products of beets (molasses and beet pulp) have been deducted from the total cost of producing sugar. These are estimated based upon current prices for the by-products in Egyptian Pounds, as well as the yield of by-products (tonnes of by-product per tonne of sugar produced). The total value of the credit in the Delta region is EGP1,620 per tonne of sugar and is calculated as follows:

- **Beet pulp** = EGP2,560 per tonne * 37% per tonne sugar (5.5% per tonne beet) = EGP970 per tonne sugar.

- **Molasses** = EGP 1,800 per tonne * 36% per tonne sugar (5.3% per tonne beet) = EGP650 per tonne sugar.

**Results**

The resulting cost of producing beet sugar on an ex-works basis are summarised in Table 3.4. It shows prices ranging from EGP6,050-6,850 per tonne.
In this section, we examine the performance of the cane sugar sector, Egypt's second largest domestic source of sugar, after beet sugar.

**Introduction to the Egyptian cane sector**

Sugarcane is grown in Upper Egypt on irrigated land close to the Nile, where the climate is more suitable than the cooler climate in the Delta region (Map 4.1). Upper Egypt is one of the country’s poorer regions, therefore maintaining a viable cane sugar industry is an important social objective for the Egyptian government.

In total, sugarcane was grown on 102,000 hectares in 2017 (243,000 feddan), with the crop providing a valuable source of income to over 150,000 farmers and the 21,000 workers employed by the ESIIC. As with the majority of Egyptian agriculture, land ownership is fragmented, meaning that many are small-scale farmers with plots of less than a hectare devoted to cane. All cane farming is conducted by independent farmers.

**Map 4.1: Map of Egyptian cane sugar factories**

As rainfall is almost non-existent in Upper Egypt, sugarcane relies exclusively on irrigation water from the Nile. While this adds to farmers’ costs, it reduces the impact of weather shocks and gives them control over water application. This is also useful in ripening cane prior to harvesting, as stressing the crop by cutting its access to water late in the growth cycle raises sucrose content.

Once planted, sugarcane grows for a full year before harvesting, and can then subsequently be cut several times before replanting; these subsequent crops are referred to as ratoons. The initial planting carries a much higher cost than the ratoon crops, as land must be prepared and planted with seed cane. This means that cultivating as many ratoon crops as possible is important in keeping costs down. However, each time the cane is cut, yields drop for subsequent harvests, which means that eventually replanting becomes necessary. The guidance provided by the Sugar Crops Council states that farmers should have 1 year of plant cane plus 4 ratoons; however, farmers typically extend this to 6-7 ratoons.
Sugarcane’s characteristics are very different from beet, which has the following implications:

- It can be planted as a monocrop. This means that the density of cane planting around factories is higher (which reduces cane haulage distances) but diversity of crops is low.

- As cane is a semi-perennial crop that does not need to be replanted for many years, the competitive pressure on cane area is low. In general, farmers only make a decision on switching crops when the cane needs to be replanted, which occurs, on an average, once in every 5-7 years. This contrasts with sugar beet, which is replanted each year and is grown in rotation with other crops.

Sugarcane can be planted either in spring or autumn, with most farmers preferring an autumn planting as it enables them to interplant winter crops (such as fava beans or vegetables). Additionally, sugarcane requires less intensive farm management than many other crops, further adding to its attractiveness. The harvest typically runs from December to March, which means a later start and an earlier finish than the beet harvest.

Egypt currently has eight operational cane mills (including Abu Kerkas, which process both cane and beet), all of which are owned by the government via ESIIC. Cane sugar accounts for most of the subsidised sugar sold via the government ration system, with the remainder coming from raw sugar imports that are refined in Egypt or from direct imports of whites.

The government also sets the price farmers receive for their cane. The government sets the price above farmers’ costs, which also ensures cane is more attractive than other crops. This makes cane farming the most popular crop in areas close to mills.

Importantly, the cane price is set per tonne of cane delivered, with no bonus or penalty for sucrose content (unlike for beet). This means farmers aim to maximise the weight of cane, rather than the amount of sugar, they deliver to mills. This results in sub-optimal application of inputs. In particular, farmers apply excessive amounts of water and nitrogen fertilisers to prioritise biomass over sugar content. Reduced sucrose raises costs for several reasons:

- It inflates the costs of harvesting, loading and transport when calculated per tonne of sugar produced. This is because these costs are incurred per tonne of cane, so raising sucrose content would lower the cost per tonne of sugar delivered to the mill.

- It reduces performance at the factory, as the mills must mill more cane that would otherwise be the case to extract the same amount of sugar. Higher sucrose content is typically also associated with higher quality (purity) of cane juice, which is beneficial for the mill’s ability to recover sugar from the cane during processing.

Most other cane-sugar industries operate some form of quality-based cane payment system in order to encourage farmers to raise the sucrose content of their crop.

**Egyptian agro-climate**

The climate in which sugarcane is grown is important for industry performance, both in the field and for milling.

Diagrams 4.1-4.6 summarise the climates in several areas where cane is grown in both other irrigated industries in Africa (Morocco, Sudan and Swaziland), as well as the world’s two largest sugar exporters to the world market: Brazil and Thailand.

Cane in Egypt is grown in exceptionally dry conditions, with virtually its entire water requirement coming from irrigation water rather than precipitation. Temperatures are also high, although they are noticeably cooler during the winter months.
Section 4: The Cane Sugar Sector

Diagram 4.1: Climate in Sohag, Upper Egypt

Diagram 4.2: Climate in Larache, Morocco

Diagram 4.3: Climate in Kosti, Sudan

Diagram 4.4: Climate in Simunye, Swaziland

Diagram 4.5: Climate in Ribeirão Preto, Brazil

Diagram 4.6: Climate in Central Thailand

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Field performance

Over the last 15 years, the area planted to cane has remained steady at just over 100,000 hectares (Diagram 4.7). It should be noted that this figure refers to the cane area supplying mills only and a small amount of area is planted for other uses, such as juice. This additional cane area is estimated to account for a further 20,000-30,000 hectares of land, but is not expanding.

Diagram 4.7: Egyptian cane area supplying mills, 2001-2017

Diagram 4.8: Egyptian cane area by mill, 2000-2017

Performance metrics

The cane sector performs well: it is the most attractive crop in the region and compares well with other industries in terms of several key performance indicators. However, the sector could perform even better, which would allow farmers to reduce costs, save water and improve efficiency in the milling sector. This would ultimately allow the government to set lower cane and sugar prices, with no impact on farmers’ margins.

Diagram 4.9 summarises the performance of Egyptian cane yields (tonnes of cane produced per hectare of land) versus yields in Centre/South Brazil (the key global exporter of raw cane sugar), since 1990.

Overall, Egypt has higher yields than Brazil. However, it should be remembered that the Egyptian industry is irrigated, and so incurs additional cost to achieve this higher level of productivity.

Although there has been modest growth in yields in Brazil (party due to the disruption caused by mechanisation of the sector over the past decade), cane yields in Egypt have stagnated and even fallen in recent years.

Diagrams 4.10 to 4.12 contrast Egypt’s field performance against other the irrigated industries in Africa, as well as Brazil and Thailand.
Egypt’s cane yields exceed those in Brazil, Thailand and the irrigated fields in Morocco (where conditions are slightly too cool for cane). However, yields are higher in the other irrigated industries, Swaziland and Sudan.

Where Egypt loses ground to global producers is in sucrose content. This could be addressed with the implementation of a quality-based cane payment system.

Finally, while Egyptian sugar yields are similar to those in Brazil and higher than those in Thailand, this is achieved via irrigation, while Brazil and Thailand are rain-fed. As irrigation carries costs, this needs to be offset by higher yields for an accurate comparison to be made, as is the case in Swaziland.

Despite these points, Egypt’s overall cane performance compares favourably to that of beet. Yields of sugar per hectare from cane exceed 10 tonnes; for beet, the average is around 7 tonnes. There are a few reasons for this:

- Cane is better adapted to the conditions of Egypt.
- Pest pressures in Egypt are much lower for cane than for beet, also resulting in lower applications of chemicals and less work for the farmer in cultivating crops.

One comment that is often made is that cane requires much more water than beet to achieve this level of productivity. However, water consumption between the crops is not directly comparable for a number of reasons:

- Cane is grown for 12 months of the year, rather than 7 in the case of beet.

---

1 Regional irrigated industries have been marked in blue, key exporting countries in orange.
Not all water applied to fields is lost to evapotranspiration (either water evaporating from the field or from the plant via transpiration) because much of it seeps into the ground and returns to the Nile and is able to be used again downstream.

Cane is grown under hotter conditions than beet. Therefore if cane was removed from Upper Egypt, the farms could not be replanted with beet, and any replacement crop is also likely to have a higher evapotranspiration loss compared to crops in the Delta.

**Regional performance**

Diagrams 4.13 and 4.14 summarise the field performance of cane supplying mills on a geographical basis. These have been ordered by latitude, from Abu Kerkas furthest to the north, down to Kom Ombo, the most southern mill.

While cane yields are broadly similar across the mill areas, there is a noticeable drop off in sucrose to the far north. However, climate does not explain all of the difference in performance, with the worst performing mill, Kom Ombo, located close to one of the best performing mills, Edfu.

**Field costs**

**Total cost of cane**

Since cane is grown as a mono-crop, the price needed for farmers to keep planting cane reflects their costs of production as well as the value of land rents in the region. Many farmers rent land from a landlord, making it a cost that needs to be covered before planting a crop; for farmers that own land, it represents revenue that could have been earned had they let someone else farm their land. We therefore include rent as a cost for all farmers in our analysis.

We have presented the results below split into the first year (when costs are higher as the crop needs to be planted), as well as subsequent ratoons. We then calculate an average cost, based upon the SCC recommended structure of one year of plant cane and four ratoons before replanting. In practice some farmers have as many as 6-7 ratoons, though this reduces yields.

The scale of cane farmers is small, with the median size of cane plots estimated at 0.6 hectares. This limits the effectiveness of mechanisation and economies of scale, meaning labour tends to be a higher proportion of total costs. Costs comprise the following elements:
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**Labour**, which covers the cost of wages in field operations, including planting, weeding, irrigation and harvesting. In 2017, these costs were estimated to be EGP 8,330/feddan in the first year and 7,230/feddan in each subsequent ratoon. These figures are based on an assumed wage of EGP80 per six hour shift. These are paid either by the farmer to hired field workers or, in the case of the farmer working their own land directly, it is considered as an opportunity cost of the wages they could have earned working elsewhere.

