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An Analytical Economic Study of Production and Marketing of the Sugar Beet Crop in Fayoum Governorate

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ABSTRACT

Sugar Beet is one of the important strategic crops globally ,as it needs 2500-3000 m^3 of water per feddan during the whole season when it is compared to sugar cane crop that consumes 10-12 thousand m^3 of water. Producing sugar beet contributes in providing about 25% of the world production of sugar. Egypt occupies the eleventh rank in terms of sugar production globally that ensures achieving about 50.1% of producing white sugar in Egypt. About 575 thousand feddans have been cultivated in 2013, and the amount of production was estimated at about 2,1930 tons and the net revenue increases at an annual rate estimated at about 171.2 pounds / feddan, and the factors affecting the production of sugar from sugar beet crop in Egypt during the period (2000-2013) are the net yield of sugar beet and the price per ton of beet supplied to factories of producing sugar, high production costs and competitiveness of beet among other alternative winter crops, especially trefoil. The most important factors affecting the consumption of sugar in Egypt during the same period are the amount of local consumption of sugar that increases by about 88.6 thousand tons annually with significance level of 0.01, an an average population that increases by about 1.56 million people annually and rate of consumption of individual of sugar that increases by about 0.547 kg/year. The size of the food gap of sugar is estimated at a rate of 46.9 thousand tons per year, and the rates of self-sufficiency of sugar ranged between a minimum amounted to about 47.2% in 2009, and a maximum amounted to about 73.9% in 2001, with an increase of about 26.7% and the gradual decline reached about 64.7 % in 2013 where the gap of sugar increased. Self-sufficiency of sugar can be achieved by the expansion in the cultivation of sugar beet crop, especially in the lands that are reclaimed recently as they bear the proportion of soil salinity and alkalinity. Fayoum governorate cultivates about 27.2 thousand feddans and is ranked as the third after Dakahlia and Kafr Al-Sheikh in terms of quantities produced of sugar beet and stages of sugar production are suffering since agriculture till consumption from some problems. As shown by the results of the field study that about 40% of the farmers suffer from lack of good follow-up of agricultural extension for the crop, resulting in problems in production and manufacturing by 33.3%. By the entry of the crop to the factory, it enters a new stage of production and marketing about 16 % of it is dedicated for the production of raw sugar, 5 % for feed production, 4 % nitrogen materials and mineral salts , are sold to companies and traders or exporters , and nitrogen materials and mineral salts contribute in some manufacturing industries , and large amounts of sugar stocks that are enough for consumption until 2015 accumulate, as a result of rejection of the Ministry of Industry to extend working with customs fees on imports to protect national industry under the pretext of violation of the rules governing the World Trade Organization , of which Egypt is a member, and this violates international norms as America imposes tariffs on sugar by 100 % , Turkey imposes 130% and European countries imposes the same proportion in the framework of the protection of local industry and they are members of the International Organization, in addition to supporting farmers by the factory where the price paid to him is more than the world price, which increases the burden on Egyptian factories. Through the final stages of marketing till the final consumer , 100 % of traders and exporters of the field study sample suffers from high transport costs by about 40 % of the rise in local prices when they are compared to global prices , 33.3% of the exporters suffer from the increase in tariffs of Egyptian ports and about 20 % of them also suffer from the accumulation of container in ports , and the factory is a common factor between production represented by the farmer, the factory producing raw sugar , and marketing represented by the factory , traders and exporters. On one hand, control and good follow-up by extension must be provided to achieve an increase in the quantity and quality of the output crop, forcing the farmer or his representative to be with the weight in the factory to prevent the loss of significant quantities before entering the crop to the factory, the state also should support farms of sugar beet crop to encourage to cultivate more areas and also take tough decisions to codify import and imposing large tariffs on the foreign product in order to protect the national industry and observe working in ports to solve the problems of Egyptians. The most important recommendations are:
- The necessity to reduce the consumption of high amounts of sugar on the local level by lowering the individual consumption rates and the possibility of increasing amounts of sugar produced at the local level through vertical expansion to increase productivity per feddan and expansion to increase the cultivated of sugar beet crop in all the governorates of Egypt, especially the governorates of lower Egypt because of the multi- crop comparative

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advantage where it succeed in all new and old , desert and alkaline lands as it needs low amount of water and it bears salinity when it is compared to sugar cane which needs land with high fertility, and high amount of water which confirms the high productivity economic efficiency of sugar beet crop in comparison with sugar cane, expansion in establishing factories producing sugar at governorates level to meet the horizontal expansion of sugar beet crop, encouraging farmers to expand the cultivation of sugar beet, increasing supply price, reducing the cost of production and thus increasing the net yield.

Key word: Production and marketing, Sugar Beet, Fayoum Governorate.

Introduction

Sugar is one of the important strategic goods and is one of the essential elements for human food and the industry of sugar from sugar beet has developed as it is cultivated in temperate and cold areas to contribute by about 25% in the production of raw sugar in the world, Egypt has entered the field of sugar beets in the late last century and the sugar industry in Egypt relies on two main crops, sugar cane and sugar beet, the first is grown in the governorates of Upper Egypt and the cultivated area of it in Egypt is estimated at about 436 thousand feddans and the amount of production is estimated at about 21930 tons , and the second in the governorates of Lower Egypt and the area is estimated at about 575 thousand feddans and the amount of production is estimated at about 11,500 tons , and sugar beet is mainly cultivated for the purpose of producing seeds containing sugar by a percentage ranging between 15-20 % as an average.

Sugar as one of the food commodities occupies the third place after oil and wheat, and is characterized by the food gap between production and consumption at the local level, so we must expand in cultivating sugar beet crop, especially in the Lower Egypt, which does not have the privilege that enables it of cultivating sugar cane, especially with the policies of rationalizing the use of water for the crops with high water needs. Self-sufficiency in sugar can be achieved by the expansion in the cultivation of sugar beet crop, especially in the lands that are reclaimed recently as they bear the proportion of soil salinity and alkalinity. Although the occupation of Egypt for the first rank in feddan productivity of sugar cane, the productivity per feddan has reached about 51.45 tons per feddan in 2007 and about 50.3 tons per feddan in 2013 and the productivity per feddan for sugar beet crop has reached about 22 tons per feddan in 2007 and about 20 tons per feddan in 2013, and because of determinants of water, areas of sugar cane in Upper Egypt has declined, which led to food gap of sugar amounted to about 64.7% in 2013 in addition to the increasing rate of individual consumption of sugar to about 34 kg / year.

Research Problem:

The problem of research at the local level is the low productivity of feddans of sugar beet crop. This productivity is ranging from (18-20) tons/ feddan compared to the capabilities of crop productivity. Moreover, as a result of population growth and the decline in the cultivated areas of sugar cane in the governorates of Upper Egypt, a gap between production and consumption has been made. That is why the country is importing large quantities of sugar from abroad, and thus the trade deficit is increased. So, it is required to increase the cultivated area of sugar beet crop, especially since water consumption is low as it ranges from (2500-3000) m/ feddan. In addition to cash return, the period of sugar beet existence in the soil and the ease of agricultural operations compared to sugar cane crop. In addition, sugar beet factories and the factory in Fayoum governorate have exposed, recently, to loss. Moreover, there are quantities of the product sufficient after the new season. This makes it difficult for beet farmers to find resources to increase their income because of factories' inability to operate at high prices, causing huge losses. The matter that requires studying the problem that threatens the industry to stop.

Study aims:

The study aims to identify the current status of sugar beet and sugar cane crops, in terms of space, amount of production and yield per feddan in order to increase the cultivated area of sugar cane crop, make its cultivation, in the new lands, successful and identify the nature of variables that encourage farmers to the decision of expanding in Egypt. Furthermore, this research wants to identify the problems that hinder cultivating and marketing the crop ,and the possibility of horizontal and vertical expansion of the crop at the local level in the light of the severe economic competition between beet and alternative winter crops. Also, it aims to study the causes leading to the accumulation of the product and the increase of the inventory in the sugar beet factory located in Fayoum governorate. In addition to the factors affecting the product and its marketing, and studying the marketing stages for raw sugar beet, and the most important problems facing the product during these stages, and also suggesting solutions for the problems.

Research Method and Data Resources:

The study has used the published and unpublished data of the Ministry of Agriculture and Land Reclamation and the Central Administration of Agricultural Economics. Also, it has used the records of the Department of Statistics, the bulletins of agricultural economy, the data of the Directorate of Agriculture in Fayoum and Information Center and a questionnaire form relating to the farmers and producers of sugar beet crop. Moreover, qualitative and quantitative methods have been used in analysis and in analyzing the linear regression of the equations of general trend and regression phased.

