

Some Economic Aspects of Sugar as a Strategic Commodity in Egypt

Gaber Ahmed Bassyouni Shehat

Dept. of Agricultural Economics, Faculty of Agriculture
(Saba Basha), Alexandria University, Egypt

Ahmed Hassan Ismaiel Srour

Dept. of Agricultural Economics, Faculty of Agriculture
(Saba Basha), Alexandria University, Egypt

Shmoaa Awad Mohamed Soliman Oraby

Dept. of Economics and Rural Development, Faculty of Environment
Agricultural Sciences, Arish University, Egypt

Sahar El-Sayed El-Sayed El-Wakeel

Agricultural Economics Institute, Agricultural Research Centre, Egypt

Hanan Abd_Elmoneim Zahran

Dept. of Agricultural Economics, Faculty of Agriculture
(Saba Basha), Alexandria University, Egypt

ABSTRACT

The research aims mainly to study Egyptian food security of sugar through studying of several sub-objectives represented in: estimating some economic indicators of sugar in Egypt during the period (2008- 2020), studying of the most important indicators of food security of sugar, estimating the size of the food gap of sugar and knowledge of the most important factors responsible for, and studying the policies and means to achieve food security of sugar in Egypt. Descriptive and quantitative analysis were used. The study depends on secondary data, which collected from local and foreign sources during the period (2008- 2020). The conduct study shows that the most important variables specific to the food gap of sugar are all from the local production of sugar and domestic consumption of sugar where it was found that the impact of each of these two variables on sugar gap be negative. The study showed that the strategic stock of sugar is estimated at 1.15 million tons and the average national consumption of sugar is estimated at 2.17 million tons during the study period (2008-2020) with an annual average during that period , therefore, coefficient of sugar food security estimated at about 0.37, therefore it requires to take various actions that would lead to increase the size of the sugar strategic stock to enough half of it needs for domestic consumption even come close to the value of coefficient of food security, from suitable coefficient of sugar food security. The study showed that the policies and means to achieve sugar food security include horizontal agricultural development policy, vertical agricultural development policy, the policy of rationalizing the consumption of sugar, policy of consumer

subsidy of sugar, and the policy of diversifying sources of imported sugar. In the light of the results of the study illustrated by research it has been possible to reach some of the following recommendations: 1- It is necessary to intensify efforts to agricultural extension and agricultural research centers in collaboration with factories engineers and agriculture departments and supervisors agricultural awareness of the importance of agriculture resistance to pests and diseases that affect the crop, and help them get on pesticides is harmful to the environment to do so. 2- Increasing of sugar production through the expansion of sugar crops, particularly sugar beet to the lack of water needs compared to sugar cane harvest in the new land. 3- Increasing of sugar productivity crops through dissemination of sugar varieties of high productivity and to suit every center of administrative centers in Egypt. 4- Rationalizing the consumption of sugar during dismiss the size of the loss of sugar. 5- to achieve food security has to be the need to develop awareness programs for the application of planning policy breeds where it is one of the most important determinants of the demand for i Egyptian imports of sugar. 6- it is important to put a national strategy to increase the self-sufficiency ratio of sugar with the need to import and distribute the amounts of diversification between different sources in order to avoid what might happen from political pressure in favor of the Egyptian economy is in the case of international political conditions change. 7- It is necessary to study the reduction commitments of support granted to the production and export in the sugar-exporting countries in order to reduce the negative effects on the Egyptian Saving.

Keywords: Food gap, Food security, Sugar, Egypt

INTRODUCTION

The food problem is considered one of the main problems facing the majority of developing countries, including Egypt, and the food gap still absorbs the largest part of the income of the majority of these countries, which results in obstructing their development plans. Food security is also considered one of the most important issues of national security, as it is an issue with multiple aspects, closely related to a number of different sectors and institutions in the country, but it is mainly related to the agricultural sector, and then makes agricultural development more food production, especially in light of the limited resources Natural, continued population increase, and then increased demand for food.

Egypt suffers from a low food security situation and an inability to achieve self-sufficiency, especially from the most important strategic crops, while agricultural development does not give sufficient attention to increasing the domestic supply of foodstuffs, and relying on imports to provide many of these strategic commodities such as wheat, sugar, edible oils, and meat of all kinds.

Sugar considers from one of most important food commodities and basic strategy that follows wheat in consumer important in Egypt as it is one of the commodities relatively cheap source of energy, which impair the attention of Egyptian agricultural policy-makers, has become the food security of major food crops in general and sugar in particular target nationally for its association with aspects of political, economic and social development, especially in light of globalization. Reflected the importance of sugar as a strategy commodity on the movement of international trade and the threat of particular importance to the balance of payments in developing countries, and the production of sugar in the world depends on two main crops,

sugar cane and sugar beets, according to figures during the period of study (2008- 2020) the average of amount sugar production in Egypt is about 2.36 million tons, sugar cane crop contributes about 1.21 million tons, representing approximately 51.07% of the total sugar production, while sugar beet crop contributes about 1.15 million tons, representing approximately 48.93% of the total production, while the total consumption of sugar is about 3.3 million tons, and up the food gap of sugar is about 1.07 million tons, the self-sufficiency rate of about 67.58% and the average per capita consumption of sugar is about 31.7 kg per year (www.capmas.gov.eg.).

The research problem is that despite the increase achieved in the production of sugar crops in Egypt from the development and modernization of farming methods, however there are still a gap between sugar production and consumption was estimated at 1233 thousand tons during the previous period, and the amount of sugar imported about 1193 thousand tons with value of about \$ 2482 million during the previous period (Ministry of Agriculture and land reclamation, sugar Crops Council, the annual report of crops sugary and sugar production in Egypt, reports (2008-2020). Due to limited farmland and water resources in Egypt at a time of increasing aggregate demand on sugar as a result of the increase in population and increasing level of income which would entail an increase of the food gap of sugar, which is the inability of the domestic production of sugar to meet the needs of local consumer of it, and are covered by this sugar gap through sugar imports, which negatively affects the Egyptian agricultural trade balance which has been suffering from a negative imbalance since the seventies of the last century and then Egyptian balance of payments. The main objective of this research is studying some economic aspects of sugar as a strategic crop in Egypt, these objectives can achieve by achieving the following objectives :

- 1- Studying of some economic indicators of sugar in Egypt during the period (2008-2020) .
- 2- Estimating the size of the food gap of sugar and knowledge of the most important factors responsible on it .
- 3- Studying of the most important indicators of food security for sugar in Egypt .
- 4- Studying of policies and means to achieve food security of sugar in Egypt.

