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An Economic Analysis of the Production and Determinants of the Egyptian Export Traceability System of Green Beans to the European Union Countries

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Abstract: Green beans are considered one of the most important vegetable crops due to their high nutritional value. Egypt's production amounted to about 176 thousand tons, and it exports about 18.24 thousand tons, at a value of $30.13 million, during the average period (2019-2021). Hence, the percentage of exports is not commensurate with the available productive energies, in addition to the presence of some exporting companies that do not adhere to the internationally agreed export rules, which results in returning the green beans trucks that do not conform to the required specifications as a result of the lack of entry into an integrated central trace system for agricultural exports, The research mainly aims to identify the current situation for the production and export of Egyptian green beans and to study the factors affecting the export Traceability system and the extent of its application in companies and farms producing and exporting Egyptian green beans. The results indicate a decrease in the area by about 1.54 thousand feddans and Yield by about 0.051 tons annually, which led to a decrease in the total production of green beans by about 7.9 thousand tons annually, The European Union markets import about 77.6% of Egypt's total exports of green beans, And it turns out from the study of factors that affect the export Traceability system in producing companies and exporting Egyptian green beans to the European Union markets, The increase in export experience, project size, and project management model leads to an improvement in following the traceability system by about 307%, 872%, and 329%, respectively, The research recommends raising production efficiency and high quality by cultivating distinctive varieties and good agricultural transactions suitable for export, Providing support and support for companies operating in the export of green beans with the Traceability system, especially for markets that have conditions such as the European Union markets.

Introduction:

The green bean crop belongs to the legume family, and it is considered one of the most important Egyptian vegetable crops for export. It gains its productive importance from the short period of its stay in the soil and that it is grown most of the year (except for the very hot or very cold months), in addition to its nutritional value, as it is rich in minerals, vitamins and fiber. And protein, in addition to that, it is a good source of employment in the Egyptian villages due to the high numbers of its own workers, and it has a high economic return, whether for the product or the source. The green bean crop ranks second after potatoes in terms of export, as the exported quantity amounted to about 18.24 thousand tons, at a value of $30.13 million, during the period (2019-2021). The European Union countries account for about 77.6% of the total exports of the Egyptian green bean crop.

Problem:

It is represented in the fluctuation of the amount of green bean exports, its instability, and its low growth rate in a way that is not commensurate with the available productive capacities, as the ratio of exports to domestic production reached about 10.4% during the average period (2019-2021). This is in addition to the existence of some exporting companies that do not adhere to the rules regulating export and internationally agreed upon, which results in the return of shipments of the green bean crop that do not conform to the required specifications, and sometimes they reach the cessation of imports from Egypt, which affects the Egyptian trade balance, as a result of the failure of these companies to enter into a Traceability system. An integrated center for agricultural exports.

Objective:

Objective of the Research is to increase the Egyptian exports of the green bean crop, by identifying the

current situation for the production and export of Egyptian green beans. And a study of the factors affecting the Traceability system of green beans exports and the extent of its application in companies and farms producing and exporting green beans to the most important foreign markets, which are the markets of the European Union countries.

Method and Data Sources:

The inductive method was relied on in the economic analysis, both descriptive and quantitative, and the use of some analysis methods such as the simple regression method, relative importance, market share, market penetration rate, and the logistic regression model.

The research relied on two types of data: The first type is the secondary data obtained from several sources, including the publications of the Economic Affairs Sector of the Ministry of Agriculture and Land Reclamation, the website of the World Trade Map, and the second type is the preliminary data of a random sample that includes 35 questionnaires for companies producing and exporting Egyptian green beans, in addition to references science related to the subject of the study

Results:

First: The Productive Status of Green Beans in Egypt:

1- Productive and Economic Indicators of the Green Bean Crop:

By extrapolating the data for the period (2005-2020) in table (1) as well as the statistical analysis for it in table (2), the following is clear:

Area: The cultivated area ranged from about 33.3 thousand feddan as a minimum in 2019, and about 73.02 thousand feddan as a maximum in 2007, and it was found that the area of green beans decreased at a statistically significant annual rate estimated at about 1.54 thousand feddan which represents about 2.8% of the average area cultivated with green beans (amounting to about 54.06 thousand feddan) during the study period.

Yield:

The productivity of a feddan ranged between a minimum of about 3,794 tons in 2016, and a maximum of about 4,950 tons in 2006, with an increase of about 15.5% over the average productivity of a feddan during the study period, which was estimated at about 4,273 tons. It was found that the productivity of a feddan decreased at a significant annual rate. Statistically, it amounted to about 0.051 tons, representing about 1.2% of the average crop yield during the study period.