The Current Status of Sugar Beet Crop in the New Lands:

The Evolution of the Cultivated Area of Sugar Beet:

Table (1) shows that the area of sugar beet in the new lands has amounted to about 11.1 thousand feddans in 2000, and has been increased until it reached 77.9 thousand feddans in 2013 with an increase of about 70.1% in 2000. Moreover, equation (1) in table (2) shows that there is a general ascending, significant and statistical trend at the level (0.01) in the area of sugar beet by 30.8 thousand feddans which represents about 86.1% of the average of beet area in Egypt, amounting to about 35.8 thousand feddans during the study period. In addition, the coefficient of determination (((R2))) has reached an average about 0.0.19, at a relative rate of change estimated at 86.1%.

The Evolution of Production and Productivity of Sugar Beet:

The Evolution of Productivity of Feddans of Beet:

Table (1) shows that the productivity of beet per feddan in the new lands has amounted to16.3 tons in 2000, and has increased until it reached about 18.8 tons in 2013, with an increase of about 1.15%. Furthermore, equation (2) in table (3) indicates that there is a general, increasing, significant and statistical trend at the level of significance (0,01) in beet's production in Egypt by 0.126 tons/ feddan which represents about 0.7% of the an an average of the productivity of beet feddan that reaches to 17.81 tons during study period. Moreover, the coefficient of determination has reached ((R2)) an an average which is about 0.23, at a relative rate of change estimated at 0.7%.

The Evolution of the Total Production of Beet:

Table (1) shows that the total production of beet in the new lands has amounted to 212.3 thousand tons in 2000, and has been increased until it reached about 1456.01 thousand tons in 2013, with an increase of about 69.1%. Furthermore, equation (3) in table (2) indicates that there is a general, increasing, significant and statistical trend at the level of significance (0,01) in beet's total production by 118.5 thousand tons which represents about 18.2% of the an an average of beet productivity in Egypt that reaches to 647.71 thousand tons during study period. In addition, the coefficient of determination ((R2)) has reached an average which is about 0.834, at a relative rate of change estimated at 18.21%.

The Evolution of Net Return per Feddan of Sugar beet:

Table (1) indicates that the net return of beet crop in the new lands has amounted to about 730.8 pounds/ feddan in 2000. It has been increased until it reached about 6109 pounds/ feddan in 2013, with an increase of about 863%. Moreover, equation (7) in table (2) shows that the net return of sugar beet crop increases at an annual, significant and statistical rate at the level of significance (0,01) which has amounted to about 131.35 pounds/ feddan, representing about 438.5% of the an an average the net return of beet crop that amounts to 2603.8 pounds/ feddan during study period, that represents in its return about 16.8% of the average of the total return of beet that amounts to 4940.43 pounds/ feddan. In addition, the coefficient of determination (((R2))) has reached an average about 0.89, at a relative rate of change estimated at 16.8%. From the above, it becomes clear that the net return of beet per feddan has amounted to about 33.9% of the total return of beet in 2000 and 2013 respectively. This decrease in the net return of beet per feddan explains, generally, the rising in the variable production costs, that the most important of them are production requirements, the decline in the net return of beet per feddan and the rising in the fixed costs is represented in rent.

The Evolution of the Price of Sugar Beet per Ton:

Table (1) indicates that the price of sugar beet per ton in the new lands has amounted to about 100 pounds/ ton in 2000. It has been increased until it reached about 365 pounds/ ton in 2013, with an increase of about 411.5%. Furthermore, equation (4) in table (2) shows that the price of sugar beet per ton increases at an annual, significant and statistic rate at the level of significance (0.01) which has amounted to about 22.1 pounds/ ton, representing about 11.8% of the average of sugar beet price per ton that reaches to 186.6 pounds/ ton during study period, that represents in its turn about 16.8% of the average of the total turn of beet feddan. In addition, the coefficient of determination (R2) has reached an average which is about 0.66, at a relative rate of change estimated at 11.8%.

From the above, it becomes clear that the price of sugar beet per ton has amounted to about 53.7%, 19.5% in 2000 and 2013 respectively. This rising in the price of sugar beet per ton explains, generally, the rising in the variable production costs, which the most important of them are production requirements, and the rising in the fixed costs is represented in rent.

The Evolution of the Costs of Sugar Beet per Feddan:

The An an average of the Total Costs of Beet Crop:

Table (1) indicates that the average of the total costs of beet crop in the new lands had amounted to about 1494 pounds/ feddan in 2000. It has been increased until it reached about 3789 pounds/ feddan in 2013, with an increase of about 253.6%.

Moreover, equation (5) in table (2) shows that the total costs of sugar beet crop increases at an annual, significant and statistical rate at the level of significance (0.01) which has amounted to about 188.6 pounds/ feddan, representing about 8.1% of the an an average of the total costs of beet crop that amounts to 2341.8 pounds/ feddan during the study period 2000-2012. In addition, the coefficient of determination (R2) had reached an average about 0.90, at a relative rate of change estimated at 8.1%.

From the above it becomes clear that the structure of the costs of beet production per feddan in Egypt has witnessed several changes during study period. The most important of these changes are those that have happened in the fixed production costs represented in rental value, as its relative importance has reached to 40.5% of the an an average of the total costs of beet production per feddan. Moreover, the total costs of a beet feddan, that the most important of them is farm work, represent production requirements as they contribute in the variable costs of beet crop by 56.9%, 43.1% respectively. Furthermore, it is indicated that the rise in the total costs of beet production per feddan may be due to the rising in variable costs, that the most of them are human and automatic work wages and chemical fertilizers value, and fixed costs (rental value) after editing the relationship between landlord and tenant.

Table 1: The Evolution of the Area, Production, Productivity, Price, Costs, Revenue and Net Return of Sugar Beet in the New Lands during (2000-2013).

Year	Area Thousand Feddans	Productivity Ton	Production Thousand Tons	Price per Ton Pound	Costs of Production per Feddan (Pounds)	Revenue per Feddan Pound	Net Return per Feddan (Pounds)
2000	**11.29**	**16.31**	**212.32**	**100**	**1494.5**	**2154.1**	**730.8**
2001	**12.48**	**18.79**	**214.84**	**100**	**1519.6**	**2000**	**480.4**
2002	**12.82**	**16.73**	**239.90**	**100**	**1558**	**2270**	**712**
2003	**8.9**	**18.72**	**152.20**	**110**	**1665**	**2263**	**598**
2004	**4.2**	**16.97**	**65.31**	**158**	**1857**	**3280**	**1423**
2005	**7.8**	**15.49**	**113.45**	**160**	**1856**	**3611**	**1755**
2006	**19.66**	**17.52**	**360.32**	**171**	**1886**	**3608**	**1722**
2007	**22.53**	**18.33**	**424.57**	**187.5**	**1959**	**4448**	**2489**
2008	**44.65**	**18.84**	**784.59**	**23.2**	**2368**	**4946**	**2578**
2009	**53.89**	**17.57**	**969.29**	**317.2**	**2698**	**6927**	**4230**
2010	**78.45**	**17.98**	**1381.52**	**263**	**3003**	**6054**	**3051**
2011	**71.15**	**18.61**	**1281.13**	**355**	**3457**	**8186**	**4729**
2012	**74.85**	**18.75**	**1403.43**	**360**	**3675**	**9521**	**5846**
2013	**77.93**	**18.8**	**1465.14**	**365**	**3789**	**9898**	**6109**
Total	**501.21**	**249.41**	**9068.01**	**2611.9**	**32785.1**	**69166.1**	**36453.2**
An average	**35.80**	**17.81**	**647.71**	**186.56**	**2341.79**	**4940.43**	**2603.8**

Source: - Ministry of Agriculture and Land Reclamation- Central Administration of Agricultural Economics, Agricultural Economics Bulletin- different numbers.

Table 2: The Equations of the General Trend of Area, Productivity per Feddan, the Total Production, Price, Costs, Revenue, and Net Return of Sugar Beet Crop in the New Lands during (2000-2013).

