ORIGINAL ARTICLES

An Economic Study of Production, Consumption and Import of Sugar in Egypt

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ABSTRACT

Due to increased consumption of sugar in Egypt due to rising incomes and steady increase in population, there occurred a gap of product locally and consumer of that study aimed to identify current status of production and consumption of sugar locally, and try to estimate food gap sugary and study factors affecting this gap. The study showed that despite an increase in domestic production of sugar at rates above national increase in consumption, but it has not achieved self-sufficiency of it due to steady increase in population, high average per capita consumption in recent years. Therefore, the study recommends need for horizontal expansion of sugar beet crop, especially during scarcity of water component, where sugar cane crop needs to be about four times needs of sugar beet crop from irrigation water, and rationalization of consumption of sugar through a national program to reduce rate of per capita consumption of it.

Key words: Production of sugar, consumption of sugar, gap of Sugar, expected energy consumption of sugar, sugar cane crop, sugar beet crop, self-sufficiency of sugar.

Introduction

Sugar is a food good and important strategy enter in style of food for all members of society, and production of sugar in Egypt depended on cane sugar crop and beet sugar crop. It could be said that cane sugar was a primary source only for sugar industry in Egypt until 1982, introducing cultivation of sugar beet crop, however, achievement of acre productivity of beet during past years has given successful results for possible expansion of sugary crop standing next to sugar cane crop, if not a rival to him, as related to it in hopes of increasing the proportion of self-sufficiency of sugar in Egypt. The sugar beet is not a substitute for sugar production, but also extends its importance by using waste of cultivation and processing in production of non-traditional animal feed along with many other secondary industries.

Due to limited resource of water in Egypt, expansion of agriculture and industry sugar from sugar beet is a fundamental way for expansion of sugar production to achieve self-sufficiency of it depending on another crop not sugar cane because it needs very irrigation water, which more than 13 thousand cubic meters per acre.

Study problem:

In spite of the increase achieved in production of sugary crops of development and modernization of agricultural methods, but study problem has represented in there are a gap between production and consumption of sugar was estimated at about 1.11 million tons in 2010. State bears the burden of management of foreign exchange to import quantities needed to fill that consumer gap, at a time when state seeks to manage foreign exchange to pay for process of economic and social development.

Objective of study:

The research aims to study relationship between production and consumption energy, appreciation of food gap of sugar in Egypt, study of affecting factors on this gap in terms of population, and average per capita consumption, as well as estimate future prospects for self-sufficiency ratio.

Research method and data sources:

The research depended mainly on secondary data published and unpublished for period (1995-2010) from Ministry of Agriculture and Land Reclamation, Central Agency for Public Mobilization and Statistics, and
Council of Sugar Crops. Descriptive and quantitative statistical analysis have been using in time series analysis of variables in study, as was estimated equations of general time trend and future prospects of variables in study.

Discussion of the results:

Production of sugar crops in Egypt:

Production areas of sugar cane in Egypt concentrated in upper governorates on south valley where there are appropriate environmental and climatic conditions for growth in governorates of Minya, Sohag, Gena and Aswan, while areas of production of sugar beet in Egypt concentrated in North Delta, where air italics cooler in governorates of Kaf El-Sheikh, Dakahlia, El-Gharbia, Damiet and Nubaria.

Domestic production of sugar:

First, domestic production of sugar cane:

Domestic production of sugar cane depended on each of cultivated area and acre productivity, and Table (1) shows proportion of sugar cane from total sugar production amounted to 84.13%, 72.7%, 65.48% for three periods (1995-1999), (2000-2004), (2005-2010), respectively, reached an average of about 88.9% for period (1995-2010).

