The Comparative Advantage of Green Bean Crop in Egypt

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ABSTRACT

The crop of green beans is one of the most important non-traditional crops, as well as promising export crops that can contribute to achieving the objectives of the Egyptian agricultural policy in terms of global demand and the possibility of growing throughout the year on the one hand in the three winter, summer and Nile lions and the possibility of planting them in the new lands and planting them under tunnels Glass. The study aimed to study the production and export conditions of the Egyptian green beans and study the external demand functions by estimating the substitution elasticity model for exports of Egyptian green beans in the most important international markets for Egypt and identifying the most important international markets for Egypt in these markets. The results of the study showed the estimation of external demand functions using the substitution elasticity model for exports of Egyptian green beans to the most important international markets: the Italian market, the UK market and the Dutch market, and the identification of the most competitive markets for Egypt in these markets. The Italian market has shown that Spain is the biggest competitor to the Italian market, second place is Germany, third is Senegal, and Ethiopia is fourth. The 10% increase in exports will lead to a decrease in the quantity exported by 18.34%, 18.58%, 142.71 The relationship between Egypt's exports and the exports of Spain and Germany is complementary, while the current relationship between Egypt's exports and the exports of Senegal and Ethiopia, and flexibility is greater than the correct one, which is flexible in all countries competing with Egypt in this market. In the UK market, Kenya is Egypt's biggest competitor, followed by Guatemala, Zambia (4th), the 10% increase in export prices (3.91%, 23.36%, 35.16% and 42.95%, respectively). It was found that the relationship between the exports of Egypt and Kenya, Zimbabwe and Zambia is related, whereas the relationship between Egypt's exports and exports is complementary, and the elasticity is less than the correct one in Kenya. Greater than the correct one in each of the Guatemalans Zimbabwe and Zambia any request is flexible. In the Netherlands market, Spain is the largest competitor of Egypt in the Netherlands market. Germany ranks second, Kenya ranks fourth and Morocco is the fourth largest exporter. The 10% increase in the export price will lead to a decrease of 1.57% The relationship between Egypt's exports and exports of Germany, Kenya and Morocco is the current one. The relationship between Egypt's exports and Spain's exports is complementary, and flexibility is less than the correct one. Countries compete with the bankers of this market. In the light of the findings, the research recommends the following: The need to expand the cultivation of green beans in the new territories and under glass spending to increase domestic production and the quantity of exports, especially as high prices compared to different vegetable crops. The need for early planting to take into account the season of global demand, especially that Egyptian green beans can be grown in winter, summer and Nile lattices.

Keywords: Comparative advantage, green bean, production, marketing, Egyptian lands, productivity, global markets, price, net return, foreign markets, domestic production.

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Introduction

The green bean crop is one of the most important non-traditional crops and one of the most promising export agricultural crops that can contribute to achieving the objectives of the Egyptian agricultural policy in terms of global demand and the possibility of planting it throughout the year in the three winter, summer and Nile lugs and the possibility of its cultivation in new lands and cultivation under glass tunnels. The winter lug is one of the most important lugs, as it represents about 64% of the total area of green beans grown in Egypt, which makes them have the advantage of exporting at times that may not be available in foreign markets. About 243.13 thousand tons in the average period (2002-2022).

The green bean crop is also one of the agricultural crops that can be relied upon to increase the proceeds of agricultural vegetable exports from foreign exchange, as it comes in third place for vegetable crops exports after potatoes and onions, with an average amount of exports for this crop amounting to about 20.44 thousand tons, and the average value of exports amounting to about 22.70 million dollars in the average study period (2002-2022). as shown in Table (3).

Problem of The Study

Despite the increase in the Egyptian domestic production of the green bean crop and the possibility of increasing it, as it is cultivated in Egypt in more than one loop in the new lands, that is, it can be expanded in cultivation, so the research problem lies in the low ratio of exports to local production, as the percentage of exports reached about 6.7% of The volume of local production during the study period, as shown in Table (3), and the attempt to increase the competitiveness of the green bean crop in its most important global markets, especially the new and promising markets .

Objective of The Study

The research aims to identify the economic dimensions of the production and export of the Egyptian green bean crop. It also aims to study the external demand functions using the Substitution Elasticity Models for the Egyptian green bean exports in its most important global markets.
The most important of which are to achieve a set of sub-goals.

First: The development of productivity indicators for the Egyptian green bean crop.
Second: The development of export indicators for the Egyptian green bean crop.
Third: Instability coefficient of Egyptian green bean exports and production.
Fourth: Geographical distribution of Egyptian green beans exports.
Fifth: The apparent comparative advantage of the Egyptian green beans.
Sixth: Estimating the external demand functions of the Egyptian exports of Egyptian green beans

Method and data sources of The Study

The research relied on the methods of descriptive and quantitative analysis of the economic phenomena and variable sunder study, where the relative importance and annual rate of change were used ,the time trend equations for the variables that were chosen and serve the purpose of the study, and the external demand functions were estimated using the substitution elasticity model for green bean exports in the most important Its global markets, and the research relied on the statistical data published by the Ministry of Agriculture and Land Reclamation in addition to the data of the Food and Agriculture Organization (FAO) and the United Nations data on the international information network for each of them, and many references and studies related to the subject of the research were used.

Results of the study
First: The development of productive indicators of the Egyptian green bean crop.

Table (1) shows the evolution of the cultivated area, per feddan productivity, total production, farm price, total costs, total revenue and net return in Egypt during the period as follows (2002-2022).