The research based on each of the statistic descriptive and quantitative analysis represented in the estimation of some model's directivity of economic variables in question in its linear models, as well as the method was used multiple regression analysis to determine the most important factors responsible for the size of the sugar gap, the use of certain economic indicators to measure the impact of factors affecting the coefficient of food security of sugar in Egypt. The research depends on secondary data published in different bulletin of agricultural economy issued by the Ministry of Agriculture and land reclamation, and the annual reports of the various sugar production for the Sugar Crops Council, and the Central Agency for Public Mobilization and Statistics, as well as bulletins of the United Nations Food and Agriculture Organization (FAO) and ITC calculations based on UN COMTRADE statistics_were used, also some research and scientific communications and some foreign references associated with the subject of the search, as well as the use of the Internet to get the international information related to the search.

RESEARCH RESULTS AND DISCUSSION

First- The Statistical Analysis of Some Economic Indicators of Sugar in Egypt During the Period (2008-2020)

A study of some economic indicators like the total domestic production of sugar, domestic consumption, and the average per capita consumption, the amount of sugar imports, food gap of sugar, the price of Egyptian imports of sugar and periods of coverage of domestic production and the quantity of imports for consumption daily from sugar can explain as follow: -

Sugar Production:

Sugar production in Egypt includes both sugar cane and sugar beet, and sugar production fluctuated from a minimum of approximately 1851 thousand tons in 2008 and a maximum of around 2712 thousand tons in 2019 with an annual average of about 2334 thousand. tons during the study period (2008-2020).

Domestic Consumption of Sugar:

Sugar consumption fluctuated from a minimum of approximately 2992 thousand tons in 2009 and a maximum of around 3548 thousand tons in 2020 with an annual average of about 3215 thousand. tons during the study period (2008-2020). If coupled with the passage of time to grow steady in the population, this will lead to a steady increase in the consumption needs of sugar in various forms

Per capita Consumption of Sugar:

Per capita consumption of sugar in Egypt ranged between a minimum of approximately 32.5 kg per capita in 2017 and a maximum of around 41.2 kg per capita in 2008 with an annual average rate of about 35.9 kg per capita during the study period (2008-2020).

Egyptian Sugar Imports:

The problem of increasing Egyptian sugar imports considers from the fundamental problems facing the Egyptian economy because of its negative effects on Egyptian agricultural trade balance and then Egyptian balance of payments, especially in light of increased prices of imports of sugar in the world market, it which requires expansion in the cultivation of sugar crops in Egypt, but that the policy of horizontal development facing several difficulties, most notably the great competition between the area of sugar crops and the rest of other agricultural crops on the farmland, and sugar cane crops needs more water resources per feddan¹ reached about (13,000 - 15,000) m³ of irrigation water. The Egyptian sugar imports have an important role to cover the gap between domestic production and the consumer needs of sugar. Table (1) shows that the sugar imports ranged from a minimum of approximately 776 thousand tons in 2013 to a maximum of approximately 1075 thousand tons in 2010 with an annual average of about 981 thousand tons during the study period.

Egyptian Price Imports of Sugar:

Egyptian price imports of sugar is particularly important as the increasing negative impact on Egyptian agricultural trade balance and then Egyptian balance of payments, and review the data in table (II) shows that the Egyptian price imports of sugar ranged between a low of about \$ 298 per ton in 2008 and a maximum of around \$ 1230 per ton in 2020 with an average annual

¹ Feddann = 0.42 hectar

rate of about \$ 840.3 per ton, and the Egyptian price imports of sugar took a general trend morally statistically significant at 1% and total amount of the annual increase of about \$ 73.5 per ton.

The Sugar Food Gap in Egypt:

With respect to sugar gap, the beginning of the sugar gap in Egypt began with the beginning of the open-door policy in 1974 and the subsequent increase in income level classes of Egyptian people and this policy characterized as a consumer policy. The sugar food gap in the inability of the domestic production of sugar to cover the consumer needs it, for that gap, it is considered from the most important problems faced by Egyptian planners and policy economic makers because sugar is one of the strategic commodities in the world market, especially after the direction to be used in the production of biofuels, and for this it must identify how the possibility of achieving self-sufficiency ratio of sugar to study the size of sugar gap and the factors influencing them to determine the extent of the possibility of reducing the sugar gap in the future period. Table (II) shows that the Egyptian sugar food gap ranged between a minimum of approximately 526 thousand tons in 2016 to a maximum of approximately 1234 thousand tons in 2008 with an annual average rate of about 857 thousand tons.

The Sugar Self-Sufficiency in Egypt:

It is clear from data of table (II) that the rate of self-sufficiency of sugar at the level of Egypt during the average period (2008-2020) amounted to about 73% with a minimum of about 60% in 2008 and with a maximum the highest amounted to about 82.48% in 2016. By estimating the general time trend of the development of the rate of self-sufficiency of sugar in Egypt during the previous period, it was found that the rate of self-sufficiency increased annually with about 3.1%, it represents about 4.25% of the average, and this increase is statistically significant at 5% level of significance during the study period.