Table 1: Development of average production, consumption, imports and self-sufficiency ratio from sugar for period (1995-2010)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>total sugar production (thousand tons)</td>
<td>1159.6</td>
<td>1265.4</td>
<td>1604.6</td>
</tr>
<tr>
<td>total consumption of sugar (thousand tons)</td>
<td>1601.6</td>
<td>1981.2</td>
<td>2791.0</td>
</tr>
<tr>
<td>imports of sugar (thousand tons)</td>
<td>505.0</td>
<td>596.2</td>
<td>1193.8</td>
</tr>
<tr>
<td>per capita consumption of sugar (km/year)</td>
<td>25.6</td>
<td>33.8</td>
<td>29.02</td>
</tr>
<tr>
<td>total production of sugar cane (thousand tons)</td>
<td>975.6</td>
<td>992.6</td>
<td>1050.7</td>
</tr>
<tr>
<td>total production of sugar beet (thousand tons)</td>
<td>184.0</td>
<td>372.8</td>
<td>554.06</td>
</tr>
<tr>
<td>self-sufficiency (%)</td>
<td>69.5</td>
<td>72.38</td>
<td>62.02</td>
</tr>
<tr>
<td>gap glucocorticoids (thousand tons)</td>
<td>362.0</td>
<td>615.8</td>
<td>984.4</td>
</tr>
<tr>
<td>population (million)</td>
<td>62.54</td>
<td>68.18</td>
<td>76.6</td>
</tr>
</tbody>
</table>

Source: compiled and calculated from Ministry of Agriculture - Board of sugar crops - sugary crops and sugar production in Egypt - different issues until 2010.

And estimate equation of overall time trend of quantities of sugar produced from cane sugar during the period (1995-2010) as shown in Table (2) shows that production of sugar output of cane sugar has taken a growing trend rate of increase in annual rate of about 4.98 thousand tons and an annual increase estimated about 0.5% of average production during period of analysis and of about 1006.3 thousand tons.

Second, domestic production of beet sugar:

The beet sugar is from sugar crops modern farming in Egypt for production of sugar, with establishment of several factories for the production of beet in governorates of Kaf El-Sheikh, Dakahlia, Fayoum, and Nubaria beginning in 1982 until 1998.

Table (1) shows that proportion of total sugar beet from sugar production amounted to about 15.87%, 27.3%, 34.52% for three periods (1995-1999), (2000-2004), (2005-2010), respectively, reached an average of about 11.1 for period (1995 -2010).

From equation of general trend of quantities of sugar produced from sugar beet crop during period as shown in Table (2), show that production of sugar output of sugar beet crop has taken an increasing general trend rate of increase in annual rate of about 36.38 thousand tons and an annual increase estimated at about 9.8% of average production during study period, amounting to about 370.3 thousand tons.

As for total amount of sugar produced from sugar cane and sugar beet from data table (1), show active participation of sugar beet crop with sugar cane for sugar production. In 1995 proportion of sugar output from beet sugar, 11.3% of total sugar production of 1.13 million tons, down to about 7.4% of total production of 1.5 million tons in 2005 and then rising to reach 10.5% in 2010 of total production about 1.61 million tons. Average sugar production was about 1.376 million tons for average study period (1995-2010).

From equation of general trend of total sugar output of cane sugar and beet sugar is clear from data table (2) that total production of sugar to take increasing general direction of increase significant statistically rate at 0.01 was about 40.9 thousand tons and rate of increase of about 2.97% of average production about of 1.376 million tons for period of study.
National consumption of sugar:

Table (1) shows development of national annual consumption of sugar and it is clear that size of national consumption has reached below about 1.6 million tons as average period (1995-1999), while maximum at about 2.79 million tons as average period (2005-2010), and by increasing estimated about 137.6% than first period.

Table (2) shows general trend of consumption for sugar to take an increasing trend statistically significant annual rate at 0.1 reached about 120.4 thousand tons and an annual increase of about 5.67% of average national consumption of about 2.12 million tons during study period. The increase in national consumption of sugar back to increase in population as well as the increase in purchasing power of consumers and increase the use of soft drinks and sweets.