Table (1) shows that the cultivated area of the bean crop in Egypt ranged during the period (2002-2022)between a minimum of 37.60 thousand feddans in 2002 and a maximum of about 73.02 thousand feddans in 2005, according to the estimation of the time trend equation The general development of the cultivated area of the bean crop during the period referred to, as shown in Table (2), that the cultivated

area has increased by a statistically significant annual increase, estimated at about 1.16 thousand feddans, which is equivalent to about 2.10% of the annual average of the cultivated area of the bean crop, which is about 55.20 thousand feddans during the study period .

Table 1: Evolution of production indicators for green bean crop in Egypt during the period (2002-2022).

year	Cultivated area thousand feddan	Productivity ton/feddan	Production thousand tons	Farm price pound/ton	Total costs pound/ feddan	Total revenue pound/ feddan	Net return pound/ feddan
2002	40.10	4.12	165.07	611	1197	2525	1328
2003	49.42	4.08	201.80	515	1186	2080	894
2004	44.90	4.89	219.53	406	1226	1983	757
2005	37.60	5.00	187.90	599	1667	2996	1329
2006	46.05	4.34	200.02	789	1293	3433	2140
2007	51.71	3.90	201.63	1180	1346	4578	3232
2008	50.72	4.24	214.89	944	1484	3984	2500
2009	54.90	4.25	233.53	877	1417	3729	2312
2010	64.96	4.33	281.05	804	1435	3472	2037
2011	51.37	4.87	250.07	882	1650	4320	2670
2012	52.03	4.73	245.91	763	1795	3607	1812
2013	52.41	4.95	259.61	930	1954	4651	2697
2014	73.02	4.52	330.26	1556	2080	7031	4951
2015	55.54	4.45	247.38	1472	3269	6492	3123
2016	67.60	4.19	282.90	1404	3069	5895	2826
2017	62.66	4.32	270.74	1600	3807	6878	3071
2018	70.56	4.33	305.56	2133	3967	9171	5204
2019	57.87	4.34	251.28	2303	4272	9996	5724
2020	57.16	4.50	257.47	2378	4403	10699	6296
2021	59.69	4.24	253.11	2415	4843	10868	6025
2022	58.85	4.18	245.99	2347	4672	10398	5716
Average	**55.20**	**4.42**	**243.13**	**1281.33**	**2477.71**	**5656.48**	**3173.52**

Source: Compiled and calculated from the Ministry of Agriculture and Land Reclamation ,Central Administration of Agricultural Economy, Bulletin of Agricultural Economics, various issues.

It was also found that the feddan productivity ranged between a minimum of 3.90 tons/ feddan in 2007, and a maximum of about 5 tons/ feddan in 2005. By estimating the general time trend equation, it is clear that there is an annual decrease that was not statistically significant during the study period.

As for the development of the total production of the green bean crop in Egypt, it fluctuated between increase and decrease during the study period and ranged between a minimum of about 165.07thousand tons in2002 and a maximum of about 330.26 thousand tons in 2014. By estimating the equation of the general time trend of production development The total green bean crop during the period referred to in Table (2) shows that the total production has increased by a statistically significant annual increase estimated at about 4.44 thousand tons, which is equivalent to about 1.83% of the annual average of the total production of the green bean crop, which is about 243.13 thousand. tons during The study period.

As shown in Table (1) the farm price fluctuated between increases and decreases during the study period, and it ranged between a minimum of about 406 pounds/ton in 2004 and a maximum of about 2415 pounds/ton in (2022)By estimating the general time trend equation, it was found The farm price increased annually, statistically significant, estimated at about 100.66pounds/ton, which is equivalent to about 7.86% of the annual average farm price of green beans, which is about 1281.33 pounds/ton, during the study period .

It was also found that the production costs per -feddan of the green bean crop in Egypt fluctuated between increase and decrease, and it ranged between a minimum of about 1186 pounds/ feddan in2003 and a maximum of 4843 pounds/ feddan in 2021, by estimating the general time trend equation for the development of production costs for the crop. Green beans as shown in Table (2) the production costs per- feddan have increased annually, statistically significant, estimated at about 198.90 pounds per feddan, which is equivalent to about 8.03% of the annual average production costs per- feddan of the green bean crop, which amounted to about 2477.71 pounds. / ton during the period the study .

Studying the development of the total revenue per- feddan of the green bean crop during the same period, as shown in Table (1), it fluctuated between increase and decrease, and it ranged between a minimum of about 1983 pounds/ feddan in2004 and a maximum of about 10,868 pounds / feddan in 2013. And by estimating the general time trend equation for the development of the total per- feddan yield of the green bean crop during the period referred to in Table (2) it was found that the total per-feddan revenue increased by a statistically significant annual increase estimated at about 449.17 pounds per- feddan, which is equivalent to 7.94% of the annual average of the total revenue. The green bean crop amounted to about 5656.48. pounds per- feddan during the study period.

As for the development of the net yield per feddan of the green bean crop during the study period(2002- 2022) ,(it was also found that it fluctuated between increase and decrease and ranged between a minimum of about 757 pounds per- feddan in 2004 and a maximum of about 6296 pounds per- feddan in the year (2020), with an estimate Equation of the general temporal trend of the development of the net yield per- feddan of green bean crop during the period referred to in Table (2) it was found that the net yield per- feddan has increased with a statistically significant annual increases teamed at about EGP 249.75 per- feddan, which is equivalent to about 7.87% of the annual average of net yield feddan of green bean crop of about 3173.52pounds per- feddan during the study period .