**Inputs**, which cover the cost of fertilisers, seed cane in the first year and pesticides. As farmers do not pay for the water they use, water costs are not included. Normally, the cost of fuel for irrigation is included here too; however, in Egyptian reporting it is included under capital (and we have preserved this approach). In 2017, total input costs were estimated to be EGP 6,300/feddan in the first year and 2,580 in subsequent ratoons, with the difference between the two being the cost of seed cane (at EGP 3,720 per feddan).

**Capital**, which covers the cost of either hiring or buying/maintaining/operating machinery used in the farming of cane. This includes machinery used in land preparation, irrigation and harvesting, and was estimated to be EGP 3,525/feddan in the first year and 3,150 for subsequent ratoons in 2017.

**Rent.** Farmers either rent land or own it. We include land rent in both cases, as it represents the opportunity cost of land that is owned by a farmer. The total shown below is for a full year.

Table 4.1 summarises these direct costs for the recent 2017 crop season:

<table>
<thead>
<tr>
<th>Table 4.1: Cane cost in Egypt, 2017 crop</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Element</strong></td>
</tr>
<tr>
<td><strong>Cost of planted cane</strong></td>
</tr>
<tr>
<td>A. Labour</td>
</tr>
<tr>
<td>B. Inputs</td>
</tr>
<tr>
<td>C. Capital (machinery)</td>
</tr>
<tr>
<td>D. Land rent</td>
</tr>
<tr>
<td>E. Cane cost in first year (A+B+C+D)</td>
</tr>
<tr>
<td><strong>Cost of subsequent ratoons</strong></td>
</tr>
<tr>
<td>F. Labour</td>
</tr>
<tr>
<td>G. Inputs</td>
</tr>
<tr>
<td>H. Capital (machinery)</td>
</tr>
<tr>
<td>I. Land rent</td>
</tr>
<tr>
<td>J. Cane cost in subsequent years (F+G+H+I)</td>
</tr>
<tr>
<td><strong>K. Average cane cost, assuming 4 ratoons ((J<em>4/5)+(E</em>1/5))</strong></td>
</tr>
<tr>
<td>L. Cane yield</td>
</tr>
<tr>
<td><strong>M. Average cost per tonne of cane (K/L)</strong></td>
</tr>
</tbody>
</table>
The cost of cane over time

Diagram 4.15 summarises how the total cost of cane production has evolved since 2010, while Diagram 4.16 summarises how margins have changed over time. Input costs on an EGP basis have risen sharply on the back of the recent devaluation, the impact of which is still being felt. This has led to a fall in cane's margins over time.

Diagram 4.15: Calculated total cost of cane vs government cane price, 2010-2017

Diagram 4.16: Margin on cane production, 2010-2017

Factory performance

Performance metrics

Processing cane is a capital intensive process, subject to high fixed costs and benefitting from economies of scale. An efficient cane mill must be large and utilise its installed capacity for as long as possible. On top of these scale efficiencies, an efficient mill must recover as much of the sucrose contained within cane as possible.

Egyptian cane mills perform well below the levels achieved in Brazil, which achieves a high level of performance and is also the price setter in the world market. However, performance of Egyptian mills also lags behind that of other countries included in our survey, notably Swaziland and, on some measures, Thailand. In particular, the small size of Egyptian factories stands out, which means they are unable to capture the benefits of scale economies.

- Average slicing capacity of Egypt mills is small by international standards. This is partly due to the restrictions associated with cane being planted along the Nile. As a result, cane haulage distances are long in relation to factory size. In contrast, other industries, such as Brazil, grow cane in a tight circular radius around the mill.

- The climate in Upper Egypt permits a relatively long processing campaign compared to its North African neighbour, as well as Thailand, although it is shorter than in Brazil and Swaziland. Season length is an important determinant of capacity utilisation.

- Sugar yield per tonne of cane in Egypt is higher than Thailand and Sudan, though below the performance of Brazil and Swaziland. This measure of performance is influenced by two factors: (a) sucrose content in cane, which, as we discussed earlier is compromised by the weight-only cane payment formula and (b) the sucrose recovery rate of the factories (see below).
Sucrose recovery (the percentage of sucrose contained within cane that gets extracted in the mills) exceeds that of beets in Egypt (Diagram 4.21), as sugarcane is better suited to the hot climate and loses sucrose more slowly once harvested. However, Egypt falls behind many other producers in sugar recovery, behind the level of both Thailand and Brazil. Brazil is a special case however; as it produces both sugar and ethanol (either from the molasses or directly from cane juice) we have shown the overall recovery from both products, rather than just sugar.2

2 Brazilian mills have a different production model to conventional factories that transform beet or cane into sugar and molasses. In Brazil, mills produce either sugar and ethanol or only ethanol. They do not produce molasses; instead, the fermentable sugars that end up in molasses in other industries are processed directly into ethanol. To allow for this difference, we present Brazil’s results on a total recovered sugars (TRS) basis to allow it to be compared with other industries.
Cost competitiveness

Methodology

To derive estimates of the ex-works cost of producing cane sugar in Egypt, we have taken account of the following elements:

\[
\text{Cane cost} + \text{Transport cost to mill} + \text{Processing cost/depreciation} - \text{Molasses value} = \text{Cost of supply, ex-works.}
\]

Our methodology for deriving each of these cost elements is explained below.

Cane cost

The cost of cane is the price the mill pays to farmers, which are set by the government each year.

Transport to mill

While some of the cost of cane transportation is paid for by farmers, the mills also collect cane via road and rail, which must be added to the cost of buying cane. Despite the fact that cane is grown in a narrow strip along the Nile, haulage distances are shorter than at Egypt’s beet factories, because cane is mono-cropped whereas beet is grown in rotation with other crops, which lowers the density of beet farming around the factories.

Processing cost/depreciation

We have estimated the processing cost to produce a tonne of sugar based upon figures provided to us during our field visit to Egypt for labour, energy, chemicals, repairs & maintenance and bagging.

Depreciation has been calculated based on the full replacement cost of capital equipment depreciated over 22.5 years and expressed per tonne of sugar produced. While many of Egypt’s mills are old and can be considered as fully depreciated, eventually machines wear out.
and must either be replaced, or if kept running, the cost of depreciation appear as steadily increasing maintenance costs. For this reason, if the cane industry is to be viable in the long term, both the operating costs of processing as well as depreciation must be covered.

For a 10,000 tonnes per day mill, we assume a replacement cost of US$150 million. Using a 22.5 year average depreciation period and an annual sugar output of 120,000 tonnes, this translates into an annual depreciation charge of US$56 per tonne of sugar (EGP990/tonne). As Table 4.4 shows, this cost has been estimated at EGP1,090-per tonne in Egypt.

**Molasses value**

The value of the molasses produced has been deducted from the total cost of producing sugar. This is estimated based upon current by-products prices in Egypt, as well as the yield of molasses (tonnes of molasses per tonne of sugar produced). We estimate the total value of the credit to be EGP610 per tonne of sugar, which we derive as follows:

- Molasses = EGP 1,800 per tonne * 34% per tonne sugar (3.7% per tonne cane) = EGP610 per tonne sugar.

**Results**

The resulting cost of producing cane sugar on an ex-works basis are summarised in Table 4.2. It estimates the cost of production at EGP8,600 per tonne, based on cane supply prices plus processing.

| Table 4.2: Cane sugar cost of production (EGP per tonne sugar, unless otherwise stated) |
|---------------------------------|-----------------|--------|
| Element                         | Unit            | Value  |
| Cane price                      | EGP/tonne       | 620    |
| Transport to mill               | EGP/tonne       | 25     |
| Delivered cost of cane          | EGP/tonne       | 645    |
| Tonnes of cane per tonne of sugar | Tonnes of cane/tonne of sugar | 9.1    |
| **Raw material cost per tonne of sugar** | EGP/tonne | 5,893  |
| Processing                      | EGP/tonne       | 2,246  |
| Depreciation                    | EGP/tonne       | 1,089  |
| By-product credits              | EGP/tonne       | -610   |
| **Total ex-mill cost /tonne**   | EGP/tonne       | 8,619  |

Note: Figures in italics are estimated from figures provided to LMC.
Section 5: Refining

In this section we analyse the refining sector. While refining takes place at the cane mills in Egypt, here we focus on those operations that process imported raw sugar into refined sugar. These are the two stand-alone refineries and some of the beet factories in the Delta.

**Introduction to the refining sector**

Egypt’s refineries are split into two categories (Table 5.1):

- Standalone refineries, which only process raw sugar rather than cane and beet. There are two such refineries in Egypt:
  - The government-owned Hawamdiya refinery (operated by ESIIC) located near Cairo (Map 5.1).
  - The Sokhna refinery on the Red Sea, which is owned by Savola.
- Refining also takes place at both public and private beet factories during the off crop, with factories able to process imported raw sugar when domestic beets are not available.

<table>
<thead>
<tr>
<th>Table 5.1: Annual refining capacity by source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>Standalone refineries</td>
</tr>
<tr>
<td>Sokhna (private)</td>
</tr>
<tr>
<td>Hawamdiya (public)</td>
</tr>
<tr>
<td>Off-crop refining</td>
</tr>
<tr>
<td>Beet factories (public/private)</td>
</tr>
<tr>
<td>Total annual capacity</td>
</tr>
</tbody>
</table>

Raw sugar is not normally refined at cane mills, as they are located too far away from ports to make refining cost effective. Moreover, there is more than sufficient capacity at the stand-alone refineries and the beet factories to supply the current market deficit. However, in exceptional circumstances (such as late 2016, when sugar was needed at short notice to cover the deficit), some cane mills have refined imported raw sugar.

The refining sector operates in the following way:

- Historically, the Sokhna refinery has supplied both the domestic and re-export markets, although over the last year the refinery has focused on re-exports due to the high level of exchange rate risk when supplying the domestic market. The refinery is located in a free zone, meaning that it only pays import duties on raw sugar sold to the domestic market, and is exempt from export duties.
- The ESIIC standalone refinery at Hawamdiya produces approximately 300,000 tonnes annually, all for the domestic market, primarily to supply the ration system. In past years the government has granted access to duty free raw sugar quota to facilitate this, and the refinery operates largely independent of commercial pressures.
- Annexed refineries either import their own raw sugar if they have the finance available, or get paid a tolling fee by another trader to refine raw sugar provided to the factory. Additionally, in 2017 the MoSIT has started to provide raw sugar to ESIIC controlled beet factories as part of its aim of ensuring sufficient supplies in the market. All production from annexed refining is sold into the domestic market.
Refining performance is influenced by a number of factors:

- Firstly, low cost refining relies upon efficient logistics: ports must be able to take large vessels, unload them in the shortest space of time and move sugar to the refinery at the lowest cost possible. This is why many refineries targeted at re-exporting their output are located in ports.