Table 2: Overall time trend of quantities of sugar produced, consumed, and imported in Egypt during period (1995-2010)

<table>
<thead>
<tr>
<th>Statement</th>
<th>equation</th>
<th>R²</th>
<th>average</th>
<th>T</th>
<th>annual growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>sugar cane (thousand tons)</td>
<td>$Y_e = 966.428 + 4.984X_e$</td>
<td>0.22</td>
<td>1006.3</td>
<td>1.91</td>
<td>0.49</td>
</tr>
<tr>
<td>sugar beet (thousand tons)</td>
<td>$Y_e = 81.645 + 36.383X_e$</td>
<td>0.88</td>
<td>370.3</td>
<td>9.76</td>
<td>9.8</td>
</tr>
<tr>
<td>total sugar (tons)</td>
<td>$Y_e = 1049.303 + 40.9033X_e$</td>
<td>0.85</td>
<td>1376.5</td>
<td>8.58</td>
<td>2.97</td>
</tr>
<tr>
<td>national consumption of sugar (thousand tons)</td>
<td>$Y_e = 1161.114 + 120.4357X_e$</td>
<td>0.82</td>
<td>2124.6</td>
<td>7.69</td>
<td>**5.67</td>
</tr>
<tr>
<td>per capita consumption of sugar (kg/year)</td>
<td>$Y_e = 23.275 + 0.774X_e$</td>
<td>0.91</td>
<td>29.47</td>
<td>11.46**</td>
<td>2.61</td>
</tr>
<tr>
<td>imported quantities of sugar (thousand tons)</td>
<td>$Y_e = 219.000 + 68.250X_e$</td>
<td>0.78</td>
<td>765.0</td>
<td>6.79**</td>
<td>8.92</td>
</tr>
<tr>
<td>gap of sugar (thousand tons)</td>
<td>$Y_e = 346.476 + 54.282X_e$</td>
<td>0.83</td>
<td>680.7</td>
<td>7.97**</td>
<td>7.97</td>
</tr>
<tr>
<td>self-sufficiency ratio (%)</td>
<td>$Y_e = 229.912 - 14.881X_e$</td>
<td>0.16</td>
<td>64.0</td>
<td>1.57</td>
<td>23.25</td>
</tr>
<tr>
<td>population (million)</td>
<td>$Y_e = 57.961 + 1.393X_e$</td>
<td>0.98</td>
<td>69.1</td>
<td>25.24</td>
<td>2.02</td>
</tr>
</tbody>
</table>

$Y_e$ = estimated value of variable is estimated
$X_e$ = time variable in year e : 1, 2, ..., 15
** Significant at 1%  * significant at 5%
Source: compiled and calculated from data table (1).

Per capita consumption of sugar:

For average per capita consumption of sugar has increased from about 25.6 kg/year average period (1995-1999) to about 33.8 kg/year average period (2005-2010) as in Table (1). When calculating general trend of average per capita consumption of sugar during study period in Table (2) shows that there is a general growing trend with increase rate of about 0.77 km/year and an annual increase estimated at around 2.61% of average per capita consumption during period in study of about 29.47 km/year.

Imports of sugar:

Table (1) shows evolution of total imports of sugar during periods of study and it is clear that volume of imports from sugar amounted to below about 505 thousand tons as average period (1995-1999) and up to about 1.193 million tons as average period (2005-2010) by increase about of 236.2% from first period, and shows general trend of imports of sugar it took an increasing general trend in total about 68.25 thousand tons, an increase of about 8.9% of average imports during study period, amounting to about 765 thousand tons. This is due to increase in population, where population increased by about 1.39 million people are estimated to increase by about 2.02% of average period of about 69.1 million people.

Self-sufficiency ratio of sugar:

Table (1) shows development of self-sufficiency ratio of sugar during periods of study and it is clear that ratio has reached a maximum at about 72.38% as average period (1995-1999) and was lowest at about 62.02% as average period (2005-2010). It is noted that Egypt was self-sufficient from sugar until early seventies, however due to increased domestic consumption of sugar rates is greater than domestic production to increase number of people appeared consumer gap of sugar, gap was about 400 thousand tons in 2001, then it increased significantly since 2002 about 627 thousand tons to about 1.11 million tons in 2010, so state treats size of deficit in domestic production by imports from abroad.