Table 2: Equations of the general time trend of the development of production for the green bean crop in 2002- 2022).(Egypt during the period)

Dependent variable	Equation	R^2	F	Average	Annual rate of change%
Cultivated area (thousand feddan)	$\hat{p}e = 42.856+1.158x\,e$ (4.415)**	0.520	19.45**	55.20	2.10
Yield (ton/ feddan)	$\hat{Y}h = 4.458\ -\ \_\ 0.004xe$ (- 0.322)	0.005	0.104	4.42	-
Aggregate production (thousand tons)	$\hat{Y}h = 194.29\ +4.110h$ (4.156)**	0.476	17.268**	243.13	1.83
Farm price (pounds/ton)	$\hat{Y}h = 174.119\ +\ 100.6560h$ (10.299)**	0.848	106.066**	1281.33	7.86
Total Costs (pounds/ feddan)	$\hat{Y}h = 289.814\ +\ 198.900xe$ (10.941)**	0.863	119.710**	2477.71	8.03
Total revenue (pounds/ feddan)	$\hat{Y}h = 715.619\ +\ 100.449h$ (11.429)**	0.873	130.615**	5656.48	7.94
Net Return (pounds/ feddan)	$\hat{Y}h = 426.281\ +\ 249.749h$ (8081)**	0.775	65.298**	3173.52	7.87

Where $\hat{p}_e$ = the estimated value of the dependent variable. ,
Where $_e$ = (21 ... ,3 ,2 ,1)   Where x e =the time.
**. Significant at the level of 0.01
Source: Calculated from the data of Table (1)

Second: The development of export indicators for the Egyptian green bean crop

Table (3) shows the evolution of the amount of exports of the bean crop in Egypt during the period (2002- 2022) that it ranged between a minimum of about 3.80 thousand tons in 2006 and a maximum of about 49.67 thousand tons in 2015 and by estimating the equation of the general time trend of the evolution of The quantity of green bean exports during the period referred to in Table (4), it was found that the quantity of green bean exports in Egypt had a statistically significant annual increases teamed at about 1.95 thousand tons, which is equivalent to about 9.52% of the annual average of the quantity of green bean exports The amount of 20.44 about thousand tons during the study period.

It was also found that the value of green bean exports fluctuated between an increase and a decrease and ranged between a minimum of about 0.95 million dollars in 2006 and a maximum of about 63.58 million dollars in 2017. During the period ,as shown in Table (4), the value of green bean exports

has increased, with a statistically significant annual increase, estimated at about $3.48 million, which is equivalent to about 15.35%of the annual average value of green bean exports, which amounted to about. 22.70$million during the study period

Table 3: The development of export indicators for the green bean crop in Egypt during the period (2002- 2022).

Year	Export Quantity (Thousand Tons)	Export value (millions of dollars)	Export price (dollars/ton)	% of exports from domestic production	Instability coefficient		
					Export Quantity	Export price	Production quantity
2002	11.31	3.51	310.34	6.85	1054.08	386.71	16.94
2003	7.55	1.99	263.58	3.74	158.03	1591.60	0.67
2004	5.12	1.15	244.61	2.33	5.09	208.12	5.74
2005	5.44	1.57	288.60	2.90	20.21	76.55	11.39
2006	3.80	0.95	250.00	1.90	56.64	1.59	7.61
2007	5.92	1.37	231.42	2.94	44.72	32.84	8.74
2008	8.18	2.80	342.30	3.81	35.37	21.34	4.65
2009	6.85	1.94	283.21	2.93	53.09	46.13	1.62
2010	5.83	2.05	351.63	2.07	64.77	42.95	19.98
2011	9.23	4.64	502.71	3.69	50.09	28.88	4.77
2012	10.85	5.64	519.82	4.41	46.92	34.81	1.14
2013	24.70	11.56	468.02	9.51	10.34	47.30	4.86
2014	28.53	18.59	651.59	8.64	17.25	33.42	31.05
2015	49.67	34.84	701.43	20.08	89.02	34.39	3.54
2016	48.68	58.57	1203.16	17.21	72.48	3.75	8.44
2017	39.99	63.58	1589.90	14.77	32.55	27.16	2.04
2018	32.39	54.69	1688.48	10.60	0.85	25.92	13.27
2019	24.13	48.12	1994.20	9.60	29.16	39.31	8.36
2020	37.60	57.80	1537.23	14.60	4.42	1.00	7.60
2021	39.20	53.13	1355.36	15.49	3.28	15.95	10.59
2022	24.28	48.29	1988.88	9.87	39.15	16.78	14.45
Average	**20.44**	**22.70**	**798.40**	**8.00**	***29.34**	***31.68**	***6.23**

*Geometric mean
Source: Compiled and calculated from: United Nations website,   International, Network Informationwww.comtrade.un.org .

Table 4: Equations of the general time trend of the development of export the green bean crop in Egypt during the indicators for period (2002- 2022).

Dependent variable	Equation	R^2	F	Average	Annual rate of change%
Export Quantity (Thousand Tons)	$\hat{Y}_h = 0.966 + 1.946x$ (5.287)**	0.595	27.950**	20.44	9.52
Export value (millions of dollars)	$\hat{Y}_h = 16.616 + 3.484h$ (7.837)**	0.764	61.414**	22.70	15.35
Export price (dollar/ton)	$\hat{Y}_h = 198.809 + 90.569h$ (8.443)**	0.790	71.287**	798.40	11.36

where $\hat{Y}_h$= the estimated value of the dependent variable.
e = (21 ... ,3 ,2 ,1) , e = the time variable.
Significant at the 0.01 level**
Source: Calculated from the data of Table (3).