- Secondly, a large proportion of a refinery’s costs are fixed, which makes economies of scale an important driver of a refinery’s competitiveness. Globally, older refineries tend to be small and have capacities of less than 1,000 tonnes sugar per day (tsd) and mostly focus on supplying local markets. However, new refineries, especially those that operate in unprotected markets or re-export sugar, tend to be much larger.

- Finally, the factory must have access to cheap inputs, of which natural gas is the most important.

Diagrams 5.1-5.2 summarise how Egypt performs on these metrics against other comparable refining operations where data is available.
• Egyptian refineries benefit from the ability of both Sokhna and the Delta ports of Damietta and Alexandria to receive large vessels. In the region, only the Al-Khaleej refinery based in Dubai takes larger average shipments.

• However, refinery size is smaller than many countries in the region. In general refineries that re-export part of their output are larger scale as they can target both domestic and external markets. However, even accounting for this, Egypt falls behind many other countries in the region, which is particularly the case for Hawamdiya.

• Fuel costs in Egypt are subsidised, providing an advantage versus refineries that have to pay world market prices. However, there are other refineries in the region (such as in Saudi Arabia) where this is also the case.

Refining competitiveness

To benchmark the cost of refining versus other sources of supply, we have calculated an estimate of the total cost of refining in Table 5.2 below, calculated from the following elements:

World raw sugar price

The purchase of raw sugar is the largest item in the overall cost of refining. Given the volatility of world prices, we have taken three price benchmarks (discussed in more detail as part of Section 6) at 13.1, 17.2 and 21.6 cents/lb, to show how the cost structure of refining varies with movements in the world price.

To this figure, we have applied a 4.05% premium, as we assume that the refineries process VHP (very high polarity) Brazilian sugar, which commands a premium above the No.11 price.

For all conversions we have also assumed an exchange rate of 17.8 EGP/US$. 

Diagram 5.1: Average size of shipments (based on shipping data), 2015-2017

Diagram 5.2: Standalone processing capacity, 2017
Ocean freight and duties

Ocean freight rates are based on prevailing rates in 2017. On top of this we have included a 1.5% fee for commission and insurance.

Given that import duties applied to raw sugar have varied over time, we show two scenarios: a 20% tariff as well the situation where no import duties apply.

In practice the duty for raw sugar has generally been below this level (Diagram 5.3), as well as set below the white sugar duty in order to support domestic refining margins.

Discharge/transport to refinery

Discharge fees and port charges are estimated at EGP210 per tonne.

On top of this we include an estimate for the additional cost of transporting the sugar via truck to the refinery gates.

Sugar loss in refining

Transforming raw sugar into refined sugar results in a weight loss, meaning that more than one tonne of raw sugar is required to produce one tonne of refined output. This loss has been estimated at 3% in standalone refineries and 5% in beet factories.

Refining cost

The refining cost has been estimated as the cost of refining one tonne of refined sugar. The largest single element is the cost of fuel, where we have estimated a fuel consumption of 82m$^3$ of gas needed per tonne of sugar at a cost of EGP3.2 per m$^3$, giving a total cost of EGP260/tonne. Bagging has been assumed to be EGP100/tonne, and labour/maintenance/other inputs have been estimated at EGP205/tonne.

Molasses credit

The molasses recovered from the refining process has been estimated at half of the loss of weight in raw sugar per tonne, or 1.5% for standalone refining and 2.5% for beet factories. When multiplied by a price of EGP1,800 per tonne this results in a small revenue of EGP27/45 per tonne of sugar produced. This revenue is treated as a credit against costs.

Depreciation

Depreciation is based on the full replacement cost of capital, based on the reported capital cost for Sokhna of US$125 million, depreciated over 22.5 years. In the case of an annexed refinery depreciation has been excluded, since in most cases it has already been included in the cost of beet sugar production, while refining activities take place on a cash cost basis.
### Table 5.2: Total cost of refining, 2017 (EGP/tonne)

<table>
<thead>
<tr>
<th>Refining cost</th>
<th>13.1 cents/lb</th>
<th>17.2 cents/lb</th>
<th>21.6 cents/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standalone refining</td>
<td>Standalone refining</td>
<td>Standalone refining</td>
</tr>
<tr>
<td>World raw sugar price</td>
<td>5,136</td>
<td>5,136</td>
<td>8,469</td>
</tr>
<tr>
<td>Pol Premium (4.05%)</td>
<td>208</td>
<td>208</td>
<td>343</td>
</tr>
<tr>
<td>Ocean freight</td>
<td>389</td>
<td>389</td>
<td>389</td>
</tr>
<tr>
<td>Commission and Insurance (1.5%)</td>
<td>86</td>
<td>85</td>
<td>111</td>
</tr>
<tr>
<td>Duty (20%)</td>
<td>1,164</td>
<td>1,157</td>
<td>1,868</td>
</tr>
<tr>
<td>Discharge/transport to refinery</td>
<td>163</td>
<td>163</td>
<td>163</td>
</tr>
<tr>
<td>Sugar loss in refining:</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>At 20% duty</td>
<td>214</td>
<td>276</td>
<td>341</td>
</tr>
<tr>
<td>Duty free</td>
<td>179</td>
<td>230</td>
<td>285</td>
</tr>
<tr>
<td>Cost of raw sugar:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 20% duty</td>
<td>7,361</td>
<td>9,460</td>
<td>11,711</td>
</tr>
<tr>
<td>Duty free</td>
<td>6,162</td>
<td>8,176</td>
<td>9,788</td>
</tr>
<tr>
<td>Cost of processing</td>
<td>556</td>
<td>556</td>
<td>556</td>
</tr>
<tr>
<td>Molasses Credit</td>
<td>-27</td>
<td>-27</td>
<td>-27</td>
</tr>
<tr>
<td>Depreciation</td>
<td>132</td>
<td>132</td>
<td>132</td>
</tr>
<tr>
<td>Total cost of refined sugar, ex-works:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 20% duty</td>
<td>8,022</td>
<td>10,121</td>
<td>12,372</td>
</tr>
<tr>
<td>Duty free</td>
<td>6,823</td>
<td>8,572</td>
<td>10,448</td>
</tr>
</tbody>
</table>
Section 6: Prices and Competitiveness

In this section, we discuss the recent drivers of prices of sugar in the Egyptian market, as well as the competitiveness of each source of supply. We finish with an assessment of the expected margins on each source of supply under different tariff scenarios across a range of world sugar prices.

**Egyptian sugar pricing**

Egyptian cane and beet sugar currently supplies around two thirds of the market, with production 2.3 million tonnes annually versus demand of 3.4 million tonnes. The remaining difference of just over one million tonnes must be supplied by imports.

This means that under normal market circumstances Egypt’s sugar price is driven by the cost of importing either white sugar, or refining raw sugar, including all freight costs and duties, a cost known as import parity. If Egyptian prices rise significantly above this level, sugar will flow into the market until prices are driven back to parity by the imported sugar, or if prices fall below this benchmark for an extended period not enough sugar will be imported, creating a shortage and triggering a price rise.

Additionally, there is also a seasonal element to imports and pricing, with domestic stocks rising during the processing campaign (approximately January to July) and falling during the off-crop (Diagram 6.1). Egypt’s sugar policy is partly influenced by this seasonality (see Section 2), with tariffs sometimes set higher during the processing campaign to secure higher returns for processors and duties reduced during the off-crop (and during times of shortage) to allow sugar to enter the market at a lower price. This means that prices tend to receive more support during the processing season than during the off-crop.

Diagram 6.1: Evolution of monthly Egyptian sugar stocks
Section 6: Prices and Competitiveness

Calculating import parity

There are three levels of import parity relevant to the Egyptian market:

- Import parity white sugar, including duties.
- Import parity white sugar, without duties. This is relevant because the EU has duty-free access to the Egyptian market.
- Import parity raw sugar that is subsequently refined in Egypt. This parity price is calculated in Section 5. Imported raw sugar can be processed either at standalone refineries or at beet factories during the off-crop.

Import parity for white sugar is calculated as follows:

\[
\text{World white sugar price (No. 5 contract) + freight to Egypt + import duties + discharge + transport costs within Egypt = Import parity}
\]

An example calculation for white sugar import parity for June-August 2017 is included below on a delivered Cairo basis.

**Table 6.1: Refined sugar import parity, delivered to Cairo, June – August 2017**

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>World No.5</td>
<td>EGP/Tonne</td>
<td>6,910</td>
</tr>
<tr>
<td>Freight</td>
<td>EGP/Tonne</td>
<td>534</td>
</tr>
<tr>
<td>Commission and insurance (1.5%)</td>
<td>EGP/Tonne</td>
<td>112</td>
</tr>
<tr>
<td>Duty on white sugar</td>
<td>EGP/Tonne</td>
<td>20%</td>
</tr>
<tr>
<td>Duty</td>
<td>EGP/Tonne</td>
<td>1,510</td>
</tr>
<tr>
<td>Discharge</td>
<td>EGP/Tonne</td>
<td>310</td>
</tr>
<tr>
<td>Transport within Egypt</td>
<td>EGP/Tonne</td>
<td>120</td>
</tr>
<tr>
<td>No.5 delivered, duty free</td>
<td>EGP/Tonne</td>
<td>7,985</td>
</tr>
<tr>
<td>No.5 delivered, with duty</td>
<td>EGP/Tonne</td>
<td>9,384</td>
</tr>
</tbody>
</table>

Egyptian prices in recent years

Diagrams 6.2 and 6.3 compare annual Egyptian ex-works sugar prices, converted to a delivered Cairo basis, versus the three import parity benchmarks listed above. The diagrams show prices in EGP and US$ respectively. They show that prices have traded within the band between import parity raw sugar and white sugar with duties for most of the time.

There was a notable break from the dynamics described above during 2016, when a sugar shortage occurred in many parts of Egypt, including Cairo. The roots of this problem stemmed from 2013, when a shortage of dollars in Egypt caused a divergence between the official pegged EGP/US$ exchange rate and the parallel rate. By mid-2016, the two rates had diverged significantly (Diagram 6.4), discouraging traders from importing sugar to supply the local market and, for a period, incentivising exports. This was an unsustainable situation given Egypt's deficit status. As the supply of dollars at the official rate was below Egypt's import requirement, and refining was not profitable at the parallel exchange rate (Diagram 6.6), Egypt started to become short of sugar once local producers sold their stocks.