Production:

The production of the bean crop ranged between a minimum of about 167.95 thousand tons in 2018, and a maximum of about 330.26 thousand tons in 2007, an

increase of about 37.5% from The average total production during the study period, estimated at about 236.35 thousand tons, and the total production took a general, statistically significant decreasing trend, estimated at about 7.95 thousand tons, representing about 3.3% of the average total production of the crop during that period**.**

The Farm Price:

It was characterized by the increase during the study period, as the minimum reached about 763 pounds per ton in 2005, and the maximum reached about 3409 pounds per ton in 2020, an increase of about 36.4 % over the average farm price of about 2237 pounds/per ton, and it turned out that the farm price increases morally an increase estimated at about 161.9 pounds/tons annually, representing about 7.2 % of the average during the study period.

Feddan Revenue:

The revenue fluctuated between a decrease and an increase, as the minimum amounted to about 3609 pounds/feddan in 2005 and the maximum amount to about 13358 pounds/feddan in 2020. The increase in the feddan revenue amounted to about 587.1 pounds per feddan, and its significance was confirmed statistically and represents about 6.3% of the average. The feddan revenue of the crop (estimated at about 9360 pounds per feddan) during the study period.

Feddan Costs:

Feddan Costs increased during the study period from about 1795 pounds per feddan in 2005 to about 6678 pounds per feddan in 2020, an increase of about 272% over 2005. It was found that the annual increase in feddan costs amounted to about 313 pounds per feddan. The significant increase was confirmed statistically and represents About 7.1% of the average federation cost of 4402 pounds during the study period. Feddan costs: increased during the study period from about 1795 pounds per feddan in 2005 to about 6678 pounds per feddan in 2020, an increase of about 272% over 2005. It was found that the annual increase in feddan costs amounted to about 313 pounds per feddan. The significant increase was confirmed statistically and represents About 7.1% of the average federation cost of 4402 pounds during the study period**.**

Production Costs of Ton:

Tends to increase in general, reaching a minimum value of about 379.5 pounds in 2005, and a maximum of about 1704.5 pounds in 2020. It was also found that the annual increase amounted to about 85.01 pounds, which is statistically significant and represents about 8.1% of the average of about 1056 pounds during that period.

Net Yield Per Feddan:

It was shown that it tends to increase in general, as the minimum amounted to about 1812 pounds in

2005, and the maximum amounted to about 8106 pounds in 2020. It was also found that the annual increase amounted to about 374.3 pounds, which is statistically significant and represents about 6.9% of the average of about 5428 pounds during the same period.

Net Yield Per Ton:

It ranged between a minimum of about 383 pounds per ton in 2005, and a maximum of about 2069 pounds per ton in 2020, an increase of about 59.3% over the average net yield of a ton during the study period, which is estimated at about 1299 pounds per ton. A general increasing statistically significant trend estimated at about 378.6 pounds per ton, representing about 29.1% of the average net yield per ton of the crop during the study period.

The Profitability of the Spent Pound:

Tends generally towards decreasing, as its minimum value reached about 0.81 pounds in 2010, and the maximum amounted to about 2.38 pounds in 2007, and the annual average was about 1.26 pounds. It was found to be relatively stable due to the non-significance of the regression coefficient during the study period.

Table (1): The Evolution of the Productive and Economic Indicators of Green Beans in Egypt during the period -2021) (2005

Year	Area	Yield	Prod.	Price of farm	Total Revenue	Costs	Prod. costs of Ton	Net Return	Net Return of Fed.	Profitability of the pound
	Thousand fed.	ton/fed	Thousand fed.	L.E/ton	L.E/fed	L.E/fed	L.E/ton	L.E/fed	L.E/ton	L.E
2005	52.03	4.730	245.91	763	3609	1795	379.5	1812	383	1.01
2006	52.41	4.950	259.61	930	4604	1954	394.7	2697	545	1.38
2007	73.02	4.520	330.26	1556	7033	2080	460.2	4951	1095	2.38
2008	55.54	4.450	247.38	1472	6550	3269	734.6	3223	724	0.99
2009	67.60	4.185	282.90	1404	5876	3069	733.3	2826	675	0.92
2010	62.66	4.321	270.74	1600	6914	3807	881.0	3071	711	0.81
2011	70.56	4.330	305.56	2133	9236	3967	916.2	5204	1202	1.31
2012	57.87	4.342	251.28	2303	9999	4272	983.9	5724	1318	1.34
2013	57.16	4.504	257.47	2378	10711	4403	977.6	6296	1398	1.43
2014	59.69	4.241	253.11	2415	10241	4843	1142.0	6025	1421	1.24
2015	59.31	4.205	249.40	2347	9869	4672	1111.1	5726	1362	1.23
2016	50.95	3.794	193.29	2751	10439	5397	1422.5	6613	1743	1.23
2017	42.11	4.177	175.90	2916	12181	5717	1368.7	6986	1672	1.22
2018	41.43	4.054	167.95	3080	12488	6038	1489.3	7360	1815	1.22
2019	33.30	3.972	177.03	3245	12889	6358	1600.7	7733	1947	1.22
2020	44.53	3.918	174.50	3409	13358	6678	1704.5	8106	2069	1.21
2021	38.91	3.945	175.76	3327	13124	6518	1652.6	7920	2008	1.22
Average	54.06	4.273	236.35	2237	9360	4402	1056.0	5428	1299	1.26
standard deviation	11.31	0.30	50.02	833.85	3081.48	1599.77	434.62	2023.98	540.31	0.33
coefficient of difference	0.209	0.070	0.212	0.373	0.329	0.363	0.412	0.373	0.416	0.265

Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration for Agricultural Economy, Agricultural Statistics Bulletin, various numbers.