Equation Number	Y	a	B	((R2))	((R2))	F	SMA	% Rate of Relative Change
1	Area Thousand Feddans	**3135.4**	**30.84- (1.7-)**	**0.19**	**-**	**2.8**	**35.8**	**86.1**
2	Productivity Ton	**16.8**	**0.126 (1.9)**	**0.23**	**-**	**3.742**	**17.8**	**0.7**
3	Production Thousand Tons	**241.32-**	**118.5 (7.7)**	**0.83**	**	**58.99**	**647.7**	**18.2**
4	Price per Ton Pound	**31.80**	**22.1 (4.9)**	**0.66**	**	**23.6**	**186.6**	**11.8**
5	Costs of Production per Feddan (Pounds)	**927.6**	**188.6 (10.5)**	**0.90**	**	**110.2**	**2341.8**	**8.1**
6	Revenue per feddan Pound	**221.8**	**629 (11.3)**	**0.91**	**	**127.4**	**4940.4**	**12.7**
7	Net return per feddan (pounds)	**685.2**	**438.55 (10.3)**	**0.89**	**	**106.4**	**2603.8**	**16.8**

Numbers in parentheses ( ) are t values

*Significant at the level of significance (0.05)

** Significant at the level of significance (0.01)

Source: - calculated from table (1)

- *The Current Status of Sugar Beet Crop in Egypt:*

- *The Evolution of the Cultivated Area of Sugar Beet:*

Table (3) indicates that the area of sugar beet in Egypt has amounted to about 136 thousand feddans in 2000. It has been increased until it reached about 575 thousand feddans in 2013, with is an increase of about 42.2% of 2000. Moreover, equation (1) in table (4) shows that there is a general ascending, significant and statistical trend at the level (0.01) in the area of sugar beet by 26.5 thousand feddans which represents about 11.1% of the average of beet area in Egypt, amounting to about 248.3 thousand feddans during study period. In addition, the coefficient of determination (((R2))) has reached an average which is about 0.79, at a relative rate of change estimated at 11.1%.

The Evolution of the Production and Productivity of Sugar beet:

- *The Evolution of Beet Productivity per Feddan:*

Table (3) indicates that the productivity of beet per feddan in Egypt has amounted to about 21 tons in 2000. It has been decreased until it reached to about 20 tons in 2013 at a rate of about 1%. Moreover, equation (2) in table (4) shows that there is a general, decreasing, significant and statistical trend at the level (0.01) in the productivity of beet by 0.02 tons/ feddans which represents about 0.09% of the an an average of beet productivity per feddan, amounting to about 20.36 tons during study period. In addition, the coefficient of determination has reached ((R2)) an an average which is about 0.01, at a relative rate of change estimated at 0.09%.

The Evolution of the Total Production of Beet:

Table (3) indicates that the total production of beet in Egypt has amounted to about 4.48 million tons in 2000. It has been increased until it reached about 8.07 million tons in 2013, with an increase of about 40.8 %. Moreover, equation (3) in table (4) shows that there is a general ascending, significant and statistical trend at the level (0.01) in the total production of beet by 530.6 thousand tons which represents about 10.4% of the an an average of beet production in Egypt, amounting to about 5017.5 thousand tons during study period. In addition, the coefficient of determination has reached ((R2)) an an average which is about 0.79, at a relative rate of change estimated at 10.4%.

The Evolution of the Net Return of Sugar Beet per Feddan:

- *The Evolution of the Net Return of Beet Crop:*

Table (3) indicates that the net return of beet crop in Egypt has amounted to about 629 pounds/ feddan in 2000. It has been increased until it reached about 2403 pounds/ feddan in 2013, with an increase of about

328.1%. Moreover, equation (7) in table (4) shows that the net return of beet crop increases at an annual, significant and statistical rate at the level (0.01), amounting about 171.2 pounds/ feddan which represents about 9.8% of the average of the net return of beet crop, amounting to about 1885.9 pounds/ feddan during study period, that represents in its return about 10.8% of the total return of beet per feddan. In addition, the coefficient of determination (R2) has reached an average which is about 0.67, at a relative rate of change estimated at 9.8

From the above it becomes clear that the net return of beet per feddan has amounted to about 29.5%, 30.4% of the total return of beet per feddan in 2000 and 2013 respectively. This rising in the net return of beet per feddan explains, generally, the decrease in the changing production costs, that the most important of them are production requirements, the decrease in the fixed costs and the increase in crop production.

- *The Evolution of Sugar Beet Price per Ton:*

Table (3) indicates that the price of sugar beet per ton in Egypt has amounted to about 96 pounds/ ton in 2000. It has been increased until it reached about 390 pounds/ ton in 2013, with an increase of about 411.5%. Moreover, equation (4) in table (4) shows that the price of sugar beet per ton increases at an annual, significant and statistical rate at the level (0.01), amounting about 24.3 pounds/feddan which represents about 11.5% of the average of sugar beet price per ton, amounting to about 211.4 pounds/ ton during study period, that represents in its return about 10.8% of the total return of beet per feddan. In addition, the coefficient of determination has reached (R2) an average which is about 0.94, at a relative rate of change estimated at 11.5%.

From the above it becomes clear that the price of sugar beet per ton has amounted to about 58.2%, 42% in 2000 and 2013 respectively. This rising in the price of sugar beet per ton explains, generally, the decrease in the changing production costs, that the most important of them are production requirements, the decrease in the fixed costs and the increase in crop production.

The Evolution in Sugar Beet Costs per Feddan:

The average of the Total Costs of Beet Crop:

Table (3) indicates that the average of the total costs of beet crop in Egypt has amounted to about 1502 pounds/ feddan in 2000. It has been increased until it reached about 5456 pounds/ feddan in 2013, with an increase of about 363.8 %. Moreover, equation (5) in table (4) shows that the total costs of beet crop increase at an annual, significant and statistical rate at the level (0.01), amounting to about 312.3 pounds/ feddan which represents about 11.4% of the average of the total costs of beet crop, amounting to about 2728.4 pounds/ feddan during study period 2000-2012. In addition, the coefficient of determination (R2) has reached an average which is about 0.81, at a relative rate of change estimated at 11.4%.

From the above it becomes clear that the structure of the costs of beet production per feddan in Egypt has witnessed several changes during study period. The most important of these changes are those that have happened in the fixed production costs represented in rental value, as its relative importance has reached to 40.5% of the an an average of the total costs of beet production per feddan. Moreover, the total costs of a beet feddan, that the most important of them is farm work, represent production requirements as they contribute in the variable costs of beet crop by 56.9%, 43.1% respectively. Furthermore, it is indicated that the rise in the total costs of beet production per feddan may be due to the rising in variable costs, that the most of them are human and automatic work wages and chemical fertilizers value, and fixed costs (rental value) after editing the relationship between landlord and tenant.

The factors affecting producing sugar from sugar beet crop in Egypt during (2000-2013):

Table (3) shows the increment of the net return of sugar beet crop from 629 pounds per feddan in 2000 to about 2403 pounds per feddan in 2013 at an estimated rate of about 382%, at an annual average amounting to about 1885 pounds per feddan during study period. This shows the importance of raising the price of beet, per ton, supplied to the factories producing sugar in order to make farmers able to keep up with the rising costs of producing beet and increase the competitiveness of beet crop among the alternative winter crops especially trefoil. Moreover, equation (7) in table (4) refers to the evolution of the net return of sugar beet, in Egypt, in pounds per ton during study period. It has been indicated that the net return per feddan has taken a general, ascending trend at an increasing annual rate amounted to about 171.2 pounds and at a changing annual rate estimated by about 9.8% of the annual an an average of the net return of sugar beet that amounts to about 1885 pounds per feddan. Furthermore, the increase of significance has been confirmed at the significant level 1%. Determination value refers to that about 67% of the changes of the net return of sugar beet per feddan are interpreted by the factor of time, and about 33% of these changes are due to other factors which have not been taken into consideration.

Y^ = 456.92 + 171.2
2.441)** (2.874)**
((R2)) =0.67 F = (24.97)**

As: -

Y^= represents the total production of sugar beet crop in Egypt per thousand tons, x= time factor, h= 1, 2, 3 ……..14

In addition, table (3) shows that the increase in the costs of sugar beet production from about 1502 pounds per feddan in 2000 to about 5465 pounds per feddan in 2013 at a rate estimated by about 363.8%, at an annual an an average amounts to about 2728.3 pounds per feddan during study period. Moreover, the significance of increase has been confirmed at the level of significance 1%. Determination value refers to that about 81% of the changes of the net return of sugar beet per feddan are interpreted by the factor of time, and about 33% of these changes are due to other factors. Such as the rising prices of fertilizers, especially nitrogenous fertilizers and the prices of pesticides, in addition to increasing the costs of uprooting, cleaning and transportation.

Table 3: The Factors Affecting Producing Sugar from Sugar Beet Crop in Egypt during (2000-2013).