Imports remained unprofitable despite the government’s decision to remove import duties (Diagram 6.5). At the same time some traders bought local sugar and exported it, as Egyptian sugar prices were well below the price of world sugar when converted at the parallel exchange rate.
The shortage was only brought to an end when the Egyptian currency was floated in November 2016. This resulted in a sharp devaluation, which in turn triggered a sharp rise in the price of sugar in Egypt, from 5,250 EGP/tonne in October to 10,000/tonne in November.

**Diagram 6.2: Egyptian wholesale sugar prices versus import parity, 2010-2017, EGP/tonne**

**Diagram 6.3: Egyptian wholesale sugar prices versus import parity, 2010-2017, US$/tonne**
The situation in 2017

Drawing together the cost calculations presented in Sections 3-5, as well as the import parities derived above, we can evaluate the competitiveness of each supply source. Diagram 6.7 summarises the results of this analysis for 2017, differentiating between domestically-produced sugar (cane and beet) and imported sugar, under both duty-free and duty-paying scenarios. We also separate out depreciation from the cash costs of production, where relevant. These costs exclude any allowance for a return on capital employed.
Beet sugar is currently the lowest-cost source of supply in the Egyptian market, despite the increase in local currency costs following the devaluation of the EGP. This is part because these cost increases have been offset to a degree by revenues earned from its processing by-products — molasses and beet pulp — both of which are exported and are therefore priced in US$.

Sugarcane has a higher cost for reasons outlined in Chapter 4 (the support for cane farmers and smaller scale of milling). Moreover, the cane sector produces only one commercial by-product, molasses, which is also more costly to export owing to the inland location of cane mills.

While HFCS only supplies a small part of the total sugar market (around 80,000 tonnes on a sugar equivalent basis), it is also relatively low cost because of the low price of its principal raw material, corn. The starch processing sector has potential to expand its market share and the current producer, National Company for Maize Products (NCMP) is currently in the process of being privatised.

World sugar prices are currently low, meaning that white sugar imports have the potential to undercut sugarcane’s full cost of production if they enter Egypt duty free. This is why the Egyptian government has imposed a tariff on white sugar from origins other than the EU.

The competitiveness of imported raw sugar for refining depends on whether it is subject to a duty. Raw sugar currently enters Egypt duty free and, in this situation, is a competitive source of supply. However, if raw sugar is subject to a duty of 20% (as has often been the case in the past when world prices have been low), its costs are similar to those of the cane sector.
**Long-run competitiveness of supply**

Looking ahead, the cost structure of each source of supply is likely to adjust over the coming years. This is for several reasons:

- Although wages have risen significantly in EGP since the devaluation in 2016, this increase is much less than the fall in the value of the currency. This means wages have declined in dollar terms and are currently low by historical standards (Diagram 6.8). While this may persist for a period of years to come, further wage inflation is likely to erode this advantage over time.

- The margin on beets is currently below that of wheat in the Delta region, meaning prices will have to rise above their 2017 level in order to incentivise farmers to maintain beet area in the longer term (see Chapter 3).

- Finally, world wheat prices are currently weak, which reduces the competitive pressure on beets. While it is not guaranteed that wheat prices will be sustained at a higher level in the future, price volatility in agricultural markets means that there will, at least, be times when wheat prices are higher and this will have to be reflected in higher beet prices.

**Diagram 6.8: Average agricultural wage in EGP/US$ terms, 2010-2017**

**Diagram 6.9: Real EGP/US$ exchange rate, 1990-2017**

In view of likely future cost pressures, we have estimated the likely future cost structure of each supply source by making the following assumptions:

- Wages move to the level implied by the long-run real exchange rate. This gives a wage of close to US$1/hour, implying approximately 30% inflation (although still below the dollar wage in recent years).

- The beet price is set so that farmers receive the cost of growing beets in the Delta to reflect the higher wage cost, plus the return from farming wheat. This gives a final beet supply price of around EGP695/tonne, or US$39 at current exchange rates (Table 6.2).

To illustrate the impact of higher wheat prices (whether this is permanent or temporary), we have presented a second scenario where the price of wheat rises by 20% to EGP4,525 per tonne. This in turn pushes the price of beet up to just over EGP820/tonne.
Table 6.2: Long-run supply price of beets versus 2017, with and without wheat price adjustments

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>2017</th>
<th>Current wheat price</th>
<th>Higher wheat price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Wheat yield</td>
<td>Tonnes per feddan</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>B. Wheat price</td>
<td>EGP per tonne</td>
<td>3,770</td>
<td>3,770</td>
<td>4,525</td>
</tr>
<tr>
<td>C. Wheat revenue (A*B)</td>
<td>EGP per feddan</td>
<td>10,600</td>
<td>10,565</td>
<td>12,670</td>
</tr>
<tr>
<td>D. Wheat cost</td>
<td>EGP per feddan</td>
<td>6,100</td>
<td>6,810</td>
<td>6,810</td>
</tr>
<tr>
<td>E. Margin on wheat (C-D)</td>
<td>EGP per feddan</td>
<td>4,500</td>
<td>3,755</td>
<td>5,860</td>
</tr>
<tr>
<td>F. Beet cost</td>
<td>EGP per feddan</td>
<td>6,235</td>
<td>7,789</td>
<td>7,789</td>
</tr>
<tr>
<td>G. Supply price per hectare of beets (E+F)</td>
<td>EGP per feddan</td>
<td>10,735</td>
<td>11,544</td>
<td>13,649</td>
</tr>
<tr>
<td>H. Beet yield</td>
<td>Tonnes per feddan</td>
<td>16.6</td>
<td>16.6</td>
<td>16.6</td>
</tr>
<tr>
<td>I. Supply price per tonne of beets (G/I)</td>
<td>EGP per tonne</td>
<td>646</td>
<td>694</td>
<td>821</td>
</tr>
</tbody>
</table>

Table 6.3 presents the impact of higher wages on the cost of producing cane. We estimate the long-run cost of this production is around EGP67 higher than it is today, and have preserved the margin of EGP44/tonne paid in 2017 to cane farmers. In reality this may rise depending upon how much the government wishes to transfer from ESIIC’s profits to farmers, however it has never fallen below this margin in previous years.

Table 6.3: Long-run cane cost versus 2017

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>2017</th>
<th>Long run cane cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost of cane (average of 4 ratoons)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Labour</td>
<td>EGP per feddan</td>
<td>7,550</td>
<td>9,890</td>
</tr>
<tr>
<td>B. Inputs</td>
<td>EGP per feddan</td>
<td>3,325</td>
<td>3,325</td>
</tr>
<tr>
<td>C. Capital (machinery)</td>
<td>EGP per feddan</td>
<td>3,105</td>
<td>3,105</td>
</tr>
<tr>
<td>D. Land rent</td>
<td>EGP per feddan</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>E. Average cane cost (A+B+C+D)</td>
<td>EGP per feddan</td>
<td>19,980</td>
<td>22,320</td>
</tr>
<tr>
<td>F. Cane yield</td>
<td>tonnes/feddan</td>
<td>34.7</td>
<td>34.7</td>
</tr>
<tr>
<td>G. Average cost per tonne of cane (E/F)</td>
<td>EGP/tonne</td>
<td>576</td>
<td>643</td>
</tr>
<tr>
<td>H. 2017 margin:</td>
<td>EGP/tonne</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>I. Final price (G+H)</td>
<td>EGP/tonne</td>
<td>620</td>
<td>687</td>
</tr>
</tbody>
</table>

Finally, we have estimated beet and cane processing costs using adjusted wages. Combining these with the adjusted beet and cane price, we have derived the adjusted costs of producing beet and cane sugar.
Table 6.4: Long-run cost of cane and beet sugar vs 2017 estimates, in 2017 EGP values

<table>
<thead>
<tr>
<th></th>
<th>Beet sugar 2017 average</th>
<th>Beets</th>
<th>Beet sugar Long run</th>
<th>Beet sugar Long run - Higher wheat prices</th>
<th>Cane sugar 2017 average</th>
<th>Cane sugar Long run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average price of beets (per tonne beet/cane)</td>
<td>573</td>
<td>694</td>
<td>821</td>
<td></td>
<td>620</td>
<td>687</td>
</tr>
<tr>
<td>Transportation to factory (per tonne beet/cane)</td>
<td>71</td>
<td>72</td>
<td>72</td>
<td></td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Cost of delivered beet/cane (per tonne beet/cane)</td>
<td>643</td>
<td>766</td>
<td>893</td>
<td></td>
<td>645</td>
<td>712</td>
</tr>
<tr>
<td>Tonnes of beet or cane/tonnes of sugar</td>
<td>6.8</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
<td>9.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Raw material cost per tonne of sugar</td>
<td>4,384</td>
<td>5,440</td>
<td>6,340</td>
<td></td>
<td>5,950</td>
<td>6,570</td>
</tr>
<tr>
<td>Processing cost</td>
<td>2,120</td>
<td>2,470</td>
<td>2,470</td>
<td></td>
<td>2,250</td>
<td>2,500</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1,170</td>
<td>1,170</td>
<td>1,170</td>
<td></td>
<td>1,090</td>
<td>1,090</td>
</tr>
<tr>
<td>By-product credits</td>
<td>-1,633</td>
<td>-1,633</td>
<td>-1,862</td>
<td></td>
<td>-610</td>
<td>-614</td>
</tr>
<tr>
<td>Total ex-factory cost /tonne</td>
<td>6,041</td>
<td>7,447</td>
<td>8,118</td>
<td></td>
<td>8,680</td>
<td>9,546</td>
</tr>
</tbody>
</table>

We compare these long-run costs with current import parities in Diagram 6.10. This shows that beet sugar is expected to remain in a much better position to compete with imports than cane sugar. However, duty-free white sugar imports would squeeze margins for beet processors, especially if wheat prices were to increase. Meanwhile, the cane sector would potentially remain uncompetitive on a full cost basis even at a 20% duty; although it would be able to cover its cash costs when competing with imported white sugar.