As for the development of the export price per ton for the green bean crop, it has also been found that it fluctuated between increase and decrease and ranged between a minimum of about 231.42 dollars per ton in 2007 and a maximum of about 1994.20 dollars per- ton in 2019 and by estimating the equation of the general time trend of the evolution of the export price of the ton for the bean crop During the period referred to in Table (4) it was found that the export price of the ton had a statistically significant increase, estimated at about $90.57 per - ton annually, which is equivalent to about 11.36% of the annual average export price of a ton of the green bean crop, which amounted to about $798.40 per- ton. during the period. the study.

It also appears from Table (3) (that the ratio of Egyptian exports of green beans to the amount of domestic production during the period (2002-2022) fluctuated between a minimum of about 1.90% of production in 2006 and a maximum of about .%20.08 of production in 2015, while the average period amounted to about 8% of the local production of the Egyptian green bean crop.

Third: The coefficient of instability production exports the Egyptian green bean

By studying the instability coefficients for exports in terms of the development of the exported quantity or its price or the development of the quantity of domestic production, it isone of the most important indicators for judging the stability of exports in the imported markets. The decision to take measures that increase the stability of exports in certain markets.

The instability coefficient is : calculated from the following equation.

$$\text{Where, Instability coefficient} = \left| \frac{P - \hat{P}}{\hat{p}} \right| \times 100$$

Table (3) shows that the quantity of exports, the export price, and the production quantity of the green bean crop were greater than zero in all years of the study, which means that there is a significant degree of instability. The average value of the instability coefficient for the quantity of exports reached during the period (2002-2022) about 29.34%, although there were some low years, especially the years 2002 ,2013 ,2011 ,and 2014, where it reached about 5.09%, 0.85%, 4.42%, and 3.28% ,respectively, while the instability coefficient in some years was high in 2002 ,2016 ,2015 ,2010 ,2003 , where it reached about 1054.08%, 158.03%, 64.77% ,%89.02 ,and 72.48%, respectively .

As for export prices, Table (3) shows that there is no stability in export prices, as the average of this coefficient is about 31.68%, but there are some low years, especially during the years 2006, 2016 and 2020, where this indicator during these years reached about 1.59% , 3.75% and 1%, respectively, while the instability coefficient in export prices was high in some years, such as the years 2002, 2003, 2004, 2005 ,reaching about 386.71%, 1591.60%, 208.12%, and 76.55%, respectively .

As for the coefficient of instability with regard to the amount of green bean crop production during the study period, the average instability coefficient for this period was about 6.23% ,which is characterized by relative stability compared to the quantity exported and the export price. Some years were low, especially 2003, 2004, 2008, 2009 ,2017 ,2015 ,2013 ,2012 ,2011 ,where it reached about 0.67%, 5.74%, 4.65% ,%2.04 ,%3.54 ,%4.86 ,%1.14 ,%4.77 ,%1.62 ,respectively, while the instability coefficient in some years was as high as years 2002, 2010, 2014, 2018, 2022 ,where it reached about 16.94%, 19.98%, 31.05%, 13.27%, and 14.45% ,respectively.

From the above it is clear that the quantity of exports and the export price are more volatile than the quantity produced for the crop during the study period due to the lack of marketing information on the conditions of export to markets, especially the new promising markets that can absorb large quantities of the Egyptian green bean crop. Therefore, it is necessary to study the possibility of increasing the competitiveness of the crop. Green beans in the most important global markets.

Fourth: Geographical distribution of Egyptian green beans exports.

Table (5) shows the most important global markets for green bean exports in terms of quantity, value, and price during the period (2002-2022). The data of the table indicates that the average amount of green bean exports is estimated at about 20.44 thousand tons, with an average value of $22.70 million. The average export price of a ton of green beans was about $798.40/ton during the study period.

Table (5) shows that Italy is one of the most important importing countries for green beans, as the average quantity exported to it from Egypt was about 3.62 thousand tons, which represents about

17.71% of the average total quantities of Egyptian green bean sex ported to the world. Its value amounted to $3.80 million, which represents about 16.74% of the annual average value of the total value of green bean exports to the world.

Table 5: Geographical distribution of Egyptian exports of the Egyptian green in its most important global markets   bean crop during the Period (2002- 2022).

	The state	Export Quantity			Export value			Export price	
		Thousand tons	% of the total annual average	Country ranking	Million dollars	% of the total annual average		Dollar/ton	Country ranking
1	Italia	3.62	17.71	1	3.80	16.74		1049.72	5
2	United kingdom	3.46	16.93	2	4.50	19.83		1300.58	1
3	Holland	2.33	11.40	3	1.79	7.89		768.24	9
4	Belgium	2.21	10.81	4	2.86	12.60		1294.12	2
5	Germany	2.02	9.88	5	2.49	10.97		1232.67	3
6	France	1.44	7.04	6	1.75	7.71		1215.28	4
7	Arab Emirates	1.40	6.85	7	1.26	5.55		900.00	8
8	Saudi Arabia	0.500	2.45	8	0.488	2.15		976.00	7
9	Switzerland	0.385	1.88	9	0.402	1.77		1044.16	6
10	United State	0.158	0.77	10	0.106	0.47		670.89	10
11	other countries	2.92	14.28	-	3.25	14.32		6314.74	-
	Total Exported Quantity (2002-2022)	429.24	-	-	476.7	-		16766.4	-
	Annual average of total exports (2002-2022)	20.44	100	-	22.70	100		798.40	-

Source: Compiled and calculated from: United Nations website, International Network Information. , www.comtrade.un.org   .