Year	The Amount of Sugar Production (Thousand Tons)	Area Thousand Feddans x1	Productivity Tons x2	Net Return per Feddan (Pounds) x3	Costs of Production per Feddan (Pounds) x4	Farm Price Pound/ Feddan x5	The Total Revenue x6
2000	**2856**	**136**	**21**	**629**	**1502**	**96**	**2131**
2001	**2980**	**149**	**20**	**480**	**1520**	**89**	**2000**
2002	**3080**	**154**	**20**	**711**	**1558**	**97**	**2296**
2003	**3620**	**131**	**20**	**597**	**1665**	**108**	**2262**
2004	**2820**	**141**	**20**	**1365**	**1857**	**155**	**3222**
2005	**3340**	**167**	**20**	**1755**	**1856**	**153**	**3611**
2006	**3906**	**186**	**21**	**1722**	**1886**	**178**	**3608**
2007	**5456**	**249**	**22**	**2500**	**1959**	**188**	**4459**
2008	**4902**	**258**	**19**	**2578**	**2368**	**231**	**4946**
2009	**5500**	**275**	**20**	**3230**	**2697**	**317**	**5927**
2010	**6405**	**305**	**21**	**1880**	**4040**	**269**	**5920**
2011	**6615**	**315**	**21**	**2406**	**4594**	**325**	**7000**
2012	**8265**	**435**	**19**	**2120**	**5230**	**363**	**7350**
2013	**11500**	**575**	**20**	**2403**	**5465**	**390**	**7895**
Total	**70245**	**3476**	**284**	**26403**	**38197**	**2959**	**62627**
An an average	**5088.9**	**248.29**	**20.3**	**1741.13**	**2728.36**	**211.36**	**4473.35**

Source: - Ministry of Agriculture and Land Reclamation- Central Administration of Agricultural Economics, Agricultural Economics Bulletin- different numbers.

Table 4: The Equations of the General Trend of Area, Productivity per Feddan, the Total Production, Price, Costs, Revenue, and Net Return of Sugar Beet Crop in Egypt during (2000-2013).

Equation Number	Y	a	B	(R2)	(R2)	F	SMA	% Rate of Relative Change
1	Area Thousand Feddans	**41.8**	**27.5 (6.8)**	**0.79**	**	**46.21**	**248.28**	**11.1**
2	Productivity Ton	**20.45**	**0.02- (0.4-)**	**0.01**	**-**	**0.15**	**20.28**	**0.09**
3	Production Thousand Tons	**1108.9**	**530.66 (6.8)**	**0.79**	**	**45.87**	**5088.9**	**10.4**
4	Price per Ton Pound	**28.9**	**24.3 (13.9)**	**0.94**	**	**193.94**	**211.35**	**11.5**
5	Costs of Production per Feddan (Pounds)	**386.26**	**312.27 (7.2)**	**0.81**	**	**51.39**	**2728.35**	**11.4**
6	Revenue per feddan Pound	**845.25**	**483.73 (18.6)**	**0.96**	**	**344.95**	**4473.35**	**10.8**
7	Net return per feddan (pounds)	**456.9**	**171.2 (4.9)**	**0.67**	**	**24.97**	**1741.1**	**9.8**

Numbers in parentheses ( ) are t values
*Significant at the level of significance (0.05)
** Significant at the level of significance (0.01)
Source: - calculated from table (3)

Moreover, table (3) shows that the farm price of sugar beet crop per ton is ranging between a minimum limit amounted to about 96 pounds per feddan in 2000, and a maximum limit amounted to about 390 pounds per feddan in 2013 at an annual an an average amounting to about 211.4 pounds per feddan during study period.

Furthermore, table (4) indicates that significance of increase has been confirmed at the significance level 1%. Determination value refers to that about 94% of the changes in the farm prices of sugar beet are interpreted by time factor, at an annual changing rate estimated by about 11.5%, and about 6% are due to other factors that have not been taken into consideration. Moreover, despite the increase in the price of beet made by the factories producing sugar from beet, it does not cover the annual increase in the costs of beet sugar production.

Furthermore, it is indicated that the local production of beet sugar is increased from about 2856 thousand tons of sugar in 2000 to about 11500 thousand tons of sugar in 2013 at an annual average amounting to 5017.5 thousand tons during study period. This increase in the local production is due to increasing the production of sugar beet per feddan. In addition, significance of increase has been confirmed at the significance level 1%. Table (4) shows that the determination value refers to that about 79% of the changes in the local production of sugar beet are interpreted through time factor, at an annual changing rate estimated by about 10.4%, and about 21% are due to other factors that have not been taken into consideration.

- *The Current Status of Sugar Beet Crop in Egypt:*

- *The Evolution of the Cultivated Area of Sugar Beet:*

Table (5) indicates that the area of sugar beet in Egypt has amounted to about 319 thousand feddans in 2000. It has been increased until it reached about 436 thousand feddans in 2013, with an increase of about 136% of 2000. Moreover, equation (1) in table (6) shows that there is a general ascending, significant and statistical trend at the level (0.01) in the area of sugar beet by 6.88 thousand feddans which represents about 1.9% of the average of beet area in Egypt, amounting to about 344.4 thousand feddans during study period. In addition, the coefficient of determination (R2) has reached an average which is about 0.69, at a relative rate of change estimated at 1.9%.

The Evolution of the Production and Productivity of Sugar beet:

- *The Evolution of Beet Productivity per Feddan:*

Table (5) indicates that the productivity of beet per feddan in Egypt has amounted to about 49.9 tons in 2000, It has been increased until it reached to about 20 tons in 2013, with an increase of about 1.04%. Moreover, equation (2) in table (6) shows that there is a general, decreasing, significant and statistical trend at the level (0.01) in the productivity of sugar cane in Egypt 0.03 ton/ feddan which represents about 0.06% of the an average of sugar cane productivity per feddan, amounting to about 50.3 tons during study period. In addition, the coefficient of determination (R2) has reached an average which is about 0.02, at a relative rate of change estimated at 0.06%.

The Evolution of the Total Production of Sugar Cane:

Table (5) indicates that the total production of sugar cane in Egypt has amounted to about 15.92 million tons in 2000, It has been increased until it reached about 21.9 million tons in 2013, with an increase of about 137%. Moreover, equation (3) in table (6) shows that there is a general ascending, significant and statistical trend at the level (0.01) in the total production of sugar cane by 326.9 thousand tons which represents about 1.9% of the an average of sugar cane production in Egypt, amounting to about 17.2 thousand tons during study period. In addition, the coefficient of determination (R2) has reached an average which is about 0.64, at a relative rate of change estimated at 1.9%.

The Evolution of the Net Return of Sugar Cane per Feddan:

- *The Evolution of the Net Return of Sugar Cane Crop:*

Table (5) indicates that the net return of sugar cane crop in Egypt has amounted to about 1300 pounds/ feddan in 2000. It has been increased until it reached about 6172 pounds/ feddan in 2013, with an increase of about 474%. Moreover, equation (6) in table (6) shows that the net return of sugar cane crop increases at an annual, significant and statistical rate at the level (0.01), amounting about 375.5 pounds/feddan which represents about 11.5% of the an average of the net return of sugar cane crop, amounting to about 3351.6 pounds/ feddan during study period, that represents in its return about 11.2% from the total return of sugar cane per feddan, amounting to 9051.2. In addition, the coefficient of determination (R2) has reached an average which is about 0.89, at a relative rate of change estimated at 11.5%.

From the above it becomes clear that the net return of sugar cane per feddan has amounted to about 27.4%, 34.1% of the average of the total return of sugar cane per feddan in 2000 and 2013 respectively. This rising in the net return of beet per feddan explains, generally, the decrease in the changing production costs, that the most important of them are production requirements and the increase in the price of sugar cane crop per ton.

- *The Evolution of Sugar Cane Price per Ton:*

Table (5) indicates that the price of sugar cane per ton in Egypt has amounted to about 95 pounds/ ton in 2000. It has been increased until it reached about 360 pounds/ ton in 2013, with an increase of about 378.9%. Moreover, equation (4) in table (6) shows that the price of sugar cane per ton increases at an annual, significant and statistical rate at the level (0.01), amounting about 20.5 pounds/feddan which represents about 11.2% of the average of sugar cane price per ton, amounting to about 182.7 pounds/ ton during study period. In addition, the coefficient of determination has reached (R2) an average which is about 0.90, at a relative rate of change estimated at 11.2%.

From the above it becomes clear that the price of sugar cane per ton has amounted to about 51.9%, 197.1% in 2000 and 2013 respectively. This increase in the price of sugar cane per ton which is, generally, due to the decrease in the changing production costs, that the most important of them are production requirements, the increasing demand on it abroad, occupying lands for long period and the increase in water needs for sugar cane crop.

- *The Evolution in Sugar Cane Costs per Feddan:*

- *The average of the Total Costs of Sugar Cane Crop:*

Table (5) indicates that the average of the total costs of sugar cane crop in Egypt has amounted to about 3441 pounds/ feddan in 2000 It has been increased until it reached about 11.93 thousand pounds/ feddan in 2013, with an increase of about 338%. Moreover, equation (5) in table (6) shows that the total costs of sugar cane crop increase at an annual, significant and statistical rate at the level (0.01), amounting to about 623.9 pounds/ feddan of beet which represents about 10.9% of the average of the total costs of sugar cane crop, amounting to about 5699.6 pounds/ feddan during study period 2000-2012. In addition, the coefficient of determination (R2) has reached an average which is about 0.75, at a relative rate of change estimated at 10.9%.