Diagram 6.10: Long term competitiveness of beet/cane sugar versus current prices

However, world prices are volatile and alter the import-parity benchmarks shown in Diagrams 6.7 and 6.9 (which are based on prices prevailing in 2017). Diagram 6.11 shows how the No.11 raw sugar price has moved in recent years, as well as its minimum and maximum yearly average, as well as the period average, (13.1, 17.2 cents and 21.6 cents respectively).
Diagram 6.11: World raw sugar price, with average prices, 2012-2017

Taking into account this volatility in world prices, Diagram 6.12 compares the competitiveness of domestic supplies at the three pricing benchmarks from Diagram 6.11 above. In the diagram, the adjusted costs of the beet and cane sectors are represented by the vertical lines.

Diagram 6.12: Long run cane and beet production costs versus import parity benchmarks 2012-2017, EGP/tonne
The diagram highlights the vulnerability of the cane sector in the absence of import duties. Although the beet sector is more robust, it too would be vulnerable at low world prices (which are comparable to prices prevailing at the time of writing) in the absence of duties.

Diagram 6.13 illustrates the likely distribution of sugar prices in Egypt in the absence of import duties. Using the import parity calculations described above, we have taken daily world white sugar prices (No.5) from 2012-2017 and added the current cost of logistics, discharge and transport to Cairo. From these results, we have derived the distribution of price levels in Egypt.

- Diagram 6.13 shows the proportion of time prices would have been expected to trade at a certain level. For example, it implies prices would be around EGP9,000 per tonne 11% of the time.

- Diagram 6.14 presents the same results on a cumulative basis. For example, it suggests that prices would be EGP9,000 per tonne or higher 63% of the time.

In Diagram 6.14, we have also highlighted a column that corresponds to the adjusted cost structure of the beet and cane sector as shown in Diagrams 6.10 and 6.12, to which we have added freight to Cairo. As we noted earlier, these costs exclude any allowance for a return on capital employed.

- The results suggest beet sugar would have covered its full costs 85% of the time, with world market imports falling below its costs 15% of the time.

- Cane sugar on the other hand would only have covered its costs 37% of the time.
In this section, we discuss policy options for the Egyptian sugar industry, comparing the status quo with full and partial liberalisation. We then present a number of policy options for consideration and discuss their implications.

Key conclusions

- Full liberalisation of the sugar sector would likely result in the closure of the cane sector in Egypt, with negative implications for farm incomes and employment in Upper Egypt. While the beet sector would remain viable most of the time, volatile world prices would mean that the sector would be unlikely to attract further investment in a liberalised market.

- In terms of policy options, continuing to offer some form of protection to the sugar industry seems to be the most pragmatic approach if it is to continue to make a meaningful contribution to the socio-economy and to expand further. At average world prices, we estimate that a 10% tariff is required to support the cane industry, which is also the tariff needed to encourage investment in the beet sector. This duty would need to rise to around 20% if world prices are low.

- While duties of 10-20% are not dissimilar from those employed in the recent past, going forward there is an opportunity for the government to adopt a more transparent approach. This could take the form of a two-pronged strategy:
  - Greater transparency on import tariffs. Examples from elsewhere in the world, e.g. Russia, have shown that variable import duties, which automatically adjust depending on the level of world prices, can help to attract investment by providing transparency while minimising the burden placed on consumers. The impact on consumers could also be reduced by applying lower tariffs during the off-crop after domestic sugar has been marketed.
  - Measures to help improve cost competitiveness. Improving competitiveness would be useful for the cane sector in particular, and would reduce the tariff level needed in the long term. Such measures could include cane mill rehabilitation and/or rationalisation and the introduction of a quality-based cane payments system. In the beet sector, improving yields is critical to maintaining beet’s competitiveness in the rotation. Morocco, where beets are grown in similar climatic conditions to Egypt, has made significant strides in this area in recent years. As part of this approach, one option would be to introduce a phased reduction in tariffs over a period of time to encourage the domestic industry to enhance its competitiveness.

- Historically, the government has offered lower duties on raw sugar than whites to encourage domestic refining of imported raw sugar. This tariff differential has encouraged investment in the sector, although this was almost 10 years ago. A key issue is whether the government wishes to continue to offer a tariff advantage to refiners. There are several reasons for doing so, including the promotion of value addition in country and the threat to refining margins posed by the re-emergence of the EU as a major exporter. However, this would need to be managed in a way that does not undermine support for the domestic sugar sector.

- The other area of trade policy that needs to be addressed is the unlimited duty-free access to the Egyptian market currently granted to sugar from the EU. This supply of sugar needs to be addressed if a new variable tariff system is to be effective.
The impact of the current sugar policy

To be able to evaluate the potential effects of full and partial liberalisation of the sugar sector, we identify and quantify the impacts of current policy on the principal stakeholder groups in Egypt. Current policy has the following core elements:

- **A flexible import duty structure.** Duties are kept around 10% in normal conditions, and raised when world prices fall (up to a maximum of 20%1).
- **If the duty is not sufficient to ensure the cane industry is profitable, the government provides the ESIIC with a direct subsidy to ensure it can pay cane farmers.**
- **The duty on raw sugar imports has tended to be lower than the duty on refined sugar, to encourage domestic refining.**

In some years, the duties applied have been higher when the domestic industry is marketing its sugar, and decreased/removed during the off-crop to allow sugar to enter the country at a lower price, easing the burden on consumers. However, the government’s decision to adjust duties depends on local market conditions and has not occurred every year.

Using the long-run cane/beet supply prices and import parity calculations in Section 6, we estimated the profits/losses made by each form of domestic sugar supply, as well as the impact on broader stakeholder groups. These impacts of current policy arrangements have been calculated at the low, average and high No.11 price benchmarks of 13, 17 and 22 cents/lb respectively that were derived in Section 6.

**Cane industry profit/loss**

To calculate the annual profit/loss of the cane industry, we have taken the long-run cost of cane production and compared it to the cost of importing white sugar at our three price benchmarks and at duties of 0%, 10% and 20% (Table 7.2). This analysis suggests that the cane sector is unable to cover its full costs (including depreciation, but excluding a return on capital) in the absence of duties, unless the world price is high (over 20 cents/lb).

**Table 7.1: Annual long run profit/loss of the cane industry, low, average and high world sugar prices and 0%, 10% and 20% duties**

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Low price (13.1 cents/lb)</th>
<th>Average price (17.2 cents/lb)</th>
<th>High price (21.6 cents/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long run cost of cane production</td>
<td>US$/tonne</td>
<td>543</td>
<td>543</td>
<td>543</td>
</tr>
<tr>
<td>White sugar import parity, duty free</td>
<td>US$/tonne</td>
<td>433</td>
<td>533</td>
<td>640</td>
</tr>
<tr>
<td>White sugar import parity, 10% duty</td>
<td>US$/tonne</td>
<td>474</td>
<td>584</td>
<td>702</td>
</tr>
<tr>
<td>White sugar import parity, 20% duty</td>
<td>US$/tonne</td>
<td>515</td>
<td>635</td>
<td>763</td>
</tr>
<tr>
<td>Cane sugar profitability, duty free</td>
<td>US$/tonne</td>
<td>-110</td>
<td>-11</td>
<td>-96</td>
</tr>
<tr>
<td>Cane sugar profitability, 10% duty</td>
<td>US$/tonne</td>
<td>-69</td>
<td>40</td>
<td>158</td>
</tr>
<tr>
<td>Cane sugar profitability, 20% duty</td>
<td>US$/tonne</td>
<td>-28</td>
<td>91</td>
<td>220</td>
</tr>
<tr>
<td>Cane sugar production</td>
<td>Thousand tonnes</td>
<td>970</td>
<td>970</td>
<td>970</td>
</tr>
<tr>
<td>Total cane industry profit/loss, duty free</td>
<td>US$ million</td>
<td>-107</td>
<td>-10</td>
<td>94</td>
</tr>
<tr>
<td>Total cane industry profit/loss, 10% duty</td>
<td>US$ million</td>
<td>-67</td>
<td>39</td>
<td>153</td>
</tr>
<tr>
<td>Total cane industry profit/loss, 20% duty</td>
<td>US$ million</td>
<td>-28</td>
<td>88</td>
<td>213</td>
</tr>
</tbody>
</table>

1 Under its WTO commitments from the Uruguay round of trade negotiations, Egypt has a bound rate of 20%.
The shaded boxes indicate the lowest possible duty applied on raw sugar imports needed to meet the government objective of ensuring the cane sugar industry makes a profit (or minimises its loss), while keeping sugar prices as low as possible for consumers. These suggest a duty of 20% at low world prices, 10% at average prices and 0% at high prices (although the government has often maintained a duty on white sugar even when world prices are high).

However, at the low price (13 cents/lb) white sugar import parity is estimated to be below cane’s cost of production, even with a 20% duty. Based on recent precedent, we assume that the government provides a direct subsidy to the cane industry in this low price environment to ensure ESIC does not make a loss. In 2015/16, when world prices were low, the government paid EGP100/tonne towards the prevailing cane price of EGP400/tonne (which we discuss in Section 2).

**Beet industry profit/loss**

Beet industry profits and losses have been calculated in the same way as for cane (Table 7.2). This reveals that the beet sector is more profitable than the cane sector owing to its lower costs. Assuming duties are set to ensure the cane sector remains profitable (or operates at minimum loss), we estimate the sector is able to cover its full costs in all outcomes (if full costs include depreciation but exclude a return on capital employed). We return to the question of whether this level of profit is adequate to incentivise new investment in the sector later on.