Table (I): Evolution of imports, coverage periods of local production and imports daily consumption of sugar in Egypt during the period (2008 - 2020)

Year	Production (10 ³ tons)	Imports (10 ³ tons)	Consumption (10 ³ tons)	Coverage period / day			Total period (2+3)	Capita consumption kg
				Daily local consumption (1)	Local production for consumption (2)	Imports for consumption (3)		
2008	1851	1062	3285	9000	205.7	118	323.7	41.2
2009	1889	1020	2992	8197.3	230.5	124.4	354.9	36.8
2010	2269	1075	3033	8309.6	273.1	129.3	402.4	36.6
2011	2177	1044	3164	8668.5	251.2	120.4	383.2	37.4
2012	2271	1029	3178	8706.8	260.9	118.1	371.6	36.7
2013	2278	776	3268	8953.4	254.4	86.6	341	36.9
2014	2284	869	3315	9082.2	251.5	95.6	347.1	36.7
2015	2666	937	3281	8989.1	296.6	104.2	400.8	35.5
2016	2476	985	3002	8224.7	301.1	119.7	420.8	33.2
2017	2517	1011	3135	8589	293.1	117.7	410.8	32.5
2018	2417	1020	3272	8964.4	269.9	113.7	383.6	33.2
2019	2712	967	3516	9632.8	281.6	100.4	382	35
2020	2540	956	3548	9720.5	261.3	98.4	359.7	34.7

Annual average	2334	981	3215	8849.1	266.5	111.3	375.51	35.9
Min. limit	1851	776	2992	8197.30	205.7	86.6	323.7	32.5
Maxi. limit	2712	1075	3548	9720.50	301.1	129.3	420.8	41.2
Amount of change	58.57**	Non sig.	25.98*	71.17*	4.53**	Non sig.	Non sig.	-0.47**
Rate of change %	2.6**	Non sig.	0.8*	0.8*	1.8**	Non sig.	Non sig.	-1.3**

(1) Daily domestic consumption = domestic consumption / number of days per year.

(2) The period of coverage of local production to daily consumption = domestic production / daily domestic consumption.

(3) The import coverage daily consumption = quantity of imports / domestic consumption daily.

** : Significant at 0.01 level * : Significant at 0.05 level

Source: Compiled and calculated from

(1) The Central Agency for Public Mobilization and Statistics www.capmas.gov.eg.

(2) Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, central administration agricultural economy, food balance Egypt, different volumes.

(3) www.faostat.org

Second- Determinants of Egyptian Sugar Food Gap

The sugar food gap determines by production and domestic consumption which covers much of the imports par with it, and assumed that the change in production will Aikunlh negative impact reverse direction on the amount of imports from the country, while the effect of the change in consumption will have a positive effect in the same direction, as can be theoretically, the variable of Egyptian price imports of sugar as one of the determinants of that gap and is supposed to be a negative impact on that gap.

Standard Estimation for The Most Important Variables Specific to The Sugar Food Gap:

To study and measure the impact of some of the variables specific to the sugar food gap was estimated relationship between the amount of the gap of sugar (thousand tons) as the dependent variable, and all of the domestic production of sugar (X_1) (thousand tons), and consumption (X_2) (10^3 tons), the average real price of Egyptian imports of sugar (X_3) (\$ / ton), the annual average per capita consumption of sugar (X_4) (kg) , during the study period (2008-2020) and found that the best mathematical model reflects that relationship is the following equation:

$$Y = 89.41 - 0.839 X_1 + 0.85 X_2$$

$$(-15.88) ** \{10.34\} **$$

$$F = 131.04 \quad R^2 = 0.96$$

It is clear from the above equation that the impact of each of X_1 and X_2 on sugar gap be negative as the change in the amount of domestic production of sugar by 1% will lead to a change rate of 8.3% in the amount of that gap in the opposite direction, and the change in the average consumption of sugar by 1% leads to a change by 8.5% in the amount of that gap in the opposite direction.

Table (II): Development of production, consumption, sugar gap and Egyptian price import during the period (2008 – 2019)

Year	Production (10 ³ tons)	Consumption (10 ³ tons)	Gap (10 ³ tons)	Price imports (\$/ton)	Self-sufficiency %
2008	1851	3285	1234	298	60
2009	1889	2992	1103	385	36.14
2010	2269	3033	764	503	74.81
2011	2177	3164	987	701	68.81
2012	2271	3178	907	768	72.46
2013	2278	3268	990	823	69.71
2014	2584	3315	731	882	77.95
2015	2666	3281	615	1024	81.26
2016	2476	3002	526	1058	82.48
2017	2517	3135	618	1069	80.29
2018	2417	3272	855	1078	73.87
2019	2712	3516	804	1105	77.13
2020	2540	3548	1008	1230	71.59
Annual average	2358	3215	857	840.3	73
Min. limit	1851	2992	526	298	60
Maxi. limit	2712	3548	1234	1230	82.48
Amount of change	58.57**	25.98*	-0.47**	73.5**	1.85**
Rate of change %	2.6**	0.8*	-1.3**	10.4**	3.1*

Source: Compiled and calculated from:

(1) Central Agency for Public Mobilization and Statistics www.capmas.gov.eg

(2) Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, central administration agricultural economy, food balance Egypt, different volumes.

(3) ITC calculations based on UN COMTRADE statistics.

Third- Egyptian Food Security of Sugar

Growing interest in the topic of food security in most parts of the world is necessary which suffers from a gap between production and consumption of major food commodities that may be caused by variables such as the continued increase in the number of population and increasing individual income levels, and the inability of the agricultural resources in those countries on the production enough of those commodities to meet these numbers of the population, in addition to the increase in food prices in the world markets, leading to higher prices in local markets have imported.

It should be noted that the concentration of agricultural production surplus, food has a limited number of developed countries in North America, Europe, and the direction of those countries to be regarded as surplus food a strategic nuclear weapons to impose political trends for these countries to other importing countries it makes the problem of providing food a major factor in achieving the national security of those importing the largest countries amount of food, which means that provides the ability to buy food from the world surplus does not necessarily mean access it easily, and therefore, food security has become a key component of national security .

The interest of food security issues was increased after the application and implementation of the WTO agreements, especially the Agreement on Agriculture and the related cancellation subsidy producers and consumers of food, as well as the elimination of export subsidies of food and convert all quantitative restrictions in trade restrictions which has led to an increase the value of imports for a large number of food commodities .