Fifth: The apparent comparative advantage of Egyptian green beans

The average export price of a ton of beans was about 1049.72 dollars. While the United Kingdom ranked second, with an average exported quantity of 3.46 thousand tons, representing about 16.93%, and a value of $4.50 million, representing about 19.83% of the average value during the study period. The average price of a ton was about $1300.58, while the Netherlands ranked third. Where the average quantity of green beans exported to it amounted to about 2.33 thousand tons, at a rate of 11.40%, and the average value was 1.79 million dollars, which represents about 7.89 of the average value and an average price of about 768.24 dollars, while Belgium occupies the fourth place, where the average quantity exported to it is about 2.21 thousand tons, representing about 10.81%, at a value of $2.86 million, or 12.60%, and at a price of about $1,294.12/ton, while Germany occupies the fifth place, where the average quantity of beans exported to it reached about 2.02 thousand tons ,or 9.88%, at a value of $2.49 million, at a rate of 10.97%, at a price of %10.97 It amounted to about $1,232.67 per ton. The table also shows that about %66.73 of the average total amount of green bean exports are concentrated in the five aforementioned countries, and the average total value of green bean exports to those countries is about 68.02% of the value of bean exports in the average period (2002- 2022) .Then comes France in sixth place, with an average quantity and value of about 7.04% and 7.71%, respectively. Then the United Arab Emirates ranked seventh with an average quantity and value of about 6.85% and ,%5.55 respectively, then Saudi Arabia, Switzerland and the United States ranked eighth, ninth and tenth, with an average quantity of about 2.45%, 1.88% %0.77 ,and an average value of about 2.15%, 1.77% and 0.47%, respectively, of the average value during the study period. There are other less important countries that import green beans. The average amount of exports amounted to about 2.92 thousand tons, representing about 14.28% of the total average amount of exports, with an average value of about 3.25 million dollars, representing about 14.32% of the total average value of exports. As for the ranking

of green beans importing countries in terms of the export price per ton in dollars, they are United Kingdom, Belgium, Germany, France, Italy, Switzerland, Saudi Arabia ,the United Arab Emirates, the Netherlands, and the United States.

The development of the value of Egyptian agricultural exports, the value of1- Global green bean exports, and the value of global agricultural exports during The period (2002-2022).

Table (6) shows that the value of Egyptian agricultural exports ranged during the period (2002-2022), between a minimum of about 442.25 million dollars in 2004 and a maximum of about 5093.66million dollars in 2018. By estimating the general time trend equation with the development of the value of Egyptian agricultural exports during the same period, as shown in Table (7), it was found that the value of Egyptian agricultural exports has increased by a statistically significant annual increase estimated at about 252.61 million dollars, which is equivalent to about 12.29% of the annual average of about 2054.63 million dollars during the same period. During the study period, it was found that the value of global green bean exports ranged between a minimum of about 0.18 billion dollars in 2003 and a maximum of about 0.79 billion dollars in 2020. By estimating the equation of the general time trend of the development of the value of global green bean exports, it was found that it increased Statistically significant ,estimated at about 0.03 billion dollars annually, which is equivalent to about %7.5of the annual average of about 0.44 billion dollars during the study period, as shown in Table (7) that the value of global agricultural export strangled between A minimum of about $411.03 billion in 2007 and a maximum of about $1396.56 billion in 2020, and by estimating the equation of the general time trend of the development of the value of global agricultural exports, as shown in Table (7), it was found that the value of global agricultural exports increased annually Statistically significant, estimated at about 57.62billion dollars, which is equivalent to about 7.24% of the annual average of about 795.91 billion dollars during the study period.

Table 6: Evolution of the value of Egyptian agricultural exports, the value of global green bean exports, the value of global agricultural exports, and the apparent comparative advantage of Egyptian green beans during the period (2002- 2022).

Year	The value of Egyptian agricultural exports (million dollars)	The value of global green bean exports (billion dollars)	The value of world agricultural exports (billion dollars)	Apparent comparative advantage
2002	536.12	0.19	442.89	15.34
2003	521.09	0.18	465.53	9.71
2004	442.25	0.20	457.52	6.01
2005	571.78	0.21	437.68	5.75
2006	585.76	0.20	417.12	6.91
2007	518.14	0.23	411.03	4.79
2008	620.49	0.24	414.40	7.89
2009	771.78	0.26	442.72	4.36
2010	937.75	0.35	525.35	3.28
2011	1314.30	0.38	607.39	5.64
2012	1167.54	0.45	653.54	6.95
2013	1086.38	0.46	721.47	16.84
2014	1563.41	0.55	873.29	18.95
2015	2176.84	0.59	1067.55	28.96
2016	4406.70	0.54	950.96	23.54
2017	2918.01	0.61	1084.74	38.56
2018	5093.66	0.76	1320.24	18.75
2019	4140.77	0.71	1337.67	22.02
2020	4867.29	0.79	1396.56	21.13
2021	4326.47	0.66	1314.43	24.38
2022	4580.70	0.66	1372.04	21.85
average	2054.63	0.44	795.91	8.29

Sources: Compiled and calculated from the data of the Food and Agriculture Organization (FAO), International Information Network ,www.fao.org

Table 7: Equations of the general time trend of the development of the value of Egyptian agricultural exports, the value of global green bean exports, the value of global agricultural exports and the apparent comparative advantage during the period (2002- 2022).