It is clear from the foregoing that as a result of the decrease in both the area and productivity of Egyptian green beans, it led to a decrease in production, and then the need to increase the feddan productivity by cultivating high-yielding varieties and applying modern technological packages to increase the net yield of farms and increase profitability.

2- Geographical Distribution of Green Beans Cultivation in Egypt:

By studying the geographical distribution of the area cultivated with the green bean crop in Egypt during the period (2019-2021) in Table (3), which are grown in three seasons: winter (from the beginning of October - November), summer (from the beginning of February to mid-March), and indigo (the last week from August until the first week of September) and season winter occupies the first ranking in terms of area and production and contributes about 32.4 thousand feddans, 127.7 thousand tons, representing about 75.1% and 73.7%, respectively, of the average

total area and production of green beans at the level of the Republic, which amounts to about 43.08 thousand feddans, 173.2 thousand tons,About 78.8% of the winter lug area is cultivated in the Nubariya region, and the governorates of Giza and Ismailia, with an average area of about 19,628, 3,546, and 2,309 thousand fed.,, representing about 60.7%, 10.9%, or 7.1% of the average total winter season area, and contributes to a production of about 61.3, 21.7, 12.3 thousand tons, representing about 47.9%, 17%, and 9.6%, respectively, of the average season production during that period .

Table (2): Time Direction Equations for Green Bean Production Variables in Egypt during the Period (2005- 2021).

Variables	Unit	Constant	Slope	T value	Annual average	Annual change rate	The coefficient of determination	Level of significance
Area	k fed	67.9	-1.54	-3.7	54.06	-2.8	0.47	**
Yield	fed/ ton	4.7	-0.051	-6.3	4.273	-1.2	0.73	**
Total Prod.	k ton	307.9	-7.9	-5.2	236	-3.3	0.64	**
Farm Price	pound/ton	779.4	161.9	19.6	2237	7.2	0.96	**
Fed Revenue	pound/fed	4076.4	587.1	13.7	9360	6.3	0.93	**
Fed Costs	pound/fed	1585.1	313	24.8	4402	7.1	0.98	**
Prod. Costs	pound/ton	290.9	85	24.5	1056	8.1	0.97	**
Net Yield	pound/fed	2059.1	374.3	10.1	5428	6.9	0.87	**
Net Yield	pound/ton	378.6	102.3	12.6	1299	7.9	0.91	**
Pound Profitability	L.E	1.33	- 0.01	- 0.45	1.26	0.79	0.013	-

(**)significance at the level of 0.1   (-) non- significance
Source: Collected and calculated from Table (1).

Table (3): Geographical Distribution of Green Beans at the Level of the Most Important Governorates in Egypt during the period(2019-2021) :

Governorate	Aera Fed.	Yield Ton	Proud. Ton	% of the season area	% of the season proud.
Nubaria	19628	3.121	61266	60.66	47.98
Giza	3546	6.092	21705	10.96	17
Ismailia	2309	5.302	12307	7.14	9.64
Other	6874	3.492	32402	21.24	25.38
Total of season winter	32356	3.952	127681	100	100
Gharbia	1050	3.612	3823	20.9	17.54
Dakahlia	1045	4.892	5183	20.8	23.77
Giza	892	5.502	4887	17.37	22.42
Alexandria	718	3.601	2590	14.29	11.88
Other	1319	3.392	5318	26.26	24.39
Total of season summer	5024	4.331	21802	100	100
Giza	2182	5.965	12988	40.88	53.98
Nubaria	1565	3.09	4831	29.32	20.08
Menoufia	741	3.334	2415	13.89	10.04
Other	849	3.946	3827	15.91	15.91
Total of season Nile	5336	4.479	24060	100	100
Total republic	43077	4.021	173157	_	_

Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration of Agricultural Economy, Bulletin of Agricultural Statistics, various issues.

The Nile season comes second with about 5.3 thousand feddans, contributing about 24.1 thousand tons, representing about 12.4% and 13.9%, respectively, of the average total area and production of the Republic of the green bean crop .Cultivation of about 84.1% of the Nile season is concentrated in Giza, the Nubariya region, and Menoufia, on about 2.2, 1.6, and 0.741 thousand feddans, representing about 40.9%, 29.3%, and 13.9%, respectively, of the average total area of the Nile season, with a production volume of about 12.9, 4.8, 2.4 thousand tons, representing about 53.9%, 20.1%, 10.0% of the average total production of the Nile Season.