**Table 7.2: Annual long run profit/loss of the beet industry, low, average and high world sugar prices and 0%, 10% and 20% duties**

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Low price</th>
<th>Average price</th>
<th>High price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(13.1 cents/lb)</td>
<td>(17.2 cents/lb)</td>
<td>(21.6 cents/lb)</td>
</tr>
<tr>
<td>Long run cost of beet production</td>
<td>US$/tonne</td>
<td>425</td>
<td>425</td>
<td>425</td>
</tr>
<tr>
<td>White sugar import parity, duty free</td>
<td>US$/tonne</td>
<td>433</td>
<td>533</td>
<td>640</td>
</tr>
<tr>
<td>White sugar import parity, 10% duty</td>
<td>US$/tonne</td>
<td>474</td>
<td>584</td>
<td>702</td>
</tr>
<tr>
<td>White sugar import parity, 20% duty</td>
<td>US$/tonne</td>
<td>515</td>
<td>635</td>
<td>763</td>
</tr>
<tr>
<td>Beet sugar profitability, duty free</td>
<td>US$/tonne</td>
<td>8</td>
<td>107</td>
<td>214</td>
</tr>
<tr>
<td>Beet sugar profitability, 10% duty</td>
<td>US$/tonne</td>
<td>49</td>
<td>158</td>
<td>276</td>
</tr>
<tr>
<td>Beet sugar profitability, 20% duty</td>
<td>US$/tonne</td>
<td>90</td>
<td>209</td>
<td>338</td>
</tr>
<tr>
<td>Beet sugar production</td>
<td>Thousand tonnes</td>
<td>1,210</td>
<td>1,210</td>
<td>1,210</td>
</tr>
<tr>
<td>Total beet industry profit/loss, duty free</td>
<td>US$ million</td>
<td>9</td>
<td>130</td>
<td>260</td>
</tr>
<tr>
<td>Total beet industry profit/loss, 10% duty</td>
<td>US$ million</td>
<td>59</td>
<td>192</td>
<td>334</td>
</tr>
<tr>
<td>Total beet industry profit/loss, 20% duty</td>
<td>US$ million</td>
<td>108</td>
<td>253</td>
<td>409</td>
</tr>
</tbody>
</table>

**Refining profit and loss**

Unlike the cane and beet sugar sectors, the viability of refining is driven by the margin between raw and white sugar prices, rather than by the absolute level of prices.

Table 7.3 shows stylised estimates of the profits earned from refining under the current policy, assuming that the tariff on white sugar is 10% compared to 2% on raw sugar (we assume a 20% duty of white sugar in the low price scenario). For the purpose of this analysis, we have assumed that refiners price their sugar in relation to the cost of white sugar imports. We have also assumed that the deficit in the Egyptian market is supplied by 150,000 tonnes of duty-free white imports from Europe, and the balance by domestic sugar refining.
### Table 7.3: Refining versus white sugar import parity, low, average and high world sugar prices and historical duties

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Low price (13.1 cents/lb)</th>
<th>Average price (17.2 cents/lb)</th>
<th>High price (21.6 cents/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed duty:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>20%</td>
<td>10%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Raw</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>White sugar import parity</td>
<td>US$/tonne</td>
<td>515</td>
<td>584</td>
<td>702</td>
</tr>
<tr>
<td>Refining import parity, 2% duty</td>
<td>US$/tonne</td>
<td>402</td>
<td>504</td>
<td>613</td>
</tr>
<tr>
<td>Refining margin</td>
<td>US$/tonne</td>
<td>114</td>
<td>80</td>
<td>88</td>
</tr>
<tr>
<td>Refining demand:</td>
<td>Thousand tonnes</td>
<td>1,160</td>
<td>1,160</td>
<td>1,160</td>
</tr>
<tr>
<td>Total refining profit</td>
<td>US$ million</td>
<td>132</td>
<td>93</td>
<td>102</td>
</tr>
</tbody>
</table>

### Net government spending

In our analysis of net government expenditure on the sugar industry, we consider three elements:

**Cane industry subsidy payments**

This refers to any subsidy needed to offset losses made by the cane sector at low world sugar prices. Table 7.1 indicates this to be around US$28 million when the world price is 13 cents/lb.

**Customs revenue from duties**

We have assumed that the deficit in the Egyptian market is supplied by 150,000 tonnes of duty-free white imports from Europe, and the rest by imported raw sugar that is refined in Egypt. Revenue from duties is therefore equal to the 2% duty applied on raw sugar, multiplied by the volume of raw sugar that is imported for refining.

**Cost of the subsidy system**

Under the ration card scheme, whereby essential commodities (including sugar) are available to holder of Smart Cards, sugar is available at below market rates. Although there is currently almost no gap between the two prices, any price differential results in a cost to the sugar sector; the sugar sold under the scheme is produced by government-owned cane mills. The difference between the government price and the private market rate varies, partly as the subsidised prices have sometimes been slow to adjust, as well as price differentials changing due to government policy.

Table 7.4 shows the annual cost of the scheme to the sugar sector for a range of price differentials, assuming 1.6 million tonnes of consumption are sold under the scheme. While prices may change, currently this sugar is priced at a similar level for ration card holders versus non ration use, so the cost of the subsidy is small. Instead, consumption of sugar under the scheme is more supported by the EGP50/month stipend rather than a price differential. For this reason, we have excluded the cost of the subsidy from our analysis below.
Table 7.4: Estimated total transfer from subsidised sugar prices, 2017 EGP/US$ values

<table>
<thead>
<tr>
<th>Price differential per kg:</th>
<th>Total cost, EGP million:</th>
<th>Total cost, US$ million:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 EGP</td>
<td>800</td>
<td>45</td>
</tr>
<tr>
<td>1.0 EGP</td>
<td>1600</td>
<td>90</td>
</tr>
<tr>
<td>1.5 EGP</td>
<td>2400</td>
<td>135</td>
</tr>
<tr>
<td>2.0 EGP</td>
<td>3200</td>
<td>180</td>
</tr>
</tbody>
</table>

Total cost to consumers from duties

Applying a duty to sugar imports raises prices, which in turn carries a cost for consumers who would otherwise have paid less for their sugar. This extra cost applies to every tonne sold in the market while duties prevail.

Our estimate of this cost at our three price benchmarks and duty levels is shown in Table 7.5.

Table 7.5: Total additional cost to consumers at 10%/20% duties and high/low/average price bands

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Low prices (13.1 cents/lb)</th>
<th>Average price (17.2 cents/lb)</th>
<th>High prices (21.6 cents/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in sugar price, 10% duty</td>
<td>US$/tonne</td>
<td>41</td>
<td>51</td>
<td>62</td>
</tr>
<tr>
<td>Increase in sugar price, 20% duty</td>
<td>US$/tonne</td>
<td>82</td>
<td>102</td>
<td>123</td>
</tr>
<tr>
<td>Consumption</td>
<td>Thousand tonnes</td>
<td>3,490</td>
<td>3,490</td>
<td>3,490</td>
</tr>
<tr>
<td>Total cost increase to consumer, 10% duty</td>
<td>US$ million</td>
<td>143</td>
<td>178</td>
<td>215</td>
</tr>
<tr>
<td>Total cost increase to consumer, 20% duty</td>
<td>US$ million</td>
<td>285</td>
<td>355</td>
<td>430</td>
</tr>
</tbody>
</table>

Extra margins for farmers

Cane farming

In addition to the profits made by the cane industry, cane farmers receive a benefit from the government-set cane price, which exceeds their costs of production. This margin is estimated in Diagram 7.1, which shows that it has varied from year to year but that cane prices have always been at least EGP1,500 above the average cost of producing cane per feddan (as shown in Table 7.6). It also shows that the margin has tended to be higher in times of high world prices, when pressure on ESIIC’s profitability is low.

This pricing policy has ensured cane is the most profitable, and therefore most popular, crop to plant. We estimate the total value of this benefit to be US$22 million at 2017 prices and costs.
Table 7.6: Margin for cane farming, assumed long run value (set equal to 2017 per tonne of cane)

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cane margin, per feddan</td>
<td>EGP/feddan</td>
<td>1,606</td>
</tr>
<tr>
<td>Yield</td>
<td>Tonnes/feddan</td>
<td>36.4</td>
</tr>
<tr>
<td>Cane margin, per tonne</td>
<td>EGP/tonne cane</td>
<td>44</td>
</tr>
<tr>
<td>Cane margin, per tonne</td>
<td>US$/tonne cane</td>
<td>2.5</td>
</tr>
<tr>
<td>Cane production</td>
<td>Thousand tonnes</td>
<td>8,900</td>
</tr>
<tr>
<td>Total margin for cane farmers</td>
<td>Million US$</td>
<td>22</td>
</tr>
</tbody>
</table>

Estimating the full benefit of the sugar policy for cane farmers is difficult, as it depends on which crop would be planted if the cane industry did not exist. While farmers' margins would almost certainly be lower (as cane is the best-paying crop), irrigated land in Upper Egypt would remain in productive use, meaning they would continue to earn a margin.

In the absence of detailed data on alternative crops, all we can say is that the benefit to cane farmers under long-run supply prices is a maximum of US$22 million annually; at the other extreme, if farmers could grow equally attractive alternative crops, they would potentially experience no loss. The answer is likely to lie somewhere in between.

**Beet farming**

A similar transfer does not occur in the case of beet, as beet prices have tended to be set to ensure that beet farmers earn a similar return to what they could earn from growing wheat. In other words, they would make no profit or loss by switching crops. This is the basis upon which we have estimated long-run beet supply prices in Section 6.

**Summary**

Based on all the industry/stakeholder elements discussed above, Table 7.7 calculates the expected profits, losses and transfers implied by current government policy at each world price level and at the historic level of duties applied by the government in each scenario: 20% and 10% on white sugar and 2% on raw imports.

Table 7.7: Summary of the key profits, losses and transfers under the status quo system

<table>
<thead>
<tr>
<th>Summary of status quo</th>
<th>Low price (13.1 cents/lb)</th>
<th>Average price (17.2 cents/lb)</th>
<th>High price (21.6 cents/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White sugar duty:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw sugar duty:</td>
<td>20%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Cane industry profit/loss</td>
<td>US$ million</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Beet industry profit/loss, base</td>
<td>US$ million</td>
<td>109</td>
<td>181</td>
</tr>
<tr>
<td>Refining profit/loss</td>
<td>US$ million</td>
<td>132</td>
<td>93</td>
</tr>
<tr>
<td><strong>Industry profitability:</strong></td>
<td><strong>US$ million</strong></td>
<td><strong>240</strong></td>
<td><strong>211</strong></td>
</tr>
<tr>
<td>Cost of government support to cane industry</td>
<td>US$ million</td>
<td>-27</td>
<td>0</td>
</tr>
<tr>
<td>Revenue from duty</td>
<td>US$ million</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total government spending</strong></td>
<td><strong>US$ million</strong></td>
<td><strong>-20</strong></td>
<td><strong>10</strong></td>
</tr>
<tr>
<td><strong>Total cost to consumers from duties</strong></td>
<td><strong>US$ million</strong></td>
<td><strong>-285</strong></td>
<td><strong>-178</strong></td>
</tr>
<tr>
<td><strong>Extra margin for cane farmers</strong></td>
<td><strong>US$ million</strong></td>
<td>0 to 22</td>
<td>0 to 22</td>
</tr>
</tbody>
</table>
The impact of full liberalisation on the Egyptian sugar sector

In this section, we evaluate the impact of fully liberalising the Egyptian sugar sector, contrasting the outcome with the status quo. For purposes of this analysis, we have assumed that full liberalisation comprises:

- **Completely removing all import duties.**
- **Ceasing all direct government subsidies and transfers within the sugar industry, with cane and beet production operating under unsupported commercial conditions.** Social transfers, including any price subsidy for sugar sold through the ration system, are assumed to be unchanged.