Future outlook for food gap of sugar:

As future policy making to achieve a balance between production and consumption of sugar, it requires need to predict what could be future of these variables, production was estimated from equation of overall time
trend during period (1995-2010) as Table (2) have also been made to predict quantities required for consumption according to three alternatives are:

**The first alternative:** prediction is from time trend equations and assuming rule of current circumstances.

**The second alternative:** expected energy consumption of sugar is estimate according to following equation:

\[
\text{Expected per capita consumption} = \text{real per capita consumption in base year} \times (1 + \text{m \ y})^n
\]

Where \( m \) = elasticity of interior demand,
\( Z \) = annual growth rate in average per capita real income.
\( N \) = expectation period

**The third alternative:** estimated consumption has assumed according to average per capita consumption in period (95-2010), subject of analysis (29.47 km / year).

Table (3) shows that food gap of sugar under first alternative is expected to reach about 1.78 million tons by self-sufficiency is estimated at 51.7% in 2015, about 2.18 million tons for food gap of sugar is estimated at 49.22% for self-sufficiency in 2020. But under second alternative reduces sugary gap to about 804, 816.3 thousand tons with self-sufficiency of around 70.3%, 72.1% in both 2015, 2020. Under third alternative has decreased expected gap for each of first and second alternative, where percentage of self-sufficiency is estimated at 74.2%, 76.1% in both 2015,2020, respectively, from previous findings that study recommends by expansion in cultivation of beet sugar because basic way for increase sugar to achieve self-sufficiency due to difficulty of horizontal expansion of spaces cane as a result of limited irrigation water, rationalization of consumption of sugar through a national program to reduce rate of per capita consumption of sugar, which will reflect its impact on reducing amount of total consumption from sugar while maintaining overall health of population, fight against diseases and pests in sugar crops, to devise new varieties with high productivity and resistance to disease.

**Table 3:** Expected quantities of both production and consumption of sugar, food gap from sugar in years 2015, 2020

<table>
<thead>
<tr>
<th>Year</th>
<th>total domestic production (thousand tons)</th>
<th>total national consumption (thousand tons)</th>
<th>food gap (thousand tons)</th>
<th>total domestic production (thousand tons)</th>
<th>total national consumption (thousand tons)</th>
<th>food gap (thousand tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1908.2</td>
<td>3690.14</td>
<td>1781.9</td>
<td>2112.7</td>
<td>4292.29</td>
<td>2179.6</td>
</tr>
<tr>
<td>2020</td>
<td>1908.2</td>
<td>2712.23</td>
<td>2112.7</td>
<td>2929.0</td>
<td>804.03</td>
<td>816.30</td>
</tr>
<tr>
<td>2015</td>
<td>1908.2</td>
<td>2112.7</td>
<td>2570.08</td>
<td>2775.48</td>
<td>661.88</td>
<td>662.78</td>
</tr>
<tr>
<td>2020</td>
<td>1908.2</td>
<td>2112.7</td>
<td>2570.08</td>
<td>2775.48</td>
<td>661.88</td>
<td>662.78</td>
</tr>
</tbody>
</table>

Source: compiled and calculated from data Table (2)

**Conclusion:**

production of sugar depends on cane sugar and beet sugar crops in Egypt, where each contribute about 62.9%, 37.1% of total sugar output locally respectively, which is estimated at 1.61 million tons in 2010.

Rate of annual increase has estimated in domestic production of sugar by about 2.93%, while estimated rate of annual increase in national consumption by about 5.67%, annual increase in population and proportion of self-sufficiency is estimated at 2.02%, 23.2%, respectively, in average period (1995 -2010), while annual increase in per capita consumption is estimated at 2.61%, imported quantities of sugar is estimated at 8.92% during same period. If current conditions affecting of production and consumption extend, future prospects for production and consumption of sugar will estimated. Expected consumption reached 3.69, 2.71, 2.57 million tons under three alternatives, respectively in 2015 compared to 4.29, 2.932.77 million tons under three alternatives in 2020, respectively.

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