The season summary occupies the third ranking with about 5.0 thousand fed., 21.8 thousand tons, representing about 11.7% and 12.6%, respectively, of the average total area and production of the crop at the level of the Republic.About 73.6% of the summer plot area is cultivated in the governorates of Gharbia, Dakahlia, Giza, and Alexandria, with about 1.050, 1.045, 0.892, and 0.718 thousand feddans, representing about 20.9%, 20.8%, 17.4%, and 14.3%,

respectively, of the total average summer plot area. It contributes about 3.8, 5.2, 4.9, 2.6 thousand tons, representing about 17.5%, 23.6%, 22.4%, and 11.9% of the total average summer production.

Second: The Export Status of Egyptian Green Beans

1. Export Indicators of Green Beans

By studying the export indicators of Egyptian green beans during the period (2005-2021), it is clear from the data of Table (4) and the statistical analysis thereof in Table (5) that:

- **The Quantity of Exports**: ranged between increase and decrease, with an average of about 30.06 thousand tons during the study period, and the minimum amounted to about 10.85 thousand tons in 2005. The maximum amount reached about 49.67 thousand tons in 2008, and it exceeds the average by about 65.2%, and it was found to be decreasing by a non-significant amount statistically. Which indicates that it fluctuated around the mean during that period.

Table (4): Evolution of the Quantity, Value and Price of Exporting Green Beans in Egypt during the period-2021) (2005

Year	Proud. quantity	Export quantity	Export value	Export price	Export dependence	Percentage of exports For Production
	thousand ton	Thousand tons	Million dollars	ton (dollars)	(**)	%
2005	245.9	10.85	5.64	520	0.042	4.41
2006	259.6	24.7	11.56	468	0.087	9.52
2007	330.3	28.53	18.59	652	0.08	8.64
2008	247.4	49.67	34.84	701	0.167	20.08
2009	282.9	48.68	58.57	1203	0.147	17.21
2010	270.7	39.99	63.58	1590	0.129	14.77
2011	305.6	32.39	54.69	1689	0.096	10.6
2012	251.3	24.13	48.12	1995	0.088	9.6
2013	257.5	37.6	57.8	1537	0.127	14.6
2014	253.1	39.2	53.13	1355	0.134	15.49
2015	249.4	31.7	48.04	1515	0.113	12.71
2016	193.3	32.61	48.75	1495	0.144	16.87
2017	175.9	27.72	37.92	1368	0.136	15.76
2018	168	28.58	33.35	1167	0.145	17.01
2019	177	30.4	27.75	913	0.147	17.17
2020	174.5	11.9	30.01	2521	0.064	6.82
2021	175.8	12.41	32.63	2629	0.066	7.06
Average	236.4	30.06	39.12	1372	0.112	12.72
Standard deviation	50.02	11.37	17.01	627.17	0.04	4.55
Coefficient of Variation	0.21	0.38	0.43	0.46	0.32	0.36*

(**)Dependence on export = quantity of exports / (quantity of exports + domestic production)

(*)Geometric mean, **Source**: www.trademap.org.

- **The Value of Exports**: began to fluctuate during the study period between a minimum of about $5.64 million in 2005 and a maximum of about $63.58 million in 2010. It is higher than the average by about 62.5%, which is about $39.12 million. It was found that the increase in the value of beans exports Green is not statistically significant. This indicates that the values fluctuate around their average over the study period.
- **Export Price:** The average export price per ton of green beans was about $1372/ton during the study period. The price fluctuated between a minimum of about $468 in 2006 and a maximum of about $2,629 in 2021. It exceeds the average by about 91.6%, and it was found to increase by a statistically significant annual amount of about $84.6/ton, with an increase rate estimated at about

6.17% from the average during the aforementioned study period.

The Relative Importance of the Quantity of Green Bean Exports in Relation to Production:

It was characterized by fluctuation during the study period, with an average of about 12.72%, a minimum of about 4.41% in 2005, and a maximum of about 20.08% in 2008. It was found that it increases by an annual rate that is not statistically significant, which indicates that it fluctuates. About the average during the study period.