Summary of impacts

Table 7.8 summarises the expected outcome of liberalisation, as well as its impact versus the status quo. Overall, liberalisation would be expected to result in an overall net welfare saving, unless world prices are high. This is because in the low and average world price scenarios, domestic cane sugar is more expensive than imports from the world market. Nevertheless, there would be both winners and losers among stakeholders from such a liberalisation.

Table 7.8: Summary of the expected impact of full liberalisation within the Egyptian sugar sector

<table>
<thead>
<tr>
<th>Summary of full liberalisation</th>
<th>Low price (13.1 cents/lb) 0% duty</th>
<th>Average price (17.2 cents/lb) 0% duty</th>
<th>High price (21.6 cents/lb) 0% duty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cane industry profit/loss</td>
<td>US$ million</td>
<td>-107</td>
<td>-19</td>
</tr>
<tr>
<td>Beet industry profit/loss</td>
<td>US$ million</td>
<td>10</td>
<td>119</td>
</tr>
<tr>
<td>Refining profit/loss</td>
<td>US$ million</td>
<td>67</td>
<td>66</td>
</tr>
<tr>
<td>Government subsidy to cane industry</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Government revenue from duties</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Total cost to consumers from duties</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Extra margin for cane farmers</td>
<td>US$ million</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Impact versus status quo:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall in cane industry profits</td>
<td>US$ million</td>
<td>0</td>
<td>-30</td>
</tr>
<tr>
<td>Fall in beet industry profitability</td>
<td>US$ million</td>
<td>-99</td>
<td>-61</td>
</tr>
<tr>
<td>Change in refining profitability</td>
<td>US$ million</td>
<td>-64</td>
<td>-27</td>
</tr>
<tr>
<td><strong>Change in industry profitability</strong></td>
<td>US$ million</td>
<td>-163</td>
<td>-118</td>
</tr>
<tr>
<td>Saving from government subsidies</td>
<td>US$ million</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>Loss of duty revenue</td>
<td>US$ million</td>
<td>-7</td>
<td>-10</td>
</tr>
<tr>
<td>Change in net government revenue</td>
<td>US$ million</td>
<td>20</td>
<td>-10</td>
</tr>
<tr>
<td><strong>Total saving to consumers</strong></td>
<td>US$ million</td>
<td>285</td>
<td>178</td>
</tr>
<tr>
<td><strong>Margin lost to cane farmers switching crops</strong></td>
<td>US$ million</td>
<td>0 to -22</td>
<td>0 to -22</td>
</tr>
<tr>
<td><strong>Overall financial impact</strong></td>
<td>US$ million</td>
<td>149 to 127</td>
<td>60 to 38</td>
</tr>
</tbody>
</table>

- Full liberalisation would be expected to result in the closure of the cane sector, as subsidies would be removed and duty-free import parity prices are estimated, on average, to be below cane’s cost of production. ESILC is reported to employ 21,000 people (2012), a large percentage of whom are employed at cane mills.
Section 7: Policy Options

- **Cane farmers** in Upper Egypt would lose the opportunity to produce cane for sugar production. The resulting loss of income will depend on the returns they could earn from the next best crop. We estimate the total value of the margin cane farmers receive over and above their costs is around US$22 million (US$2.5 per tonne of cane for 8.9 million tonnes of cane). While a detailed assessment of potential margins from alternative crops is required to comment further, the closure of cane mills could result in a loss of income up to this amount annually. Any decline in income for farmers in Upper Egypt would exacerbate the regional impact of unemployment resulting from the closure of cane mills.

- The **beet sugar sector** would also experience lower revenues. Given that beet prices are assumed to generate a similar return to farmers as the next best crop (wheat), the full impact of the lower domestic sugar price would be felt by processors. Nevertheless, we estimate that the sector would remain viable even at low world prices. However, this is unlikely to create an environment that would encourage investment, an issue that we return to later in this section.

- The **refining** sector would also remain viable under a liberalised scenario, although its margins would be reduced. While the sector could expand to utilize their capacity to fully to supply the internal market, the sector is nevertheless expected to be less profitable. Furthermore, refiners would be more exposed to movements in the world white premium, which could be depressed by EU exports going forward. This issue is discussed further below.

- **Government** spending would fall slightly, as the state would no longer be subsidising the cane industry. However, the government, via its ownership of SIIC, would lose any profits it currently earns from its cane operations. Additionally government income from the beet sector — via its majority shareholding in four of the country’s six beet factories — would also drop as a result of the reduced profitability of beet processors.

- **Consumers** are expected to gain as a result of lower sugar prices. We estimate the total benefit of this to consumers to be more than US$100 million at average world prices (assuming a duty of 10% is levied at this price level).

In addition, there are benefits and costs that are harder to quantify, such as potential water savings and the foreign exchange requirement to import nearly one million tonnes more sugar (assuming the cessation of cane farming). Using 2012-2017 world prices and current import fees, the cost of importing duty-free white sugar averaged US$544/tonne. Given that cane sugar production averaged 974,000 tonnes annually over the same period, this indicates that the Egypt would have needed to spend additional US$530 million in foreign exchange annually to cover the resulting increase in imports. However, the net impact on Egypt’s trade account would also depend on which alternative crop is produced, which will either be exported to earn foreign exchange (e.g. horticultural products or fruits) or displace imports if consumed locally, both of which would benefit trade accounts.

**Policy options**

The analysis above indicates that the full liberalisation of the sector would almost certainly result in lower sugar output, with the cane sector in particular under threat. It may also discourage further investment in the beet sector. While our analysis points to an overall net gain from liberalisation, such a move would undoubtedly have significant economic and social impacts, particularly in Upper Egypt. Furthermore, it is important to remember that virtually all sugar industries globally benefit from some form of government support. With this in mind, the government may wish to partially liberalise the sector, rather than remove controls completely.
In this section, we consider a number of policy options that could be pursued by the government to encourage the sugar sector to continue to develop while minimising the additional burden placed on consumers.

These policies include:

- Measures to help improve the efficiency of the domestic sugar sector, thereby lowering the amount of support that it requires to remain viable.
- Offering a level of protection from the volatile world market that would create an environment that is more conducive to investment in the beet sector.

**Cane sector**

The cane sugar sector is currently uncompetitive with duty-free imports; however, there is potential for the sector’s reliance on duties to be reduced, even if it cannot compete in a fully liberalised market. Additionally, the Egyptian government has committed to reduce state subsidies as part of their economic reform package (stipulated in the 2017 IMF loan); raising the efficiency of the cane sector would also reduce the need for direct subsidy support. Three measures that could be considered are:

- The introduction of a quality-based cane payments system.
- A programme of mill modernisation and/or rationalisation.
- Reviewing current irrigation systems

**Quality-based payment system**

Cane farmers are currently paid according to the weight of cane delivered to the mill, with no allowance made for the sucrose content of the cane. This is in contrast to Egypt’s beet sector, as well as most other cane industries (including Brazil and Thailand, the world export leaders), which pay premiums to farmers who deliver higher quality cane.

One of the problems with paying for cane purely on the weight of cane is that it results in a divergence in the interests of farmers and millers. For example, in Egypt, a common method of increasing the mass of cane prior to harvest is by applying large amounts of water and nitrogen fertiliser to bulk up the plant. However, this also reduces sucrose content, lowering recovery rates in the factory. Indeed, best practice in other irrigated industries is generally to ‘stress’ the cane before harvest by limiting its access to water to encourage the plant to produce more sugar at the expense of biomass.

The cost savings from improving cane quality could be considerable. For example, if the ratio of cane to sugar could be reduced from 9.1 to 8.5, total costs would be reduced by around US$30 per tonne of sugar produced. This would also allow mills to pay farmers more for their cane. Additionally, it would likely reduce unnecessary water consumption and pollution from agricultural run-off, which result from the current over-application of water and fertilisers.

However, it should be noted that introducing a quality based payment system is not without cost and there are challenges associated with doing so. Indeed, in the late 1970s to the early 1980s, cane payments were based on quality, and reintroduction is expected to be controversial:

- Reference points for cane quality for the purpose of payment would need to be established by millers and growers. Experience from other industries suggests that such negotiations can be complex and lengthy.
Section 7: Policy Options

- Each farmer’s cane would need to be tested on delivery to the factory. Given the small scale of agricultural operations and the large numbers of farmers delivering cane to the mills, this would create an administrative cost and burden. An alternative is that the quality payment is based on the recovery rate of the mill; however, this would mean that farmers would receive a quality payment based on the average performance of all farmers, diluting the incentive for individual farmers to improve quality.

- A change in farming practices would be required, with farmers needing advice and technical support to adopt new farming practices.

**Mill modernisation/rationalisation**

Currently the average scale of milling in Egypt is small, which raises unit costs for cane. Part of the reason for this is because cane is grown along the banks of the Nile, limiting the ability of mills to source cane from an area within an even radius.

A programme of mill modernisation and rationalisation could allow unit costs to be reduced considerably by gaining economies of scale, updating equipment and reducing labour costs. However, this would require an upfront capital investment by the government (which may or may not be justified, depending upon the overall viability of the sector), and modernisation would result in the redundancy of some employees currently working at labour intensive mills. A cost/benefit analysis of such a policy would need to be investigated further.

**Reviewing current irrigation systems**

Currently, the vast majority of cane is irrigated by flood, which results in higher water losses to evaporation compared to other irrigation systems; it also increases fertiliser run-off. In contrast, drip irrigation supplies water to plants via buried pipes, allowing irrigation to be much more targeted.

Switching to drip irrigation therefore could have benefits for Egyptian agriculture. However, previous attempts to do so have run into problems. Drip irrigation is expensive as pumps and lines must be purchased. As farmers currently do not pay for their water use, it is currently not profitable for smallholders to purchase the systems themselves.

While the government has tried to get around this in the past by providing farmers with the capital needed for drip irrigation free of charge, fuel costs still need to be considered (as many farmers use gravity to bring water to fields in the case of flood irrigation). Additionally, farmers have sometimes been cautious about drip irrigation schemes, seeing them as a first step in charging for water.