Dependent variable	The equation	R^2	F	Average	%Annual rate of change
The value of Egyptian agricultural exports (million dollars)	$^\wedge Y_h = 724.051 + 252.607h$ $(8.956)**$	0.808	$(80.216)**$	2054.63	12.29
The value of global green bean exports (billion dollars)	$^\wedge Y_h = 0.080 + 0.033h$ $(14.683)**$	0.919	$(215.600)**$	0.44	7.5
The value of world agricultural Exports (billion dollars)	$^\wedge Y_h = 162.106 + 57.622h$ $(12.051)**$	0.884	$(45.217)**$	795.91	7.24
Apparent comparative advantage (Million dollars)	$^\wedge Y_h = 2.217 + 1.169xe$ $(4.182)**$	0.493	$(17.487)**$	8.29	14.10

Source: Calculated from the data of Table (6).
Where $^\wedge Y_h$:the estimated value of the dependent variable ,x_e :the time variable, where e = (1.2.3…..21) **Significant at the 0.01 level.

2 -The comparative advantage of Egyptian green bean exports

Apparent comparative advantage(RCA) measures Revealed Comparative Advantage Index The relative share of commodity in the exports of country compared to the share of that commodity in world exports where denotes time ,(W) denotes the world. The apparent comparative advantage index value is calculated from the following equation.

$$RCA = = \frac{X_{ij} / X_{it}}{Xwj / X_{wt}}$$

Where :
RCA =stands for Relative Advantage Index.
X_{ij} =The value of exports of commodity in country.
X_{it} =is the value of total exports of country
X_{wj} =is the value of global exports of commodity.
X_{wt} =the value of world total exports

The indicator value ranges from zero to high positive numbers. A value in which the index value is less than 1 means that there is no comparative advantage for the country in this commodity. As for the high value of the apparent relative advantage index, this indicates that the country enjoys an advantage index porting the commodity to the concerned country or region.

Table (6) shows that the comparative advantage index for green bean exports ranged between a minimum of about $3.28 million in 2010 and a maximum of about $38.56million in 2017), with an average of about $8.29 million during the period (2002- 2022). There is a clear discrepancy between the lower and upper bounds of the comparative advantage index for bean exports. From the above it is clear that the value of the relative advantage index for Egyptian green bean exports exceeded the correct one, and this indicates a comparative advantage in the Egyptian green bean exports. By estimating the equation of the general time trend of the development of the comparative advantage during the same period, as shown in Table (7) that the comparative advantage increased with a statistically significant annual increase estimated at about $1.17million, which is equivalent to about 14.10% of the annual average of about 8.29$ million during the period the study.

Estimating the external demand functions for the possibilities of increasing the competitiveness of the green bean
Sixth: Egyptian green bean exports

To identify crop in its most important global markets, the model of flexibility of substitution was used between Egypt and the most important competing countries within the markets currently penetrated by Egypt. And to identify the substitution flexibility and the relationship between Egypt and

its competing countries in the selected markets, namely, the Italian market, the United Kingdom the Dutch market during the period (2002 -2022).

$$Y_{EJ}/Y_{IJ} = F (P_{EJ}/P_{IJ}) . T.$$

Where :

Y_{EJ} =Quantity exported from Egypt to the target market.

Y_{IJ} =Quantity exported from competing countries to the target market.

P_{EJ} =Egypt's export price to the target market.

P_{IJ} = The export price of the countries competing with Egypt in the target market.

$T =$ time.

The elasticity of substitution was estimated directly from the logarithmic equation as follows:

$$Ln (Y_{EJ}/Y_{IJ} = B_0 + B_1 Ln (P_{EJ}/P_{IJ}) T + et .$$

This model is used to estimate the elasticity of substitution between two competing countries in a single market.

Where :

B_1 =elasticity modulus of substitution.

Et =estimation error.

The calculated elasticity reflects the short-term elasticity because the prices used in the model are calculated annually.

1-Estimation of the elasticity of substitution model for Egyptian exports of green beans to the Italian market .

Table (8) shows the results of estimating the substitution model on the Italian market imports from Egypt and its competing countries during the period (2002- 2022). It was found that Spain is the largest price competitor to Egypt in the Italian market, as the elasticity of substitution between Egypt's exports and Spain's exports of green beans in the Italian market amounted to about 1.83, meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 18.3%, which indicates that the relationship between them is complementary.

Table 8: Elasticity of substitution model of demand for green beans in the Italian market during the period (2002- 2022).

Competing countries	Fixed form	Relative price	R^2	q for the function	Substitution flexibility
Germany	2.757 (11.012) *	-1.858 (2.632) **	0.267	6.926**	1.86-
Spain	1.505 (8.000) **	-1.834 (-3.002) **	0.322	9.014**	1.83-
Ethiopia	10.622 (14.535) **	18,549 (13.259) **	0.902	175.80**	18.55
Senegal	11.369 (10.707) **	14.271 (7.595) **	0.752	57.685**	14.27

*Significant at the 0.05 level,   **Significant at the 0.01 level.

Source: Compiled and calculated from: United Nations website, International Information Network , www.comtrade.un.org.

Germany occupies the second place, as the elasticity of substitution between Egypt's exports and Germany's exports in the Italian market amounted to about 1.86 ,meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 18.6%, which indicates that the relationship between Egypt and Germany's exports is a relationship Integral, then Senegal comes in the third place, as the elasticity of substitution between Egypt's exports and Senegal's exports of green beans in the Italian market amounted to about 14.27, meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 142.7%, which indicates that the relationship between

them is alternative , then Ethiopia occupies the fourth place, as the elasticity of substitution between Egypt's exports and Ethiopia's exports of green beans in the Italian market amounted to about 18.55, meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 185.5%, which indicates that the relationship between them is relative.