From the foregoing, it is clear that the exported quantity of Egyptian green beans decreased, and the export price increased, which reduces its competition in European markets, so work must be done to increase the amount of exports figure (2)
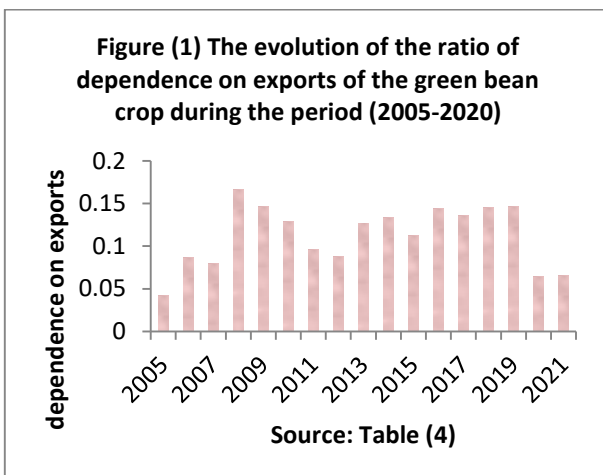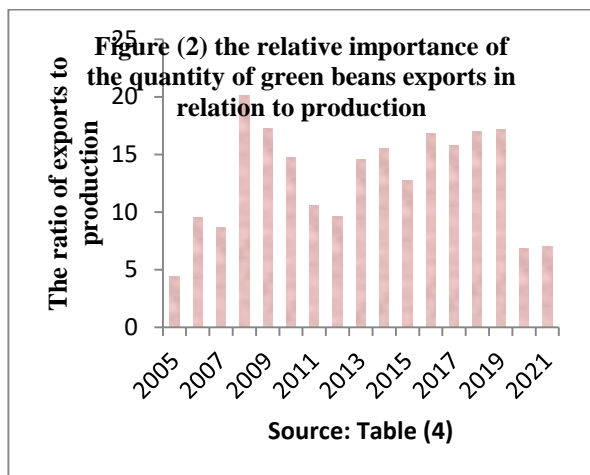

Figure (2) the relative importance of the quantity of green beans exports in relation to production

Source: Table (4)

Figure (1) The evolution of the ratio of dependence on exports of the green bean crop during the period (2005-2020)

Source: Table (4)

Table (5): Time Trend of Egyptian green bean Exports during the period (2021-2005) .

Variables	Unit	Constant	Slope	T value	R²	Average	% Rate of change
Quantity of Exports	thousand ton	35.9	0.65-	1.16-	0.08	30.06	2.16
Value of Exports	Million $	33.4	0.63	0.74	0.04	39.12	1.6
Export price	$/ton	610	84.6	**3.6	0.46	1372	6.17
% Quantity of Exports for production	%	11.8	0.12	0.52	0.02	0.32	37.5

 **Significant at 0.01

Source: Compiled and calculated from Table(4) .

2- The Most Important Export Markets for the Egyptian Green beans Crop:

By studying the geographical distribution of Egyptian green bean exports, it was found from Table (6) that they are concentrated in the European market, where the European market accounts for about 77.6% of the quantity, and about 82.3% of the value, and includes the United Kingdom, Germany, the Netherlands, Belgium, Italy, and France in quantities

of about 5.51, 3.28, 3.06, 2.34, 1.93, 1.11 thousand tons. It represents about 24.81%, 14.78%, 13.81%, 10.53%, 8.68%, and 5.01% of the average total quantity of Egypt's exports of green beans, which amounted to about 22.203 thousand tons. It was value about 9.48, 4.65, 3.45, 3.81, 3.08, 2.14 million dollars. It represents about 29.32%, 14.40%, 10.67%, 11.78%, 9.54%, and 6.61%, respectively, of the average total value of Egyptian green bean exports, estimated at

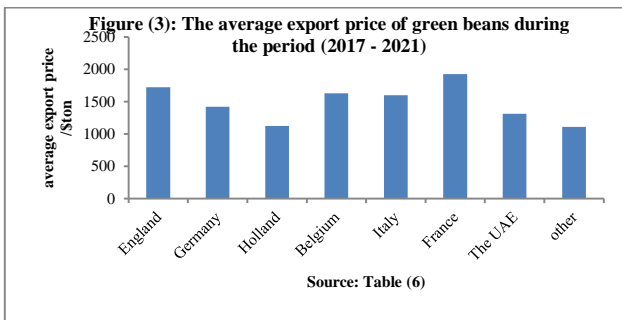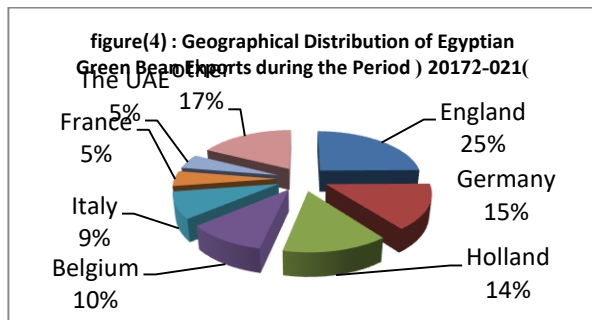about $ 32.33 million, with an average price of about $ 1456 per ton as an average for the period-2021) (2017.

figure(4) : Geographical Distribution of Egyptian Green Bean Exports during the Period) 20172-021(