This section deals with an overview of the most important indicators of sugar food security in Egypt. This is done through the review and analysis of the period of coverage of all domestic production of Egyptian and Egyptian imports annually for national consumption of sugar, as well as to estimate the coefficient of food security for the period covered by statistical analysis research (2008-2020), and then a review of some aspects of the policies and the means to achieve the Egyptian food security of sugar as a top priority for its association with the lives of all Egyptians people, because the most important one of the main sources for cheap energy .

Concepts of Food Security:

There are many concepts of food security as a result of the divergence of the view of its authors, and although the term food security is newly used, it receives the greatest interest from international organizations, experts and researchers. The following are the most important definitions of food security:

Definition of the Food and Agriculture Organization of the United Nations (FAO):

Food security is available when all people at all times have physical, social and economic opportunities to obtain sufficient, safe and nutritious food that meets their nutritional needs and tastes and ensures that they lead a healthy and active life.

It is noticeable in this definition that it moved away from the traditional concept of food security, which is the ability of the country to secure the foodstuffs necessary to feed the population and meet the basic necessary needs for human growth and survival in good health, and that there must be a stock of food that can be used in the event of natural disasters that reduce production Foodstuffs or in the event that the country is unable to obtain foodstuffs by import from abroad, where the definition is associated with the term self-sufficiency, that is, reliance on local resources to secure the basic needs of food for the population.

Definition of the Arab Organization for Agricultural Development (AOAD):

Food security means providing food in the quantities and qualities necessary for activity and health on an ongoing basis, and for every member of the population, depending on local production first and on the basis of the comparative advantage of producing food commodities for each country and making it available to all members of the population at prices that are commensurate with their income and financial capabilities. In addition to this definition, the organization focuses in its strategy on achieving sufficient food stocks in exceptional cases such as difficult natural conditions and political and military tension. Strategic stocks mean the ability of the state to provide basic food needs for all members of society, and ensure a minimum level in those needs on a regular basis, which means the volume of consumption necessary to maintain human life.

However, the condition of comparative advantage adopted by the organization in its definition cannot be generalized in practice, because some countries do not have a comparative advantage

in the production of some commodities, but they have produced and developed them through following an agricultural policy that depends on increasing support to farmers, in addition to using advanced technology and following a protectionist policy. For its agricultural commodities, and among these countries is Japan, which does not have a comparative advantage in the production of rice, but it produced it in order to preserve its political security for the Japanese citizen.

Definition of the World Bank:

The World Bank defined food security as the possibility of all people at all times having access to sufficient food necessary for their activity and health, and food security for a country is achieved when this country, with its marketing and commercial system, is able to supply all citizens with sufficient food at all times and even in times of crisis such as times of Low domestic production and disruption of international market conditions (). The definition of the World Bank is based on four foundations:

- 1- The physical basis: which is related to individuals obtaining an amount of food sufficient to carry out their activities in daily life and in a way that preserves their health.
- 2- The comprehensive basis: which is related to applying the previous basis to all citizens in society, regardless of their financial or purchasing capabilities.
- 3- The temporal basis: which is related to the access of individuals to food at all times, especially in times of crises, which include a decrease in domestic production or disruption of the conditions of international markets in the trade of food commodities
- 4- The source of obtaining food: In this regard, the definition did not stipulate a local or international source for obtaining food, but rather stipulated the ability of the local marketing system and the foreign trade system to provide food for all regions, including remote ones.

Food security has also been defined as the easy and regular access of every person to safe and sufficient food that allows him to enjoy an active life.

From the previous definitions, it is clear to us the importance of the time element in relation to food security, i.e. the necessity of providing food at all times, as well as the quantity and quality of food that is required to be achieved, and therefore to achieve food security, healthy food must be provided continuously, in addition to the necessity of matching the price of food with the capabilities available to the population, as It can be said that the concept of food security should be based on three pillars:

- Availability of food commodities in good quantity and quality.
- The presence of food commodities in the market permanently.
- That the prices of commodities be within the reach of citizens.

The concept of food security and how to achieve it has captured the interests of all developing countries, as the exacerbation of the food problem has led to an increase in the burden on the balances of those countries, forcing them to allocate a significant part of their hard currency assets to importing food commodities. Two levels of food security can be distinguished:

- 1- Absolute food security:** This means food production within the country equal to or greater than domestic demand. This level is synonymous with complete self-sufficiency and is also known as self-food security.

- 2- **Relative food security:** It means the ability of the state to provide commodities and foodstuffs in whole or in part and to ensure the minimum of those needs regularly by importing from abroad, and this is achieved by ensuring the availability of Sufficient food supply and the stability of this supply without fluctuations.

In order for the food security of the state to be achieved, there must be a stock of foodstuffs that can be used in the event of natural disasters that reduce food production, or in the event that the country cannot obtain foodstuffs through imports from abroad. Two cases of food security can be distinguished:

1. **Chronic Food Insecurity:** It is a continuous picture of the inability to obtain food, and the cost of this situation rises at the level of the country that suffers from it, where diseases and epidemics are exposed, and the roots of the chronic food security problem are due to the lack of resources to produce or obtain food.
2. **Transitory Food Insecurity:** It is a state of temporary decline in the ability of the state to obtain food as a result of the instability of food production and prices, and the extreme form of this situation is famine.