From the above it becomes clear that the structure of the costs of sugar cane production per feddan in Egypt has witnessed several changes during the study period. The most important of these changes are those that have happened in the fixed production costs represented in rental value, as its relative importance has reached to 40.5% of the an average of the total costs of beet production per feddan. Moreover, the total costs of sugar cane per feddan, that the most important of them is farm work, represent production requirements as they contribute in the variable costs of sugar cane crop by 56.9%, 43.1% respectively. Furthermore, it is indicated that the rise in the total costs of beet production per feddan may be due to the rising in variable costs, that the most of them are human and automatic work wages and chemical fertilizers value, and fixed costs (rental value) after editing the relationship between landlord and tenant.

The Factors Affecting Producing Sugar from Sugar Cane Crop in Egypt during (2000-2013):

Table (5) shows the increment of the net return of sugar cane crop from 1300 pounds per feddan in 2000 to about 6172 pounds per feddan in 2013 at an estimated rate of about 474.7%, at an annual average amounting to about 3351.6 pounds per feddan during study period. This shows the importance of raising the price of sugar cane, per ton, supplied to the factories producing sugar in order to make farmers able to keep up with the rising costs of producing sugar cane and increase the competitiveness of sugar cane among the alternative winter crops. Moreover, equation (6) in table (6) refers to the evolution of the net return of sugar cane, in Egypt, in pounds per ton during study period. It has been indicated that the net return per feddan has taken a general, ascending trend at an increasing annual rate amounted to about 375.5 pounds and at a changing annual rate estimated by about 11.5% of the annual average of the net return of sugar cane that amounts to about 3351.6 pounds per feddan. Furthermore, the increase of significance has been confirmed at the significant level 1%. Determination value refers to that about 89% of the changes of the net return of sugar cane per feddan are interpreted by the factor of time, and about 11% of these changes are due to other factors which have not been taken into consideration.

$$\hat{Y} = 534.91 + 375.54$$
$$(2.441)^* \quad (2.874)^{**}$$
$$((R2)) = 0.89 \qquad F = (97.38)^{**}$$

As: -

Y^= represents the total production of sugar cane crop in Egypt per thousand ton, x= time factor, h= 1, 2, 3 …… 14

In addition, table (5) shows that the increase in the costs of sugar cane productivity from about 3441 pounds per feddan in 2000 to about 11935 pounds per feddan in 2013 at a rate estimated by about 346.8%, at an annual average amounts to about 5699.6 pounds per feddan during study period. Moreover, the significance of increase has been confirmed at the level of significance 1%. Determination value refers to that about 75% in the changes of the costs of sugar cane per feddan are interpreted by the factor of time, at an annual changing rate estimated at 10.9%, and about 25% of these changes are due to other factors. Such as the rising prices of fertilizers, especially nitrogenous fertilizers and the prices of fuel necessary for irrigating the crop as it need a great amount of water that is about four times the needs of beet crop, in addition to the increase in the costs of uprooting, cleaning and transportation.

Moreover, table (5) shows that the farm price of sugar cane crop per ton is ranging between a minimum limit amounted to about 95 pounds per feddan in 2000, and a maximum limit amounted to about 360 pounds per feddan in 2013 at an annual average amounting to about 182.7 pounds per ton during study period. These prices are less than the prices of beet per ton compared with the prices of sugar cane per ton, but it does not cover the annual increase in its production costs. Furthermore, significance of increase has been confirmed at the significance level 1%. Determination value refers to that about 90% of the changes in the costs of sugar cane per feddan are interpreted by time factor, at an annual changing rate estimated by about 11.2%, and about 10% are due to other factors.

Table 5: The Factors Affecting Producing Sugar from Sugar Cane Crop in Egypt during (2000-2013).

Year	The Amount of Sugar Production (Thousand Tons)	The Cultivated Area Thousand Tons	Productivity Ton/ Feddan	The Net Return per Feddan (Pounds)	The Costs of Production per Feddan	Farm Price Pound/ Ton
2000	**15921**	**319**	**49.91**	**1300**	**3441**	**95**
2001	**15453**	**312**	**49.52**	**1222**	**3512**	**95**
2002	**16114**	**323**	**49.92**	**1329**	**3470**	**95**
2003	**16480**	**327**	**50.4**	**1639**	**3654**	**105**
2004	**16669**	**322**	**51.77**	**1725**	**3581**	**105**
2005	**16358**	**321**	**50.96**	**2638**	**3984**	**130**
2006	**16605**	**327**	**50.78**	**4001**	**4204**	**160**
2007	**17085**	**335**	**51.45**	**3946**	**4286**	**182**
2008	**17219**	**355**	**51.4**	**4866**	**4488**	**182**
2009	**16432**	**334**	**49.20**	**3905**	**5935**	**200**
2010	**17722**	**360**	**49.23**	**5000**	**6544**	**235**
2011	**17572**	**355**	**49.5**	**4542**	**9318**	**280**
2012	**19720**	**396**	**49.8**	**4637**	**11443**	**335**
2013	**21930.8**	**436**	**50.3**	**6172**	**11935**	**360**
Total	**241280.8**	**4822**	**704.2**	**46922**	**79795**	**2559**
An an average	**17234.34**	**344.43**	**50.29**	**3351.6**	**5699.64**	**182.7**

Source: - Ministry of Agriculture and Land Reclamation- Central Administration of Agricultural Economics, Agricultural Economics Bulletin- different numbers.

Table 6: The Equations of the General Trend of Area, Productivity per Feddan, the Total Production, Price, Costs, Revenue, and Net Return of Sugar Cane Crop in Egypt during (2000-2013).

Number of Equation	Y	A	B	Significance	(R2)	F	SMA	% Rate of Relative Change
1	Area Thousand Feddans	**292.76**	**6.88 (5.2)**	**	**0.69**	**27.37**	**344.4**	**1.9**
2	Productivity Tons	**50.53**	**0.03- (0.6-)**	**-**	**0.02**	**0.306**	**50.29**	**0.06**
3	Production Thousand Tons	**14782.2**	**326.9 (9.8)**	**	**0.64**	**22.20**	**17234.3**	**1.9**
4	Farm Price Pounds	**29.27**	**20.46 (10.6)**	**	**0.90**	**111.42**	**182.78**	**11.2**
5	Productivity Costs	**1020.15**	**623.9 (6)**	**	**0.75**	**36.2**	**5699.6**	**10.9**
6	Net Return per Feddan (Pounds)	**534.9**	**375.5 (9.9)**	**	**0.89**	**97.38**	**3351.57**	**11.5**

Numbers in parentheses ( ) are t values
*Significant at the level of significance (0.05)
** Significant at the level of significance (0.01)
Source: - calculated from table (5)

Furthermore, it is indicated that the local production of sugar cane is increased from about 15.92 million tons of sugar in 2000 to about 21.93 million tons of sugar in 2013 at an annual average amounting to about 17.23 million tons during study period. In addition, significance of increase has been confirmed at the significance level 1%. Determination value refers to that about 64% of the changes in the costs of sugar cane per feddan are interpreted by time factor, at an annual changing rate estimated by about 1.9%, and about 36% are due to other factors that have not been taken into consideration, such as the increase in the productivity of sugar cane per feddan.

The Relative Importance of the Cultivated Area and the Amount of Producing Sugar from Sugar Beet for the Total of the Cultivated Area and the Amount of Producing Sugar from Beet and Sugar Cane Crops: -

Moreover, Table (7) shows that the average of the cultivated area of sugar crops has amounted to about 593 thousand feddans during study period. The maximum limit of the cultivated area has amounted to about 1011 thousand feddans in 2013, however, the minimum limit has amounted to about 455 thousand feddans in 2000. In addition, the maximum limit of the cultivated area of sugar beet has amounted to about 575 thousand feddans in 2013 that represents about 56.8% of the total area of sugar crops amounting to about 1011 thousand feddans during the same year. It represents about 45.8% of the total amount of sugar production supplied from sugar beet crop. This amount reaches to 18.9 million tons during the same year.

Furthermore, the minimum limit of the cultivated area of sugar cane has amounted to about 319 thousand feddans in 2000. This amount represents about 70.1% of the total area of sugar crops which amount to about 455 thousand feddans during the same year and represent about 78.9% of the total supplied amount of sugar that represents about 21.8% of sugar's total production supplied from sugar beet crop. However, the maximum limit of the cultivated area of sugar cane has amounted to about 436 thousand feddans in 2013. This amount represents about 56.8% of the total area of sugar crops that amount to about 1011 thousand feddans during the same year and represent about 54.1% of the total supplied amount of sugar that represents about 45.8% of sugar's total production supplied from beet.