2 -Estimating the elasticity of substitution model for Egyptian exports of green beans to the UK market .

Table (9) shows the results of estimating the import substitution model for the UK market between Egypt and its competing countries during the period (2002-2022).

It is clear that Kenya ranks first as it is considered the largest price competitor to Egypt in the UK market, as the substitution elasticity between Egypt's export sand Kenya's exports of green beans in the UK market amounted to about 0.391 , meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 3.91%, which indicates that the relationship between them is a substitution relationship, and Guatemala comes in second place as a price competitor to Egypt, as the substitution elasticity between Egypt's exports and Guatemala's exports in the UK market amounted to about 2.34 ,meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 23.36%, which indicates that the relationship between Egypt's exports and Guatemala's is a complementary relationship, then Zambia occupies the third place as a price competitor to Egypt, as the elasticity of substitution between Egypt's exports and Zambia's exports in the UK market amounted to about 3.52, meaning that an increase in the export price by 10%will lead to a decrease The exported quantity is 35.16%, which indicates that the relationship between Egypt and Zambia's exports is a substitution one ,then Zimbabwe comes in fourth place as the substitution elasticity between Egypt's exports and Zimbabwe's exports of the alpha crop Green soybeans in the UK market amounted to about 4.30, meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 42.95%, which indicates that the relationship between Egypt's exports and Zimbabwe's exports is an alternative one.

Table 9: Substitution elasticity model for demand for green bean sin the UK market during the period (2002-2022).

Competing countries	Form constant	Relative price	R^2	q for the function	Substitution flexibility
Kenya	-1.365 (-14.243) **	0.391 (3.153) **	0.343	9.941**	0.39
Guatemala	1,350 (3.320) **	-2.336 (-3.856) **	0.592	13.032**	-2.34
Zimbabwe	4.020 (6.675) **	4.295 (4.366) **	0.501	19.059**	4.30
Zambia	3.994 (4.479) **	3.516 (2.372) *	0.228	5.625*	3.52

*Significant at the 0.05 level ,   **Significant at the 0.01 level.

Source: Compiled and calculated from: United Nations website, International Information Network , www.comtrade.un.org.

3 -Estimation of the elasticity of substitution model for Egyptian exports of green beans to the Dutch market

Table (10) shows the results of estimating the substitution model on the Dutch market imports between Egypt and its competing countries during the period (2002- 2022). Egypt and Spain's exports to the Dutch market amounted to about 0.157, meaning that an increase in the export price by 10% will lead to a decrease in the export equinity by 1.57%, which indicates that the relationship between them is a complementary relationship, then Germany occupies the second place as a price competitor to Egypt in the Dutch market as the flexibility of substitution Between Egypt's exports and Germany's exports to the Dutch market, the amounted to about 0.718, meaning that an increase in the export price by 10%will lead to a decrease in the exported quantity by 7.18%, which indicates that the relationship between them is a substitution relationship, then Kenya comes in third place as the substitution flexibility among Egypt's exports Kenya's exports to the Dutch market amounted to about 0.729, meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by 7.29%, which indicates

that the relationship between Egypt and Kenya's exports is a substitution relationship, then it occupies the fourth tempting rank. B as a price competitor to Egypt in the Netherlands market, as the elasticity of substitution between Egypt's exports and Morocco's exports in the Netherlands market amounted to about 0.997, meaning that an increase in the export price by %10 will lead to a decrease in the exported quantity by 9.97%, which indicates that the relationship between Egypt and Morocco's exports is a substitution relationship.

Table 10: Replacement elasticity model of demand for green bean crop in the Dutch market during the period (2002- 2022).

Competing countries	Fixed form	Relative price	R^2	q for the function	Substitution flexibility
Germany	-0.102 (-1.184)	0.718 (11.984) **	0.883	143.609**	0.718
Kenya	0.608 (3.461) **	0.729 (4.152) **	0.476	17.238**	0.729
Spain	-0.156 (-1.770) *	-0.157 (-3.954) **	0.451	15.631**	0.157
Morocco	-0.340 (-1.689)	0.997 (14.667) **	0.919	215.111**	0.997

*Significant at the 0.05 level   ,** Significant at the 0.01 level.
Source: Compiled and calculated from: United Nations website, International Information Network , www.comtrade.un.org.

Summary and recommendations

The green bean crop is one of the most important non-traditional crops and also one of the most promising export agricultural crops that can contribute to achieving the objectives of the Egyptian agricultural policy in terms of global demand and the possibility of planting it throughout the year on the one hand in the three winter, summer and Nile lugs and the possibility of planting it in new lands and planting it under tunnels vitreous.

The research aimed to study the production and export conditions of the Egyptian green bean crop and study the external demand functions using the model of elasticity of substitution for the Egyptian green bean exports in the most important global markets, and to identify the most important competitive markets for Egypt in these markets.

A study of the geographical distribution of Egypt's exports showed that the most important global importing markets for Egyptian green beans are Italy, the United Kingdom and the Netherlands, respectively, with rates amounting to about 17.71% ,%16.93 ,and 11.40% of the amount of Egyptian green beans exported by Egypt, and the percentage of the value of exports amounted to about 16.74 %, 19.83%, 7.89%of the value of Egypt's exports of green beans, and accordingly, the external demand functions were studied by estimating the elasticity of substitution model for Egypt and the most important competing countries for Egypt in these markets during the period (2002-2022).