Factors Affecting the Achievement of Food Security:

There are many factors influencing the achievement of food security, and their importance may vary from one country to another depending on the specificity of that factor influencing the achievement of food security. In general, these factors can be divided into two main types:

1. **Internal factors:** They are those factors related to the country or the national economy that can achieve its distinction from other countries, and these factors are as follows:
 - A. **Natural factors:** They are the factors of climate, land and water, and they constitute the main pillar of food security. At the level of some countries, the climate is described as high temperature in most months of the year, and drought prevails in most lands, where the desert climate prevails over these lands.
 - B. **Human resources:** Population growth is one of the most important factors influencing the issue of food security, as it puts pressure on natural resources, which is reflected in negative ways that lead to drought, pollution, energy crisis, lack of food, high prices and famine.
 - C. **Scientific research in the field of agriculture:** Scientific research in the field of agriculture aims to improve agricultural production and choose the best and most economical methods of production in proportion to the conditions and nature of the country. Traditional varieties are more tolerant to drought and salinity.
 - D. **Agricultural investment:** The agricultural sector suffers in general from weak investments directed to it compared to other sectors such as the industrial sector, and of course the weakness in this investment direction will negatively affect the achievement of food security in such countries.
2. **External factors:**
 - A. **Transformations in the global system:** Major changes took place in the economic systems in the world during a period extending to two decades. The growth of agriculture in some countries, with which economic agreements are linked, became difficult to implement later.
 - B. **Global economic inflation:** It has become one of the features of the new era is the rise in prices and the decline in purchasing power as a result of inflation occurring in

the economies of different countries of the world, and this has negatively affected investment opportunities in the agricultural sector and the development of these investments in an escalating manner, as a result of the concern of investors of the economic feasibility achieved in light of the acceleration in economic inflation.

- C. The growth of economic blocs:** The idea of economic blocs has taken on a wide range at the present time, especially in the field of applying the free trade area, the European Common Market and other world economic blocs and agreements, which paved the way for developed countries to directly dominate the economies of countries less able to develop and keep pace with technology. achieved in the field of agricultural production, and thus these countries became less able to achieve food security because they became more hidden than productive.

The concept of food security is linked to the concept of sustainable food security, which will be clarified as follows:

Definition of Sustainable Food Security:

The term food security appeared in a new formula that keeps pace with the current changes, as food security became required to be sustainable, by considering the economic, social and environmental aspects, considering the right of future generations by ensuring a minimum level of healthy food on a regular basis for the current and future generations

In the field of food, sustainable food security is defined as providing suitable food for current generations in ways that do not prevent future generations from enjoying a similar or better amount of food. Reliance on productive and continuous natural resources, as the challenge facing governments and producers is to increase agricultural productivity, and then ensure food security while enhancing the productive capacity of resources in a continuous manner.

Therefore, sustainable food security is the provision of safe and healthy food for current generations without losing the right of future generations to obtain the same level or better food, which means ensuring the provision of food needs for the ever-increasing population, and therefore sustainable food security must be considered within a dynamic framework that reflects the relationship between the population always growing, and their needs for food.

Dimensions and Strategies of Sustainable Food Security:

In view of the importance of sustainable food security, and the pivotal role it plays in achieving the well-being and stability of different peoples, we find that it has complex dimensions, so it is necessary to know and define the various strategies to achieve it.

Dimensions of Sustainable Food Security:

According to the different definitions that have been presented about sustainable food security, we find that its concept includes several dimensions, the most important of which are as follows:

- A. The time dimension:** Any country that enjoys food security can cover its needs continuously, whether in the short or long term, according to the time dimension.
- B. Quantitative dimension:** It means that the consumer gets the right amount of materials and nutrients, which covers his needs in the quantitative sense according to the individual needs of energy and nutrients.

- C. The qualitative dimension:** In addition to the quantitative dimension, food security for consumers is not complete without providing the qualitative dimension as well, i.e. the consumer's access to food of a certain quality and quality, and the quality is linked to the source and diversity of food, whether of plant or animal origins.
- D. The economic dimension:** Even if the required food is always available in the required quantities and quality, we cannot say that it provides sustainable food security unless people are able to access food supported by purchasing power that actually enables them to obtain food and eat it at all times. Therefore, sufficient income that guarantees the consumer obtaining the required food is an essential pillar of sustainable food security.
- E. The social and political dimension:** This dimension is represented in highlighting the importance of food as one of the human rights, and therefore achieving sustainable food security represents the other side of the right to food, and focus must be placed on the necessity of providing a subsistence level of food for every member of society, so that his life continues in a healthy and active manner. Whereas the lack of a subsistence level of food in the community, and the inequity of its distribution among the members of the community, must contribute to the lack of social stability within the state. It also has an important role in bringing about political stability, as the occurrence of a food shortage, especially in essential commodities, may lead to a direct threat to the lives of individuals, which means a threat to the stability of the internal security of the state, as food has become one of the economic weapons that are used as a method of political influence.
- F. The environmental dimension:** The environmental dimension is considered one of the most important dimensions of sustainable food security. Sustainable food security requires the production of food in sufficient and nutritious quantity and good quality, and the possibility of obtaining it at all times in various capacities, while preserving the resources on which it depends and reducing its environmental impacts, through Preparing good programs to preserve the environment and prevent its destruction through inappropriate agricultural policies.

It is known that many countries use chemicals to improve and increase production, but despite their effectiveness, they have significant side effects on the environment, so the use of natural methods must be encouraged, by making radical changes in public policies that encourage the use of pesticides and chemical fertilizers and the use of Instead of natural methods, there must be legislation and research that proposes a strategy aimed at reducing the use of chemicals.

Determinants of Sustainable Food Security:

The sustainable food security must have major determinants, and these determinants are as follows:

- Providing food regularly and ensuring access to it at all times, by providing the infrastructure to ensure that it reaches all regions, in addition to price stability and providing appropriate income to obtain it at all times.
- The food should be of good quality, that is, healthy and meet the nutritional needs of individuals, and the environmental aspect must be taken into account through the rational use of the available resources when producing it, and the use of advanced technology to reduce its effects on the environment, and the inclusion of environmental awareness in the educational system.

- All members of society must be given the opportunity to obtain food of good quality, and food must be culturally appropriate, i.e., compatible with the customs and traditions of society.

Sustainable food security is achieved by continuing to increase productivity, expanding the cultivated area, continuous searching for and maintaining import sources, increasing the quantities imported from them, and continuing to raise the efficiency of resource production. All these factors combined lead to providing food for the population while providing part of it to raise the strategic stock of commodities. The main reason for the continued flow of food to catch up with the growing demand of the population, which also leads to an increase in the food security coefficient of these commodities.