Table 7: Shows The Relative Importance of the Cultivated Area and the Amount of Producing Sugar from Sugar Beet for the Total of the Cultivated Area and the Amount of Producing Sugar from Beet and Sugar Cane Crops:

The Cultivated Area per Thousand Feddans					The Amount of Supplied Sugar Production per Million Tons			
Year	Sugar Cane	Sugar Beet	Total	% the Cultivated Area of Beet to the Total	Sugar Cane	Sugar Beet	Total	% the Amount of Supplied Sugar Production from Beet to the Total
2000	**319**	**136**	**455**	**29.89**	**10.02**	**2.79**	**12.8**	**21.8**
2001	**312**	**149**	**461**	**32.32**	**10.14**	**3.6**	**13.7**	**26.2**
2002	**323**	**154**	**477**	**32.29**	**9.66**	**2.94**	**12.62**	**23.3**
2003	**327**	**131**	**458**	**28.60**	**9.39**	**2.43**	**11.82**	**20.6**
2004	**322**	**141**	**463**	**30.45**	**9.29**	**2.57**	**11.9**	**21.7**
2005	**321**	**167**	**488**	**34.22**	**9.64**	**3.21**	**12.9**	**15**
2006	**327**	**186**	**513**	**36.26**	**9.5**	**3.6**	**13.1**	**27**
2007	**335**	**249**	**584**	**42.64**	**9.9**	**5.23**	**15.1**	**34.6**
2008	**355**	**258**	**613**	**42.09**	**9.93**	**3.73**	**13.7**	**27.3**
2009	**334**	**275**	**609**	**45.16**	**6.02**	**4.09**	**13.1**	**31.2**
2010	**360**	**305**	**665**	**45.86**	**8.99**	**7.51**	**16.5**	**45.5**
2011	**355**	**315**	**675**	**46.67**	**9.27**	**6.92**	**16.2**	**42.7**
2012	**396**	**435**	**831**	**53.35**	**9.28**	**7.47**	**16.8**	**44.5**
2013	**436**	**575**	**1011**	**56.87**	**10.25**	**8.68**	**18.93**	**45.8**
Total	**4822**	**3476**	**8303**	**556.67**	**131.3**	**64.77**	**199.2**	**427.2**
An an average	**344.4**	**248.3**	**593.1**	**39.76**	**9.37**	**4.63**	**14.22**	**30.51**

Source: - Ministry of Agriculture and Land Reclamation- Central Administration of Agricultural Economics, Agricultural Economics Bulletin- different numbers.

- The Factors Affecting the Consumption of supplied Sugar in Egypt during (2000-2013):

Table (8) shows that the most important factors affecting sugar consumption in Egypt are:

1- Population: - table (8) shows that population has increased from about 65.5 million people in 2000, to about 85.22 million people in 2013, with an increase of about 19.72 million people at an annual average amounting to about 75.46 million people during study period. Moreover, table (9) indicates that population average has taken an increasing trend at a rate of 1.56 million people, annually. This rate represents about 2.1 of the average of population during this period. However, the average of sugar production has amounted to about 14.4 million tons during study period. In addition, production has increased from about 12.83 million tons in 2000 to about 18.93 million tons in 2013, with an increase of about 0.414 thousand tons in 2000.

2- The Amount of Domestic Consumption of Sugar: - table (8) shows that the amount of domestic consumption of sugar has increased from about 1845 thousand tons in 2000 to about 2925 thousand tons in

2013, with an increase of about 1080 thousand tons at an annual average amounting to about 2453 thousand tons during study period. Furthermore, table (9) indicates that the amount of domestic consumption of sugar has taken an increasing trend at a rate of 88.6 thousand tons annually, at the significance level 1% that represents about 3.6 from the average of consumption during this period. However, the average of sugar production has amounted to about 14.4 million tons during study period.

3- Per Capita Consumption of Sugar kg/ year: - it is one of the most important factors affecting the amount of sugar consumption in Egypt, as its minimum has reached to about 27 kg/ year in 2000 and its maximum has amounted to 34.5 kg/year. This rate is one of the highest rates of world consumption per capita that amounts to 25 kg/ year, with an increase of about 9.5 kg/ year. In addition, table (9) refers to that per capita consumption of sugar has taken an increasing trend at a rate of 0.547 kg/ year at the significance level of 0.01 that represents about 1.7 from per capita consumption of sugar during this period.

4- The Size of Food Gap of Sugar: - table (8) shows that the size of food gap of sugar has increased from about 562 thousand tons to about 1022 thousand tons in 2013, with an increase of about 460 thousand tons, at an annual an an average amounting to about 1024.6 thousand tons during study period. Moreover, table (9) shows that the size of food gap of sugar has taken an increasing trend at a rate of 46.9 thousand tons annually, at the significance level of 0.01 that represents about 4.6 from the average of the food gap of sugar during this period.

5- Self Sufficiency Rate of Sugar: - self sufficiency rates has ranged between a minimum limit amounted to about 47.2% in 2009 and a maximum limit amounted to about 73.9% in 2001, with an increase of about 26.7%, that continue in gradual declining, and the gap in sugar increases with them.

Table 8: The Factors Affecting on the Consumption of Sugar in Egypt during (2000-2013).

Year	Population Million People 1	The Amount of Sugar Production Million Tons 2	The Amount of Local Consumption Thousand Tons 3	The An average of Per Capita Consumption Kg/ Year 4	Sugar Gap Thousand Tons (2-3)	% Self-Sufficiency 3/2	The Cultivated Area of Cane and Sugar Beet
2000	**65.5**	**12.83**	**1845**	**27**	**562**	**69.5**	**455**
2001	**66.9**	**13.75**	**1860**	**27**	**485**	**73.9**	**461**
2002	**68.3**	**12.67**	**2000**	**29.9**	**733**	**63.3**	**477**
2003	**69.5**	**11.85**	**2100**	**30.3**	**915**	**56.4**	**458**
2004	**70.7**	**11.99**	**2200**	**32**	**1001**	**54.5**	**463**
2005	**73.7**	**12.97**	**2432**	**33**	**1125**	**53.3**	**488**
2006	**75.1**	**13.15**	**2553**	**34**	**1239**	**51.5**	**513**
2007	**76.5**	**15.17**	**2600**	**34**	**1083**	**58.38**	**584**
2008	**77.7**	**13.72**	**2640**	**34**	**1268**	**51.91**	**613**
2009	**80**	**13.10**	**2770**	**34**	**1460**	**47.2**	**609**
2010	**81.2**	**16.51**	**2765**	**34**	**1114**	**59.7**	**665**
2011	**82.4**	**16.27**	**2800**	**34**	**1173**	**58.1**	**675**
2012	**83.8**	**16.88**	**2853**	**34.5**	**1165**	**59.2**	**831**
2013	**85.22**	**18.93**	**2925**	**34**	**1022**	**64.7**	**1011**
Total	**1056.52**	**199.13**	**34343**	**451.7**	**14345**	**821.5**	**8303**
An an average	**75.46**	**14.4**	**2453.07**	**32.3**	**1024.6**	**58.68**	**593.11**

Source: - Ministry of Agriculture and Land Reclamation- Central Administration of Agricultural Economics, Agricultural Economics Bulletin- different numbers.

The Current Status of Sugar Beet Crop in Fayoum Governorate:

The Evolution of Sugar Beet Production on the Local Level:

Sugar beet crop has a great interest in both public and private sectors, as it contributes about 50.1% in Egypt. Moreover, the processing wastes of sugar beet enter into many industries such as feed industry as it acquires 5% of fiber wastes. In addition, about 4% of nitrogenous non- sugary materials and mineral salts enter into many manufacturing and light industries. Egypt has transformed from an exporter of sugar in 1972 to an importer of it, as the data of table (10) refers to that. The percentage of self- sufficiency of sugar has amounted to about 69.1% in 2012. Despite the increase in production from 593 to 2004 thousand tons, the increase in consumption at rising rates from 501 to 2900 thousand tons is due the increase in population at the first place, then the increase in consumption. Per capita consumption has increased from 16.6 to 34 kg per year, which represents an increase of 48.8%. This increase is due to growing poverty in the Egyptian society. Also, it may be due to the change in the style of food and consumption of this commodity.

Table 9: The Equations of the General Trend of the Production and Consumption of Supplied Sugar, Gap's Size and Self-sufficiency Rates of Sugar in Egypt during (2000-2013).