A study of the comparative advantage of Egyptian green bean exports showed that the relative advantage index ranged between a minimum of about $3.28 million in 2010 and a maximum of about $38.56 million in 2017, with an average of about $8.29 million during the period (2002- 2022) .(Which indicated a comparative advantage in the Egyptian green bean exports.

As it was shown from the study of external demand functions using the substitution elasticity model for Egyptian green bean exports to the most important global markets, which are the Italian market, the United Kingdom market, and the Dutch market, and identifying the most important competitive markets for Egypt in these markets, it has been shown with regard to the Italian market that Spain is considered the largest price competitor to Egypt in the market Then Germany ranks second, Senegal ranks third, and Ethiopia ranks fourth, where the relative export price reached about 1.834, 1.858, 14.271, and 18.549 ,respectively, meaning that an increase in the export price by 10% will lead to a decrease in the exported quantity by rates of about 18.34%. 18.58%, 142.71% ,and 185.49%, respectively. And that the relationship between Egypt's export sand the exports of Spain and Germany is a complementary relationship, while it was a substitution relationship between Egypt's exports and those of Senegal and Ethiopia, and that the elasticity of substitution is greater than the correct one, i.e. demand is elastic in all countries competing with Egypt in this market.

It was also found that for the UK market, Kenya is the largest price competitor to Egypt ,ranked second by Guatemala, ranked third by Zambia, and ranked fourth by Zimbabwe, where the relative price for export was about 0.391, 2.336, 3.516 ,4.295 , respectively, meaning that the increase in the export price by 10% will lead to a decrease in the exported quantity by rates of about 3.91%, 23.36% , ,%42.95 ,%35.16respectively. It became clear that the relationship between Egypt's exports and Kenya, Zimbabwe and Zambia is a substitution relationship, while the relationship between Egypt's exports and Guatemala's exports is complementary. The elasticity was less than one, meaning demand is inelastic in Kenya, while the elasticity was greater than one, meaning demand is elastic in Guatemala, Zimbabwe and Zambia.

The Dutch market also shows that Spain is the largest price competitor to Egypt in the Netherlands market. Germany comes in second place, Kenya ranks third, and Morocco ranks fourth, with the export price reaching about 0.157, 0.718, 0.729 ,0.997 ,respectively, meaning that the increase in the export price by 10%, it will lead to a decrease in the exported quantity by rates of about 1.57% , ,%9.97 ,%7.29 ,%7.18respectively. It also became clear that the elasticity of substitution is less than the correct one, that is, the demand is inelastic in all countries competing with Egypt in this market.

In light of the results reached, the research recommends the following:

1- The need to expand the cultivation of green beans in new lands and under glass tunnels to increase local production and the quantity of exports, especially since they are of high prices compared to different vegetable crops.

2- The necessity of early planting dates to take into account the seasons of global demand, especially that Egyptian green beans can be grown in the winter, summer and Nile seasons.

3- The necessity of the availability of international standards for export in terms of quality for each market separately, with the need to pay attention to marketing operations such as sorting, grading and packaging, and taking into account the tastes of the consumer in each market in terms of the volume of beans required.

The comparative advantage of green bean crop in Egypt

The crop of green beans is one of the most important non-traditional crops, as well as promising export crops that can contribute to achieving the objectives of the Egyptian agricultural policy in terms of global demand and the possibility of growing throughout the year on the one hand in the three winter, summer and Nile lions and the possibility of planting them in the new lands and planting them under tunnels Glass.

The study aimed to study the production and export conditions of the Egyptian green beans and study the external demand functions by estimating the substitution elasticity model for exports of Egyptian green beans in the most important international markets for Egypt and identifying the most important international markets for Egypt in these markets.

The results of the study showed the estimation of external demand functions using the substitution elasticity model for exports of Egyptian green beans to the most important international markets: the Italian market, the UK market and the Dutch market, and the identification of the most competitive markets for Egypt in these markets.

The Italian market has shown that Spain is the biggest competitor to the Italian market, second place is Germany, third is Senegal, and Ethiopia is fourth. The 10% increase in exports will lead to a decrease in the quantity exported by 18.34%, 18.58%, 142.71 The relationship between Egypt's exports and the exports of Spain and Germany is complementary, while the current relationship between Egypt's exports and the exports of Senegal and Ethiopia, and flexibility is greater than the correct one, which is flexible in all countries competing with Egypt in this market.

In the UK market, Kenya is Egypt's biggest competitor, followed by Guatemala, Zambia (4th), the 10% increase in export prices (3.91%, 23.36%, 35.16% and 42.95%, respectively. It was found that the relationship between the exports of Egypt and Kenya, Zimbabwe and Zambia is related, whereas the relationship between Egypt's exports and exports is complementary, and the elasticity is less than the correct one in Kenya. Greater than the correct one in each of the Guatemalans Zimbabwe and Zambia any request is flexible.

In the Netherlands market, Spain is the largest competitor of Egypt in the Netherlands market. Germany ranks second, Kenya ranks fourth and Morocco is the fourth largest exporter. The 10% increase in the export price will lead to a decrease of 1.57% The relationship between Egypt's exports

and exports of Germany, Kenya and Morocco is the current one. The relationship between Egypt's exports and Spain's exports is complementary, and flexibility is less than the correct one. Countries compete with the bankers of this market.

In the light of the findings, the research recommends the following:

- The need to expand the cultivation of green beans in the new territories and under glass spending to increase domestic production and the quantity of exports, especially as high prices compared to different vegetable crops.
- The need for early planting to take into account the season of global demand, especially that Egyptian green beans can be grown in winter, summer and Nile lattices.

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