The Most Important Indicators of Egyptian Food Security of Sugar:

This part of the study deals the most important indicators of food security for sugar in Egypt during the study period (2008-2020) to calculate the coefficient of food security for sugar commodity, which is represented in each of the Egyptian production of sugar, which is about 2.54 million tons in 2020, domestic consumption of approximately 3.55 million tons in 2020, and leads to the fact that the average per capita consumption of sugar approximately 34.7 kg a year, and the consequences of that the sugar gap is nearly 1.01 million tons in 2020.

The length of the period of cover production and decrease the period of coverage of imports for the national consumption which consider good step indicate the direction to achieve food security somewhat, and that indicates a reduced reliance on imports from abroad .

1. **Egyptian daily consumption of sugar:** Table (I) showed the Egyptian daily consumption of sugar during the period (2008-2020) that ranges from a minimum of about 8197.3 thousand tons in 2009 and a maximum of about 9720.5 thousand tons in 2020 with an annual average rate of nearly 8849.1 thousand tons during the study period and the Egyptian daily consumption of sugar took a general trend upward statistically significant at the 5% which estimated at 71.17 tons, representing about 0.80% of the annual average of the Egyptian daily consumption of sugar.
2. **The period of cover Egyptian production to daily consumption of sugar:** This period knows as a period which can be covered by the Egyptian production of sugar for the needs of daily food for the population, and can be seen reviewing a period during the years (2008-20) it ranges from a minimum of about 205.7 days in 2008 and a maximum of about 301.1 days in 2016 with an annual average rate of about 266.5 days table (I). The decrease of the period of cover Egyptian production to daily consumption of sugar is due to increase the rate of annual growth in national consumption of sugar during the study period.
3. **The period of cover of Egyptian imports for daily consumption of sugar:** This period knows as the period which can cover the annual import of sugar to daily nutritional needs of the population, which can be seen during the review period (2008-2020), they range from a minimum of about 86.6 days in 2013 and a maximum of about 129.3 days in 2010 with an annual average rate of approximately 111.3 days during the study period -Table (I).

Fourth - Determination of Egyptian Strategic Stock from Sugar

The strategic stock for a commodity knows that the quantities held by the government and the private sector to meet the expected demand for domestic and export on this item during a future period of time. The management and organization of the strategic stock is affected by a number of factors, the most important of which are the two periods of adequacy of production and coverage of imports for local consumption, and the temporal and spatial consumption differences and the conditions of the world market for the commodity.

It is estimated that the strategic stock during a certain time period that the outcome of the entire surplus directed to the development of the strategic stock in some years and the amount of the deficit, which is withdrawn from inventory during the other years, which shows the deficit in domestic consumption. That is maintaining a strategic stock of sugar of the most important considerations of Egyptian national food security. Strategic stock is configured through domestic production or through imports or both. It turns review the amount of Egyptian strategic stock from sugar during the period (2008-2020) that up to approximately **2030.7** thousand tons, and this is sufficient for the consumption of about 229.5 days, or about 7.64 months, which necessitates the need to increase the size of the stock at about 3189.6 thousand tons of sugar to enough for domestic consumption for 12 months or about 1594.7 thousand tons of sugar for 6 months conformable to Egyptian national food security considerations - (Table III).

Surplus and Deficit in the Consumption of Sugar Allocated for The Egyptian National During the Study Period (2008-2020):

Reviewing a surplus and the deficit in the Egyptian national consumption of sugar allocated during the study period (2008-2020), through calculated by the following equation (the sum of two terms insufficient production and imports - 365) * daily consumption) and therefore no surplus through for the years of 2008, 2009, 2013, 2014, 2020. It turns reviewing a surplus in the sugar allocated for the Egyptian national consumption during the study period that ranges from a minimum of about 57.5 tons in 2012 and a maximum of about 458.9 thousand tons in 2016, and this surplus directed to the development of the strategic stock in some years, which shows where the deficit, which is withdrawn from the stock during the other years 2010, 2011, 2012, 2015, 2016, 2017, 2018, 2019, and the deficit of sugar allocated for the Egyptian national consumption of the during the period. The study estimated at 98.6 thousand tons, or about 11.43 days, and this deficit will be covered during the years of deficit either by drawing from strategic reserves or import sugar from abroad - Table (III).

Coefficient of Food Security for Sugar in Egypt During the Study Period (2008-2020):

The value of coefficient of food security for sugar in Egypt fluctuates between zero and one, and the closer the value of zero indicates that the decline in the rate of food security and the closer the value of one, the higher the achievement rate food security for sugar, and calculated coefficient of food security as the ratio of strategic stock to the national consumption of sugar, and as the strategic stock of sugar is estimated at 1.15 million tons and the average national consumption of sugar is estimated at 2.17 million tons during the study period (2008-2020) with an annual average during that period, therefore, coefficient of sugar food security estimated at about 0.37, therefore it requires to take various actions that would lead to increase the size of the sugar strategic stock to enough half of it needs for domestic consumption even come close to the value of coefficient of food security, from suitable position - (Table III).

Table (III) - Period of the adequacy of the surplus and the deficit of sugar allocated for Egyptian daily domestic consumption during the period (2008-2020)

Year	Surplus		Deficit		Strategic stock 10 ³ ton	Coefficient of food security
	Quantity)10 ³ ton(	Period adequacy surplus in daily domestic consumption	Quantity)10 ³ ton(	Period deficit in sugar allocated for daily domestic consumption		
2008	-	-	371.7	41.3	-371.7	-0.11
2009	-	-	82.7	10.1	-82.7	-0.02
2010	310.8	37.4	-	-	310.8	0.10
2011	157.8	18.2	-	-	157.8	0.05
2012	57.5	6.6	-	-	57.5	0.02
2013	-	-	214.9	24	-214.9	-0.07
2014	-	-	162.6	17.9	-162.6	-0.05
2015	321.8	35.8	-	-	321.8	0.10
2016	458.9	55.8	-	-	458.9	0.14
2017	393.4	45.8	-	-	393.4	0.12
2018	166.7	18.6	-	-	166.7	0.05
2019	163.8	17	-	-	163.8	0.05
2020	-	-	51.5	5.3	-51.5	-0.01
Total	2030.7	235.2	883.4	98.6	1147.3	0.37

Surplus = (sum of two terms insufficient production and imports -365) * daily consumption.