Figure (3): The average export price of green beans during the period (2017 - 2021)

Source: Table (6)

Table (6): Geographical Distribution of Egyptian Green Bean Exports during the Period (2017-2021)

Country	Quantity of exports		Value of exports		Average of Ex., price /Ton ($)
	Thousand Ton	% from Total	Thousand $	% from Total	
England	5.51	24.81	9480	29.32	1721
Germany	3.28	14.78	4654	14.4	1418
Holland	3.07	13.81	3449	10.67	1125
Belgium	2.34	10.53	3808	11.78	1629
Italy	1.93	8.68	3083	9.54	1600
France	1.11	5.01	2138	6.61	1923
Emirates	1.07	4.82	1405	4.35	1312
Other	3.9	17.57	4314	13.34	1106
World	22.2	100	32330	100	1456

Source: www.trademap.org

3- Market Share

Market share is considered one of the competitive indicators, as its rise represents one of the main objectives of the process of expanding the volume of foreign sales to any country, and it is calculated by the following equation:

$$MSHji = \frac{Xjci}{Mcwi} \times 100$$

Whereas:

MSHji: Market share of The country's j from commodity i.

X_jc_i: the quantity of country exports j to country c from commodity i.

Mcw$_i$: The total quantity of country c imports from world from commodity i.

It can be seen from the table (7), The Italian market ranks first from In terms of market share of Egyptian green beans, Its imports from Egypt averaged about 15.09% of Italy's total imports of green beans, from all countries of the world during the period (2017-2021), The German market ranks second, In terms of market share of Egyptian green beans, As this share averaged about 14.04% during that period, England, the Netherlands, France, and Belgium come

in the third to sixth positions, with a market share of about 11.03%, 6.44%, 3.20%, and 2.87% for each of them, respectively, during the aforementioned period.

4- Market Penetration Rate

Market penetration rate is one of the most important criteria for measuring the competitiveness of a country. And indicates the extent to which there is a real market, or not, The increase in the value of this indicator in a particular market indicates the breadth of the market and easy access, and vice versa. It can be calculated from the following equation:

$$MPRjci = \frac{Mcij}{Qci + Mci - Xci}$$

Whereas:

MPRjci: rate of market penetration to j country from i commodity in country c.

Mcij: The quantity of C country imports from i commodity from j country.

Qci: The quantity of C country production from i commodity.

Mci: The quantity of C country imports from i commodity.

Xci: The quantity of C country Exports from i commodity.

Table (7): Market share and market penetration rate of Egyptian green bean exports in the most important importing countries in the period (2017-2021) Quantity: in thousand tons

Country	Imports from Egypt	Imports from the world	Local production	Exports	Market Share	Market Penetration Ratio
Italy	2.78	18.43	155.51	2.402	15.09	0.016
Germany	3.71	26.45	48.18	20.117	14.04	0.068
United Kingdom	4.42	40.11	12.03	1.554	11.03	0.087
Netherlands	3.86	60	35.27	32.236	6.44	0.061
France	1.65	51.66	56.16	97.57	3.2	0.161
Belgium	2.88	100.21	115.93	5.43	2.87	0.014

Source: www.trademap.org

Egyptian exports of green beans were concentrated in six countries that were ranked in terms of market penetration rate, such as France, the United Kingdom, Germany, the Netherlands, Italy, and Belgium. The penetration rate of Egyptian green beans in each of them is about 0.161, 0.087, 0.068, 0.061, 0.016, 0.014 respectively, which indicates the high value of the market penetration rate in France, which means that Egypt enjoys a competitive advantage in this market, and low market penetration rate values for the most important countries importing Egyptian green beans, namely Belgium, Italy, the Netherlands, Germany, the United Kingdom, and this indicates the weak possibility of Egyptian green beans penetrating those markets. This means a decrease in Egypt's competitive advantage in these markets, and that there are still opportunities to meet the needs of those markets of Egyptian green beans, by studying and knowing those needs and desired specifications, and working to meet them, to increase Egypt's export shares to it and thus raise the rate of penetration of Egyptian green beans to them.

Third: Factors Affecting the Traceability System of Green Bean Exports:

The agricultural export Traceability system aims to support competitiveness, increase exports, and improve product quality and safety, as the European Union has obligated its exporting countries to apply the Convention on Sanitary Safety and Plant Health No. 178 in 2002 emanating from the World Trade Organization (W T O), to apply international health conditions, in order to safety of citizen health, and in light of this, the Egyptian Organization for Export and Import Control has established a system unit to track fresh and processed agricultural exports. It helps producers and exporters of agricultural crops from all sectors (public, private and associations), to use the Traceability system, to improve the quality of Egyptian exports, as it reduces the rejection of export

letters to the European Union, and the reverse Traceability procedure on them to know the step, which was not done in an optimal manner, and led to its rejection, and reducing the reasons for rejection or avoiding them permanently.