Nevertheless, a full cost benefit analysis of adopting drip irrigation could form a first step for government if the problem of water use in the cane sector is to be addressed in the long term.

**Beet sector**

While the beet sector is in a stronger position than the cane sector, beet factories must be able to make a reasonable return on capital employed if it is to expand further. While this is likely to require some protection from imports, from a government perspective, it is important that the burden on consumers is not excessive.

In order to assess the level of protection that the beet sector requires, we have developed a simple cash flow model to estimate the rate of return that is available on an investment in beet processing in different scenarios. This model is based on the cost of beets including transport presented in Section 3 (US$43/tonne), the cost of beet processing in 2017 and assumes it costs US$250 million to construct a new beet factory with a capacity of 10,000 tonnes of beet per day.
Table 7.9 shows the domestic price that would be needed to generate a return on capital, while Table 7.10 shows the rate of return that would be achieved under different policy and world price scenarios.

- To generate a pre-tax return of more than 10%, the domestic sugar price needs to be in the region of US$570-580/tonne, delivered Cairo.

- At a world price of 17 cents/lb (the average price scenario), a tariff of around 10% on imports would be sufficient to encourage investment in the beet sector. If world prices were to trade above 20 cents/lb on a consistent basis, no protection would be required. However, at low world prices, even a 20% duty is not enough to achieve a 10% return.

**Table 7.9: Sugar price range needed to generate an IRR of between 0 and 15%, basis long run costs (US$/tonne, Cairo basis)**

<table>
<thead>
<tr>
<th>IRR</th>
<th>Domestic price required</th>
<th>Cost of production (incl. depreciation)</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0%</td>
<td>425</td>
<td>425</td>
<td>0</td>
</tr>
<tr>
<td>5.0%</td>
<td>492</td>
<td>425</td>
<td>67</td>
</tr>
<tr>
<td>7.5%</td>
<td>528</td>
<td>425</td>
<td>102</td>
</tr>
<tr>
<td>10.0%</td>
<td>565</td>
<td>425</td>
<td>139</td>
</tr>
<tr>
<td>12.5%</td>
<td>603</td>
<td>425</td>
<td>177</td>
</tr>
<tr>
<td>15.0%</td>
<td>642</td>
<td>425</td>
<td>216</td>
</tr>
</tbody>
</table>

**Table 7.10: Pre-tax internal rate of return from investing in the beet sector at different levels of import duty and world price**

<table>
<thead>
<tr>
<th></th>
<th>Low price  (13.1 cents/lb)</th>
<th>Average price (17.2 cents/lb)</th>
<th>High price (21.6 cents/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beet factory IRR, duty free</td>
<td>0%</td>
<td>7%</td>
<td>14%</td>
</tr>
<tr>
<td>Beet factory IRR, 10% duty</td>
<td>3%</td>
<td>11%</td>
<td>18%</td>
</tr>
<tr>
<td>Beet factory IRR, 20% duty</td>
<td>6%</td>
<td>14%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Of course, these rates of return could be greater if the performance of the beet sector improves in the future. As in the cane sector, there are areas where improvements could be achieved. We discuss both of these below:

**Beet field performance**

Field performance in Egypt is poor compared to some other beet industries (see Section 3 for details). Part of the reason for this is attributable to the climate, with beet varieties less suited to the conditions of Egypt compared to Northern Europe; however, other industries have made performance gains under similar conditions.

The best example of this is Morocco, which has made great strides in improving field performance in recent years, driven by the organisation of growers into production units. This has facilitated greater co-ordination between field and factory and allowed economies of scale to be achieved even on small plots. Each farm remains responsible for their output and gets paid for their beets. However, technical support, mechanisation and delivery times are co-ordinated at the level of the production unit. This has reduced sucrose losses between the field and factory and allowed Moroccan growers to make use of mono-germ seeds, increasing yields and reducing field costs.
The impact on yields is shown in Diagram 7.2, which shows the improvement in performance that Morocco has achieved, with yields exceeding 70 tonnes/hectare in 2016/17. Assessing whether a similar improvement could be achieved in Egypt is beyond the scope of this report. However, Morocco may provide useful lessons for how performance could be improved in similar climatic conditions to those in Egypt.

Diagram 7.2: Beet yields — Egypt vs. Morocco

Diagram 7.3: Sugar yields — Egypt vs. Morocco

Diagram 7.4: Index of beet vs. wheat yields in Egypt (1990 = 100)

Improving yields would strengthen the competitiveness of beet in the rotation. Diagram 7.4 shows that beet yields have actually been declining relative to the major alternative crop, wheat.

If this trend continues, it will inflate the price that beet processors will have to offer to farmers to keep beet in the rotation and increase the risks surrounding beet supply. If beet yield improvements can outpace wheat yields, it will improve the cost competitiveness of the sector.

Trade policy

Import duties

Our analysis suggests that an import tariff will be required if the cane industry is to continue in its current form and the beet sector is to expand further. While the government has been adjusting tariffs on an *ad hoc* basis in response to changing market conditions, a more formal structure would provide greater encouragement for further private sector investment in the sector. In this area, there is the potential to learn from the experience of other countries.
The experience of Russia

Up until the mid-2000s, Russia was the largest importer of raw sugar in the world. However, increases in output since then have recently transformed Russia into a surplus sugar producer. A major driver behind this huge swing in production was the import duty policy adopted by Russia in 2004. The current structure of the policy is shown in Diagrams 7.5-7.6.

Diagram 7.5: Russian duty structure versus world price level

Diagram 7.6: World prices including Russian duties

Russia's import policy is made up of the following elements:

- A flat, high duty on white sugar to encourage domestic refining.
- A variable duty on raw sugar, which is set based on the previous month's average No.11 sugar price. This rises as world prices fall, based on a published formula, shown in Diagram 7.6.
- The policy also has a seasonal element, with the duty applied varying depending on whether sugar is imported during the processing season or in the off-crop period.

This policy has helped to create a more attractive investment environment in Russia, as well as a transparent government policy.

Any future policy adopted by the Egyptian government will need to be consistent with their WTO commitments. One feature of the Russian system, and an important reason for its success, is the high level of the tariffs applied to imports. Under the Uruguay Round, Egypt committed to a bound rate on sugar of 20%, limiting the size of the duty that can be applied. Nevertheless, the principle of a published formula that adjusts automatically depending on the level of world prices offers an interesting example for Egypt, given that the government applies a similar approach in practice, albeit on a more ad hoc basis.

Alternative models — Colombian price band system

An alternative system to the Russian policy is to use a price band similar to the one used in Colombia. The idea behind this system is to reduce the impact of volatility of world prices, as well as to provide protection against imports. A variable import duty softens price fluctuations by reducing the duty when sugar prices rise above a reference price, and raises them if prices drop below it. In this way, the policy helps to create a balance between offering reasonable support for growers, while at the same time lessening the price paid by consumers when the world sugar price is high.
The system works by applying a variable surcharge on top of a basic tariff of 20%. The surcharge is levied on the c.i.f. price to bring the price of imported sugar to within a designated band, which is established by floor and ceiling prices (Diagram 7.7). The variable duty is equal to 120% of the difference between the floor or ceiling price, and the reference price, which is based on the c.i.f. value of world market sugar is adjusted every fortnight.

- If the reference price is within the floor and ceiling price band, the import duty is charged at the standard rate of 20%.
- If the reference price falls below the floor price, a variable surcharge, determined by the difference between the reference price and the floor price, is calculated.
- If the reference price is greater than the ceiling price, a reduction is made to the variable duty, dependent on the difference between the reference price and the ceiling price.

In all cases, the total tariff charged inclusive of the variable duty must not exceed the WTO bound rate. The ceiling and floor prices are revised every April.

Once again, this allows an automatic adjustment of import duties depending upon the level of the world price, meaning that as prices fall producers are supported and as they rise the burden to the consumer is reduced.

However, the introduction of the upper and lower bounds allows the government to adjust the level at which it wishes prices to trade. This allows the policy to be combined with annual adjustments for local conditions (wages, fuel prices etc.), or allow protection to be reduced over time based upon a published schedule.

Diagram 7.7: Estimated Colombian sugar reference price versus price bands, 2010-2017
Policy towards EU imports

If import duties are to provide an effective way of supporting local prices, it is important that any loopholes are closed. One potential issue is the current policy towards EU imports, which grants unlimited duty-free access. While EU exports have effectively been limited in the past, from October 2017, the level of EU exports will no longer be constrained by the current WTO limit of 1.4 million tonnes. This means that much larger amounts of EU sugar could come into Egypt in the future, potentially destabilising the government’s policy, particularly if importers invest in more sophisticated supply chains.

Policy towards the refining sector

In the past, the government has offered tariff protection to refiners by maintaining a higher duty on white sugar than raw sugar most of the time. The advantage to refining locally is that more value is added within Egypt, maintaining employment in the sector. Furthermore, it is important to note that the tariff differential would have played an important role in securing investment in the sector in 2008, when the new refinery was constructed in Ain Sokhna.

A key issue is whether the government wishes to continue to offer a tariff advantage to refiners. There are several reasons that support doing so, including the promotion of value addition in country. Moreover, the re-emergence of the EU as a major exporter poses a threat to refining margins. Importantly, as a beet sugar producer, the EU does not respond to the level of the white premium. This means that, in years when EU exports are high, the white premium could be depressed to very low levels.

Table 7.11 calculates the level of the world white premium that the refining sector would need to cover its operating costs when supplying the domestic market. It suggests that the sector can survive at relatively low levels of the white premium (US$40-60/tonne). However, these figures do not include depreciation or a return on capital which would have to be covered in the long run. This would add a further US$15-20/tonne to this figure. For these reasons, a differential tariff structure could still be beneficial if the government wishes to ensure that the refining sector continues to operate at a profitable level.

Table 7.11: World white premium required to cover refining costs

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Low price (13.1 cents/lb)</th>
<th>Average price (17.2 cents/lb)</th>
<th>High price (21.6 cents/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margin above No.11 needed to cover refining costs (duty free)</td>
<td>US$/tonne</td>
<td>106</td>
<td>116</td>
<td>126</td>
</tr>
<tr>
<td>Supply cost from the EU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight</td>
<td>US$/tonne</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>C+I</td>
<td>US$/tonne</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Discharge</td>
<td>US$/tonne</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Transport within Egypt</td>
<td>US$/tonne</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Required white premium:</td>
<td>US$/tonne</td>
<td>41</td>
<td>49</td>
<td>58</td>
</tr>
</tbody>
</table>