Deficit = (365 - sum of two terms insufficient production and imports) * daily consumption. Source: Collected and calculated from table (I).

Fifth - Policies and Means to Achieve Sugar Food Security in Egypt

During the past decades, many attempts to achieve an appropriate rate for agricultural development in Egypt, which included inventory and Reclamation then farming new land and decide what grants to them from field crops and horticulture, as well as follow the identification of ways to service the occasion, and the provision of strains of high-yield resistance to climatic conditions in various regions of Egypt. It was the establishment of irrigation systems of high efficiency reaches a total length of 40 thousand kilometers, stretching from Lake Nasser in front of the High Dam to the fields of the valley and delta of the total floor area of about 8.3 million feddans of the crop of about 15 million feddans, and in spite of all these efforts, it has exacerbated the problem declined Egyptian food security in general as the inability of GDP to meet the needs of a growing population year after year, and was a major import foodstuffs including wheat, beans, oil, sugar, maize, animal feed Levantine quantities exceeded 50% of total consumption. The following is a review can be the most important means to achieve food security policies of Egyptian sugar as one of the most important problems of food security in Egypt is related to the daily consumption of each population. This can be achieved food security of the Egyptian sugar through the following policies:

Horizontal Agricultural Development Policy:

It includes direction of the new areas for the cultivation of sugar crops by reclaiming arable land with the provision of water resources additional necessary in order to achieve food security, especially in the land under the reform like the land-Salam Canal, which has an area of about

620 thousand feddans, of which 400 thousand feddans in the Sinai, a large part of them fit for cultivation immediately, as well as the territory of North Coast, which can exploit the rainy season in the winter, except for the month of April, as well as the land area of about 540 thousand feddans in Toshka, as well as another area in east Owaynat of about 250 thousand acres, in addition to the approximately 400 feddans of arable in Aswan as well as about 500 feddans are planted in Egypt annually pulp any that can be added about two million feddans of the patch can be allocated, including part of the cultivation of sugar crops and thus could approach the great eye of the sufficiency from Egyptian needs from that strategy commodity with an annual average consumption of which about 2.17 million tons during the period (1995-2012).

Vertical Agricultural Development Policy:

This is done by continuing to devise new varieties of early sugar crops in maturity and resistance to diseases and other pests and resistant to stress environmental characterized by an increase of the yield per feddan compare with old varieties to be replaced, to be accompanied by the provision of production inputs at appropriate times, like most of the good seed of improved varieties developed especially for fertilizers, especially nitrogenous taking into account the direct agricultural extension of the farmers on how to use it with suitable prices for these inputs.

It should be noted that it could be reconsidered in the compositions cropping current to increase the acreage under sugar crops without affecting other crops through the development of early maturing varieties able to punish the cultivation of another crop after sugar crops, as well as the establishment of agricultural extension in turn encourage and educate farmers attention to agriculture, including achieve higher production and motivate them using the methods of modern technology of irrigation systems and methods of service and care for the crops to maintain high productivity. The role of agricultural extension in vertical agricultural development by educating farmers on the use of modern technological methods as well as the use of deep plowing instead of plowing the traditional because it helps to distribute the water in a way to help increase the percentage of germination and the style of the traditional irrigation became big in the amount of water because the sugar cane crop needs a large amount of water in the cultivation and therefore must be the direction of sprinkler irrigation and thus increases the amount of output diabetes.

Policy of Rationalizing the Consumption of Sugar:

The Egyptian policy of rationalizing the consumption of sugar and organization, provided that appropriate of the most important policies that are consistent with international standards of health, which may result in a decrease in the size of the Egyptian consumer of sugar gap because the per capita consumption of the most important factors influencing the sugar gap, and requires directing a great deal of awareness and guidance of government directed the Egyptian people to raise the level of per capita consumption in order to reduce the average consumption of sugar and work to address the ignorance of food found in Egyptian society to improve per capita consumption of sugar.

Policy of Consumer Subsidy of Sugar:

The consumer subsidy of sugar considers from the most important factors that have a positive impact in the increase in the average per capita consumption of sugar may be due to an increase

in the amount of the total demand for subsidized goods to lower their price and cheap source of energy, something that would increase the consumption of sugar at rates greater than the increase in the local production of it and thus increase the amount of sugar imports to cover this sugar gap, which adversely affects the Egyptian balance of trade and then balance of payments which led to follow the Egyptian government's policy of deficit financing and increase the amount of the total payment methods which not commensurate with the total increase in the gross national product which resulted in increased inflation problem as a result of an increase in aggregate demand at a rate faster than the increase in total supply.

Policy of Diversification of Sugar Imports Sources:

It includes all the arrangements followed by the state which needed to control and regulate imported annually to achieve the provision of sugar commodity and achieve the national food security, which have an impact on the overall development and increased investment in the fields of agricultural, industrial and tourism which lead in turn, to increase the national income and the strengthening of the national economy and achieve of raise the standard living for all Egyptian people. The statistics data show that Egypt was self-sufficient of sugar until 1973, but as a result of environmental conditions unsuitable happened deficit in domestic production of sugar has been unable to meet the particular needs of consumer and then resort to sugar imports to solve this deficit which athrip upon the existence of a deficit in Egyptian agricultural trade balance and then a deficit in the Egyptian balance of payments where bears Egypt most of the value paid in the import process in foreign currency (American dollar and Euro), in addition to targeted subsidies annually for sugar to the category of low-income people, which represents a large proportion of members of the Egyptian people through ration cards, and getting this problem difficult in light of the trend increasing world sugar prices due to the entry of sugar in the production of biofuels from sugar crops, which negatively affects staffed offered sugar that go into the food industry, which leads to the increase in the price of sugar imports and the consequent of a deficit in the Egyptian balance of payments.