To study the factors affecting the Egyptian green bean export Traceability system. The Logistic Regression Model was used, where the logistic regression model is based on a basic assumption, which is that the dependent variable is a binary variable that follows the Bernoulli distribution, takes the value (1) with a probability (p), and the vertex 0 (with a probability of $(1-P) = q$), which means that the response occurs and does not occur, and it is easy to convert it to the linear form using what is known as Logit Transformation, and the logistics function is a continuous function that takes values (0-1) where the dependent variable approaches zero, The closer the right-hand side of the logistics function is $(-\infty)$, and the dependent variable approaches the one, when the closer the right-hand side of this function is.$(\infty+)$

Logistic regression is estimated by the method of (maximum likelihood), which measures the observed probabilities of n independent variables, let them be $(P_1, P_2 \ldots\ldots P_n)$, the product of probabilities, represents the greatest probability function as follows: M.L = prob $(P_1, P_2, \ldots\ldots\ldots.P_n)$

$$L=\ln\left(\frac{P_i}{1-P_i}\right)=B_0+B_1X_1+..+B_kX_k$$

Whereas:

$\left(\frac{P_i}{1-P_i}\right)$: It represents the so-called weighting ratio, which is the ratio of the probability of an event occurring to the non-occurrence of that event.

L :The natural logarithm of the weighting ratio

Nagelkerke R^2, Cox& Snell R^2 are used as an alternative to the coefficient of determination **(R^2)** where the **($R^2_{COX-Snell}$)** statistic is considered a measure

of improvement in the square of the geometric mean per observation, and takes the following formula:

$$_{2/N}R^2_{Cox-Snell} = 1 - \left(\frac{L_0}{Lm}\right)$$

Whereas:

Lo : Weighting function for the form with the fixed limit only.

Lm: weighting function involving all independent variables.

N :Total number of observation.

The R^2 **Nagelker ke** statistic is a measure of improvement in the square of the geometric mean for each observation.

$$R^2_{Nagel ker ke} = \frac{R^2_{Cox-Snell}}{Maximum\ Possible\ R^2_{Cox-Snell}}$$

Wald statistic is used to find out the significance of the estimated parameters for each independent variable, and the Wald statistic is **chi-square** (X^2). Its significance indicates that the variable has an effect in predicting a value on the dependent variable as follows:

$$Wald^2 = \left[\frac{b}{SE_b}\right]^2$$

Whereas:

It is the value of the logistic regression coefficient for the independent variable.: **b**)(

(**SE**)It is the standard error value of the logistic regression coefficient for the independent variable.

The Model used:

There are internal and external influences that affect the traceability system for agricultural products. It is affected by four types of factors, represented in the characteristics of the company, management performance, agreements, and market competition. These factors can be put as follows:

$T_i = f(x_1, x_2, x_3, \ldots, \square_i)$

Whereas:

T_i: Origin Traceability system.

$\square_i$: Other unobserved or unmeasured factors.

So the logistic regression analysis will be used as follows:

$$P_i = f\left(\square_0 + \frac{1}{1+e^{-(\beta0 + \sum_{i=1}^{m}\beta_i X_{ij})}}\sum_{i=1}^{m}\beta_i X_{ij}\right) + \square_i$$

P_i = The possibility of applying a Traceability system.

$\square_i$ = regression coefficient.

m = The number of factors for this possibility.

$\square_0$ = Regression constant.

$\square_i$ = random error.

Variables:

A- Dependent variable:

Ti = traceability system established, the value is taken as one in the case of establishing the traceability system, and the value is zero in the case of not establishing the traceability system.

B- Influencing factors:

The effective factors include 4 factors. The first factor (the characteristics of the company) appears in the form of 5 variables: (export experience, company size, type of ownership, management form for the company, the degree of completion of the Traceability system), and the second factor (management performance) appears in the form of 5 variables: (food security perception, realization For the Traceability system, changing competition, changing the condition of consumers, changing products sales), and the third factor (agreements) appears in the form of 3 variables: (repeated examination of the sample, export of products, sudden inspection methods), and the fourth factor (the market rival) shows in the form of 5 variables They are (preferential policies from the government, the pressure of corresponding or competition companies, and the expectation of improving the competitive status of products, The expectation of an improvement in the quality of products, the expectation of an improvement in the economic return).

It is clear from Table (8) that the chi-square is not significant for the variables of the company's characteristics, which indicates that these variables did not affect the follow-up of the Traceability system, and that the chi-square is significant for the management performance variables with the exception of the food security perception variable, which indicates the importance of these variables on following the system Traceability , and the chi-square significance of the variables of the agreements was not proven to follow the Traceability system, which indicates that these variables did not affect the follow-up of the Traceability system, and the chi-square significance of the market competition variables was proven on the established Traceability system with the exception of the pressure variable of the corresponding companies or competition, and the Traceability variable achieves an increase The volume of exports, which indicates the importance of these variables to follow the Traceability system.