Equation Number	Y	a	B	(R2)	Significance	F	SMA	% Rate of Relative Change
1	Population (Million People)	**63.74**	**1.562 (53.5)**	**0.99**	**	**2864.5**	**75.46**	**2.1**
2	The Amount of Sugar Production (Million Tons)	**11.16**	**0.414 (4.9)**	**0.66**	**	**23.6**	**14.4**	**2.9**
3	The Amount of Local Consumption Thousand Tons	**1788.1**	**88.65 (15.1)**	**0.94**	**	**225.8**	**2453.1**	**3.6**
4	The An an average of Per Capita Consumption (Kg/ year)	**28.15**	**0.547 (5.9)**	**0.74**	**	**35.2**	**32.3**	**1.7**
5	Sugar Gap (Thousand Tons)	**672.20**	**46.9 (3.6)**	**0.52**	**	**13.15**	**1024.6**	**4.6**
6	The Cultivated Area of Cane and Beet (Thousand Feddans)	**334.19**	**34.51 (6.6)**	**0.78**	**	**43.11**	**593.1**	**5.8**

Numbers in parentheses ( )are t values

*Significant at the level of significance (0.05)

** Significant at the level of significance (0.01)

Source: - calculated from table (8)

Table 10: The Evolution of the Production and Consumption of Sugar Cane and Sugar Beet in Egypt, Self-sufficiency and the Gap during (1912-1972).

Year	Sugar Production per Thousand Tons	Consumption per Thousand Tons	Gap per Thousand Tons	The Annual Per Capita in Kg	%
***1972**	**593**	**501**	**0**	**16.6**	**118.5**
1980	**618**	**1115**	**497**	**26.5**	**55.4**
2008	**1582**	**2564**	**982**	**33**	**61.7**
2011	**1897**	**2750**	**853**	**34**	**69**
2012	**2004**	**2900**	**896**	**34**	**69.1**

*1972 Base Year

Source: - Sugar Crops Council.

If we give an attention to the production of the Egyptian governorates, we would find that Kafr Al-Sheikh governorate contributes about 29.4% of beet sugar production in Egypt. Thus, it is considered the first Egyptian governorate producing sugar beet. However, Assiut governorate is considered the largest in terms of productivity per feddan as it amounts to about 32 tons/ feddan although it ranks the eleventh in terms of crop area. Moreover, Menoufia governorate is considered the least in terms of area as seen from table (11).

Moreover, Fayoum governorate is currently planting 27.2 thousand feddans, which represent 6.4% of the total area at the republic level as it is indicated in table (12). That area, that being planted by Fayoum governorate, is considered a small area for there is a factory producing sugar in the governorate. This factory has started in operation tests in March 2001 to produce 1030 tons of sugar, 2590 tons of molasses and a small amount of beet pulp.

Although Fayoum governorate is in a middle site in terms of production and productivity among the governorates of Egypt, it contributes about 15.1% of law sugar production at the republic level as indicated in table (13). This rate is due to the factory of beet established in 1997. Furthermore, sugar beet crop is being stared to be planted in the governorate with the beginnings of operating. In addition, crop areas in Fayoum governorates have been evolved. The cultivated areas has decreased in some years as a result of the reluctance of some farmers to plant the crop due to some administrative problems relating to paying the dues as indicated in 2004, 2005 and 2006 or due to some marketing problems. This matter needs a lot of efforts in order to advance the crop. In an average, Fayoum governorate cultivates about 15.8 thousand feddans. A feddan achieves an average about 15.5 tons/ feddan.

Table 11: The Cultivated Areas of Sugar Beet Crop, the average of Productivity per Feddan and the Percentage of the Total Production on Republic Level in 2012 AD.

Governorate	Kafr Al Sheikh	Dakahlia	Sharkia	Beheira	Beni Suef	Fayoum	Port Said	Minya	Ismailia	Gharbia	Assiut	Suez	Damietta	Alexandria	Menoufia	Total
Area per Thousand Feddans	**124.5**	**72.2**	**46**	**32**	**27.4**	**27.2**	**20**	**19.5**	**18.5**	**10.4**	**7**	**6.5**	**5.7**	**5.5**	**0.8**	**423.2**
The average of Production per Feddan in Tons	**20.1**	**24.6**	**20.6**	**18.5**	**23.5**	**19.2**	**20**	**30.5**	**17**	**23.5**	**32**	**20.4**	**20.6**	**18.3**	**20**	**21.5**
%	**29.4**	**17.1**	**10.9**	**7.6**	**6.5**	**6.4**	**4.7**	**4.6**	**4.4**	**2.5**	**1.7**	**1.5**	**1.3**	**1.3**	**0.1**	**100**

Source: - collected and calculated from the data of the Ministry of Agriculture, Economic Affairs Sector.

Table 12: The Evolution of the Cultivated Areas of Sugar Beet Crop, the average of Productivity per Feddan and the Ratio of the Total Production IN Fayoum Governorate in (2004-2012).

Area per Thousand Feddans	**2**	**3.6**	**6.8**	**12.5**	**23.9**	**20**	**10.5**	**30.5**	**30.5**	**27.2**	An average 15.8
The An an average of Production in Ton/ Feddan	**16.5**	**17**	**16**	**19**	**18.6**	**12.2**	**12.2**	**16.6**	**16.2**	**19.2**	15.5
Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**		

Source: - collected and calculated from the data of the Ministry of Agriculture in Fayoum, Information Center.

Table 13: The Production of Sugar beet in the Producing Companies at the Republic Level in 2012 AD.

Company	Production per Thousand Tons	Percentage % from the Total
Dakahlia	**279**	**27.8**
Delta	**253**	**25.2**
Fayoum	**152**	**15.1**
Nubaria	**126.1**	**12.6**
The Nile	**112.4**	**11.2**
Abu Qurqas	**81**	**8.1**
Total	**1003.5**	**100**

Source: - collected and calculated from the data of the Egyptian companies producing sugar.

Marketing Stages of Sugar Beet:

Sugar beet crop passes many marketing stages as indicated in figure (1). The crop is delivered to the factory which is considered the main producer of raw sugar equivalent to 16% of the amount of the crop. The factory, in its return, either exports to the outside or goes to the wholesaler, the retailer then to the final consumer. However, byproduct forms about 5% of beet pulp which is synthetic fibers marketed in a form of feed that go in its return to the wholesaler, the retailer then to the final consumer. 4% remains from the product to remains in order to be manufactured in a form of nitrogenous materials and mineral salts sold to the factories of processing materials in order to come out in a form of products sold in its return to the wholesaler, the retailer then to the final consumer. Across this trip, the product is exposed to some problems that will be addressed below.

The Problems of Sugar Beet Cultivation in Fayoum Governorate:

First, the Problems Afflicting Farmers:

In order to study these problems, a questionnaire has been designed for all the farmers of sugar beet at the level of the governorate. A sample of 30 farmers has been selected. They are distributed on governorates centers by 5 farmers from each center. Those farmers have been selected randomly. The results of the questionnaire are as shown in table (14). Moreover, the problem is, primarily, a guiding problem as a lot of risks on the crop have resulted from lack of good and ongoing follow up by guides, as the increase in water duty leads to the death of seedlings in the early stages of growth or roots rot in the late stages. These problems represent 33.3% of the problems. This may be the reason of finding some technical problems in manufacturing.

Table 14: The Problems of Sugar Beet Cultivation in Fayoum Governorate from the Point of View of Farmers.

Statement	Farmers No.	Ratio of the Total
1- Lack of good and ongoing follow up by guides	**12**	**40**
2- The Decrease of the amounts supplied to the factory during transport stage	**9**	**30**
3- The inexperience of some farmers	**8**	**26.7**
4- Seedlings death in the early stages, roots rot in the late stages	**10**	**33.3**
5- Lack of the amount of sugar	**6**	**20**
6- There is some insect injuries	9	30

Source: - collected and calculated from questionnaire form of study for Fayoum governorate for 2012 season.

Second, the Problems Afflicting the Factory:

Sugar beet factory in Fayoum factory suffers from commodity stock's accumulation that leads, in its turn, to the increase in storage costs which accumulate day by day until the stock of the last season has become enough for consumption needs until April 2014. Moreover, if the current situation continues, the production of the current season will be enough for consumption until 2015 according to the reports of the Ministry of Foreign Trade. This comes as a result of Ministry of Industry's rejection to extend working by customs duty on imported sugar for 6 months arguing that this violates the rules of World Trade Organization, in which Egypt is a member, and this violates the international norms. America imposes tariffs on sugar by 100%, Turkey by 130 and all European countries are in the same proportion according to FAO in the framework of protecting local industry, and these countries are members in the same organization. In Egypt, importation has become to a great extent. This is in the interest of a class of merchants, and threatens local industry to be collapsed and farmers to bankrupt. In addition to Egypt's greatest need to hard currency especially we have a dangerous economic situation. Factory's problems can be summarized as follows:

1- The accumulation of the commodity stock of raw sugar.
2- There is no imposition of tariff protection for raw sugar.
3- Sugar factories support to farms through the distinctive prices without economic benefits for the factory in the light of raw accumulation. The price of a ton of beet is more than its identical in by about 40% in comparison with price in a country like Brazil. This matter increases the financial burdens and the indebtedness of the factory.
4- The high degree of viscosity, the difficulty of clarification, the reduction in the final output of sugar and increase the proportion of sugar lost in molasses.