It should be noted that it is expected that a significant increase in the quantity of sugar imports in the coming years - if it is not the expansion of sugar production in Egypt - and because the system import of sugar in Egypt is subject to the phenomenon of geographical focus as Egypt depends on imports of sugar cane and sugar beet on six countries mainly are Brazil, Australia, Cuba, India, France and Germany and those countries controlled most of the international market for sugar and thus on prices and routes to export, in addition to the implementation of the convention and the establishment of the World Trade Organization is expected to result in a future increase in the prices of most food commodities, including sugar, which requires the development of a national strategy to increase the self-sufficiency ratio of sugar with the need to distribute the amounts of import and diversification among various sources in order to avoid what might happen from political pressure not to be in favor of the Egyptian economy in the event of changed circumstances the international political; this is because the dependence on these markets in the provision of sugar consumer needs makes it susceptible to numerous global risks that occur in the world food markets or those related to potential climate change at the world level or local. It also requires the need to study the obligations of reduction of subsidies granted to the production and export in the countries exporting sugar in order to reduce the negative effects on Egyptian economy, and studying the application of the free policy to import sugar through studying the prices of exported in different countries, which might be characterized as heterogeneous as a result of differing results of reduction of subsidies in each

of them, and to increase sugar production through the expansion of sugar crops, particularly sugar beet for the lack of its needs of water compared to harvest sugar cane in new lands and raise the productivity of sugar crops circulating through the varieties of high productivity and to suit every center of administrative centers in Egypt, and rationalizing the consumption of sugar through dismiss size wastage of sugar, and to achieve food security has to be awareness programs need to prepare for the application of planning policy breeds where it is one of the most important determinants of the demand for Egyptian sugar imports.

RECOMMENDATIONS

Related to the results obtained, the research recommends the following: -

- Supporting the productive capacities of producers to decrease sugar imports and hence reducing the negative impact of Egyptian agricultural trade balance.
- It is necessary to intensify efforts to agricultural extension and agricultural research centers in collaboration with factories engineers and agriculture departments and supervisors' agricultural awareness of the importance of agriculture resistance to pests and diseases that affect the crop, and help them get on pesticides is harmful to the environment to do so.
- Increasing of sugar production through the expansion of sugar crops, particularly sugar beet to the lack of water needs compared to sugar cane harvest in the new land.
- Increasing of sugar productivity crops through dissemination of sugar varieties of high productivity and to suit every center of administrative centers in Egypt.
- Rationalizing the consumption of sugar during dismiss the size of the loss of sugar.
- To achieve food security has to be the need to develop awareness programs for the application of planning policy breeds where it is one of the most important determinants of the demand for i Egyptian imports of sugar.
- It is important to put a national strategy to increase the self-sufficiency ratio of sugar with the need to import and distribute the amounts of diversification between different sources in order to avoid what might happen from political pressure in favor of the Egyptian economy is in the case of international political conditions change.
- It is necessary to study the reduction commitments of support granted to the production and export in the sugar-exporting countries in order to reduce the negative effects on the Egyptian Saving.

CONCLUSIONS

The food problem is considered one of the main problems facing the majority of developing countries, including Egypt, and the food gap still absorbs the largest part of the income of the majority of these countries, which results in obstructing their development plans. Food security is also considered one of the most important issues of national security, as it is an issue with multiple aspects, closely related to a number of different sectors and institutions in the country, but it is mainly related to the agricultural sector, and then makes agricultural development more food production, especially in light of the limited resources Natural, continued population increase, and then increased demand for food.

Egypt suffers from a low food security situation and an inability to achieve self-sufficiency, especially from the most important strategic crops, while agricultural development does not give sufficient attention to increasing the domestic supply of foodstuffs, and relying on imports

to provide many of these strategic commodities such as wheat, sugar, edible oils, and meat of all kinds.

Sugar considers from one of most important food commodities and basic strategy that follows wheat in consumer important in Egypt as it is one of the commodities relatively cheap source of energy, which impair the attention of Egyptian agricultural policy-makers, has become the food security of major food crops in general and sugar in particular target nationally for its association with aspects of political, economic and social development, especially in light of globalization. Reflected the importance of sugar as a strategy commodity on the movement of international trade and the threat of particular importance to the balance of payments in developing countries, and the production of sugar in the world depends on two main crops, sugar cane and sugar beets, according to figures during the period of study (2008- 2020) the average of amount sugar production in Egypt is about 2.36 million tons, sugar cane crop contributes about 1.21 million tons, representing approximately 51.07% of the total sugar production, while sugar beet crop contributes about 1.15 million tons, representing approximately 48.93% of the total production, while the total consumption of sugar is about 3.3 million tons, and up the food gap of sugar is about 1.07 million tons, the self-sufficiency rate of about 67.58% and the average per capita consumption of sugar is about 31.7 kg per year (www.capmas.gov.eg.).

The research problem is that despite the increase achieved in the production of sugar crops in Egypt from the development and modernization of farming methods, however there are still a gap between sugar production and consumption. Due to limited farmland and water resources in Egypt at a time of increasing aggregate demand on sugar as a result of the increase in population and increasing level of income which would entail an increase of the food gap of sugar.

The main objective of this research is studying some economic aspects of sugar as a strategic crop in Egypt.

The research depends on each of the statistic descriptive and quantitative analysis represented in the estimation of some model's directivity of economic variables in question in its linear models, as well as the method was used multiple regression analysis to determine the most important factors responsible for the size of the sugar gap, the use of certain economic indicators to measure the impact of factors affecting the coefficient of food security of sugar in Egypt. The research depends on secondary data published in different external and internal bulletin of agricultural economy and associated with the subject of the search, as well as the use of the Internet to get the international information related to the search.

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