Third, the problem of traders and exporters:

Sample of study and the questionnaire form of traders and exporters show that 10 individuals of traders sample and five of exporters have been collected. The following results have been obtained: -

Table 15: The Problems of Traders and Exporters of Raw Sugar in the Sample of Study.

The Statement	The number of Traders/ Exporters	The Ratio of the Total
High Transport Costs	**15**	**100**
High Local Prices Compared to the International Prices	**6**	**40**
The Increase of Fees in the Egyptian Ports	**5**	**33.3**
Containers Accumulation in Ports	**3**	**20**

Source: - collected and calculated from the data of field study in 2013 AD.

High transport costs is one of the most important problems facing traders and exporters alike by 100% as shown in table (15). About 40% of local traders and exporters have referred to the high local costs compared to local prices. Moreover, the increase in the fees of the Egyptian ports forms an impediment for Egyptians by 33.3%, in addition to containers accumulation in ports by 20%, which makes an increase in the costs of export. Also, some exporters are exposed to delay penalties.

Proposals for solving the problems:

The factory is considered a common denominator between the points of production and marketing, between which problems are distributed. Points of production are represented in farms and the factory; however the points of marketing are represented in the factory, traders and exporters. There are solution proposals for both points below

First, the Proposed Solutions for the Problems of Production Points:

1- Emphasizing censorship and careful monitoring for the guides who belong to the factory and the government alike in order to asking the farmers themselves about the number of field visits during planting season and the extent of solving problems permanently. This will be easy through planting the crop in large tracts in a specific area in the governorate interchangeably with other areas through applying the agricultural cycle.
2- Obliging farmers or their legal representatives to be with their crops delivering them to the factory in order to ensure that there are no missed parts from the crops before delivering them.
3- Obliging farmers with the date of uprooting the crops which is determined by the factory, in order to ensure that there is no decrease in the amount of sugar and avoid increasing the ratio of viscosity or microbial load.
4- Taking governmental decisions about codifying the importation and confining it in the amount that the country may need in the future in order to protect the local production and the national industry.
5- Supporting farmers through the government in order to encourage on increasing the production.

Second, the Proposed Solutions for the Problems of Marketing Points:

1- Commissioning Chambers of Commerce to support transporting raw sugar and its products.
2- Adjusting the amounts of importation would adjust the prices of the local market.
3- Adjusting the system of work in the Egyptian ports in collaboration with the Ministry of Commerce would help to prevent accumulating containers in ports and speed shipping.

Recommendations:

The study has found the following:

- The need to reduce the high amounts of consuming sugar at the local level by lowering the per capita consumption rates which is considered one of the highest rates at the global level.
- The possibility of increasing the amounts of sugar produced at the local level through the vertical expansion in the increase of the productivity of sugar beet crop per feddan. The average of productivity per feddan ranges between 20-22 tons/ feddan in comparison with the capabilities of crop productivity at research level. This capabilities amount to (30-40) tons/ feddan and this difference gives a strong indication in reducing the gap and rising the self-sufficiency rate of sugar.
- The possibility of increasing the amounts of sugar produced at the local level through expanding in increasing the cultivated area of sugar beet crop in all the governorates of Egypt especially the governorates of lower Egypt for the existence of multiple comparative advantages of the crop. It successes in all the kinds of land such as the new, old, desert and alkaline lands as this crop needs a small amount of water and affords salinity compared to sugar cane which needs lands with high fertility and high amounts of water. That confirms the high economic efficiency of the production of sugar beet crop compared to sugar cane.
- The increase in the operational efficiency of sugar factories in Egypt in order to receive the new supplied amounts as a result of the expansion in the cultivated areas of sugar beet.
- Expanding in establishing factories producing sugar at the level of governorates in order to meet the horizontal expansion in sugar beet crop.
- Encourage farmers to expand in planting sugar beet, increase the price of supply and decrease the costs of its production and thus increase the net return by: -
- Providing the requirements of production 2- Supporting the production. 3- Eliciting varieties of high productivity in the new lands. 4- Providing agricultural machinery for farmers at the lowest costs.
- Providing agricultural extension to increase the production. 6- Providing a database of producing, marketing and manufacturing sugar beet for the benefit of farmers to increase the production in the new lands.

Abstract:

- Sugar Beet is one of the important strategic crops globally as it needs 2500-3000 m3 of water per feddan during the whole season when it is compared to sugar cane crop that consumes 10-12 thousand m3 of water. Producing sugar beet contributes in providing about 25% of the world production of sugar. Egypt occupies the eleventh rank in terms of sugar production globally that ensures achieving about 50.1% of producing white sugar in Egypt. Although the industry of extracting sugar beet has entered Egypt in 1982, it does not keep pace with the global averages in terms of productivity as it reaches to 20.3 tons/ feddan as an average. About 575 thousand feddans have been cultivated in 2013, and the amount of production was estimated at about 2,1930 tons and the net revenue increases at an annual rate estimated at about 171.2 pounds / feddan, and the factors

affecting the production of sugar from sugar beet crop in Egypt during the period (2000- 2013) are the net yield of sugar beet and the price per ton of beet supplied to factories of producing sugar, high production costs and competitiveness of beet among other alternative winter crops, especially trefoil. The most important factors affecting the consumption of sugar in Egypt during the same period are the amount of local consumption of sugar that increases by about 88.6 thousand tons annually with significance level of 0.01, as an average population that increases by about 1.56 million people annually and rate of consumption of individual of sugar that increases by about 0.547 kg/year. The size of the food gap of sugar is estimated at a rate of 46.9 thousand tons per year, and the rates of self-sufficiency of sugar ranged between a minimum amounted to about 47.2% in 2009, and a maximum amounted to about 73.9% in 2001, with an increase of about 26.7%, the gradual decline reached about 64.7% and the gap has increased with it.

Fayoum governorate cultivates about 27.2 thousand feddans and is ranked as the third after Dakahlia and Kafr Al-Sheikh in terms of quantities produced of sugar beet and stages of sugar production are suffering since agriculture till consumption from some problems. As shown by the results of the field study that about 40% of the farmers suffer from lack of good follow-up of agricultural extension for the crop, resulting in problems in production and manufacturing by 33.3%. By the entry of the crop to the factory, it enters a new stage of production and marketing about 16 % of it is dedicated for the production of raw sugar, 5 % for feed production, 4 % nitrogen materials and mineral salts , are sold to companies and traders or exporters , and nitrogen materials and mineral salts contribute in some manufacturing industries , and large amounts of sugar stocks that are enough for consumption until 2015 accumulate, as a result of rejection of the Ministry of Industry to extend working with customs fees on imports to protect national industry under the pretext of violation of the rules governing the World Trade Organization , of which Egypt is a member, and this violates international norms as America imposes tariffs on sugar by 100 % , Turkey imposes 130% and European countries imposes the same proportion in the framework of the protection of local industry and they are members of the International Organization, in addition to supporting farmers by the factory where the price paid to him is more than the world price, which increases the burden on Egyptian factories. Through the final stages of marketing till the final consumer , 100 % of traders and exporters of the field study sample suffers from high transport costs by about 40 % of the rise in local prices when they are compared to global prices , 33.3% of the exporters suffer from the increase in tariffs of Egyptian ports and about 20 % of them also suffer from the accumulation of container in ports , and the factory is a common factor between production represented by the farmer, the factory producing raw sugar , and marketing represented by the factory , traders and exporters. On one hand, control and good follow-up by extension must be provided to achieve an increase in the quantity and quality of the output crop, forcing the farmer or his representative to be with the weight in the factory to prevent the loss of significant quantities before entering the crop to the factory, the state also should support farms of sugar beet crop to encourage to cultivate more areas and also take tough decisions to codify import and imposing large tariffs on the foreign product in order to protect the national industry and observe working in ports to solve the problems of Egyptians. The most important recommendations are: -

- The necessity to reduce the consumption of high amounts of sugar on the local level by lowering the individual consumption rates and the possibility of increasing amounts of sugar produced at the local level through vertical expansion to increase productivity per feddan and expansion to increase the cultivated of sugar beet crop in all the governorates of Egypt, especially the governorates of lower Egypt because of the multi- crop comparative advantage where it succeed in all new and old , desert and alkaline lands as it needs low amount of water and it bears salinity when it is compared to sugar cane which needs land with high fertility, and high amount of water which confirms the high productivity economic efficiency of sugar beet crop in comparison with sugar cane, expansion in establishing factories producing sugar at governorates level to meet the horizontal expansion of sugar beet crop, encouraging farmers to expand the cultivation of sugar beet, increasing supply price, reducing the cost of production and thus increasing the net yield.

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