It is clear from Table (9) the significance of the Wald coefficient for the variables of the company's characteristics, which were represented in each of the export experience, the size of the project, the management model for the project, and the signs are all consistent with the economic logic, which indicates that these variables had a significant impact on the

Traceability system with the exception of the variable of the degree of completion of the Traceability system, It was also found that these variables explained about 21%: 51% (using the Snell & Cox R^2 coefficient), and about 30%: 73% (using the Nagelkerke R^2 coefficient) of the changes in the Traceability system (the dependent variable), and the value of B indicates that the increase of each From the export experience, the size of the project, the management model of the project, the degree of completion of the Traceability system with one unit leads to a change in the log or logarithm of the weighting coefficient by making the dependent variable equal to 1 (It means follow the Traceability system) by about 1.403, 2.274, 1.456, -21.113 times in the preference logarithm. Traceability system for these variables in order, the value of the weighting ratio (odds Ratio) Exp (B) indicates that the increase in export experience, the project size, the project management model leads to an improvement in the Traceability system by about 307%, 872%, and 329%, respectively.

As evidenced by the same table, the significance of the Wald coefficient for management performance variables, which was represented in each of the food security perception, the change in the condition of consumers (the sign does not agree with the economic logic), the change in product sales (the signal does not agree with the economic logic), which indicates that these variables may Significantly affected the Traceability system, and it was found that the moral variable is nonsignificant variable to the Traceability system, and the changing competition (the signal does not agree with the economic logic) It also turned out that these variables have interpreted about 16%: 64% % (using the Snell & Cox R^2 coefficient), and about 23%: 91% (using the NagelkerkeR^2 coefficient) of changes in the traceability system (dependent variable), and the value of B indicates that the increase of each of Discuss food security, the change of consumers, ,

A change in product sales by one unit leads to a change in the log or the logarithm of the weighting coefficient so that the dependent change is equal to 1 (It means follow the Traceability system) by about 0.986, -1.667, -2.769 times in the preference logarithm of the Traceability system for these variables, respectively, and the value of the weighting ratio (odds Ratio) Exp (B) indicates that an increase in perception

of food security, awareness of the traceability system, changes in consumers' status, and changes in product sales lead to an improvement in following the traceability system by about 168%, 409%, and a decrease in following the traceability system by about 81%, 94%. Respectively, It is also clear from Table (9) that the Wald coefficient was not significant for the variables of the agreements, which were represented in the inspection methods, which indicates that this variable did not affect the traceability system.

It is also clear that the Wald laboratory for market competition variables, which was the traceability, leads to improving the company's competitiveness, the company deals with the application of the traceability system on the basis of a long -term strategic plan, the company's message is based on achieving improving the international image of the product, The company's mission is to achieve more markets (Signs are consistent with the economic logic),which indicates that these variables may Significantly affected the Traceability system, It was also found that these variables have interpreted about 56%: 57% (using the Snell & Cox R^2 coefficient), and about 80%: 81% (using the Nagelkerke R^2 coefficient) of changes in the Traceability system (the dependent variable), The value of B indicates that the increase in each(Traceability improves the company's competitiveness, The company deals with the application of the Traceability system on the basis of a long -term strategic plan, The company's mission is based on improving the international image of the product, The company's mission is to achieve more markets (Increase them with one unit leads to a change of logge or Logarithm. The weighting laboratory is that the dependent change is equal to 1 (i.e. the Traceability system) about 2.486, 2.514, 2.604, 2.540 times in the preference of the Traceability system of these variables, respectively, The weight rate (odds Ratio) Exp (B) indicates that the height of each Traceability leads to an improvement in the company's competitiveness, The company deals with the implementation of the Traceability system on the basis of a long-term strategic plan, The company's mission is based on improving the international image of the product, The company's message is based on achieving more markets that leads to an improvement in the Traceability system of about 1101%, 1135%, 1251%, 1168%, respectively.

Table (8): Chi-Square Test for the Frequencies of the Independent Variables of Green Bean Crop**.**

Variables			Frequencies							The Ratio							Chi-Square	Asymp. Sig.
			0	1	2	3	4	5	total	0	1	2	3	4	5	total		
Characteristics of Company		Follow the Traceability system	10	25					35	28.6	71.4					100	6.43	0.01
		Export experience		8	6	7	9	5	35		22.9	17.1	20.0	25.7	14.3	100	1.43	0.84
		Project size		7	15	13			35		20.0	42.9	37.1			100	2.97	0.23
		Property Type		35	0				35		100	0.0				100		
		Project management model		7	11	17			35		20.0	31.4	48.6			100	4.34	0.11
		The degree of completeness of the Traceability system		15	14	6			35		42.9	40.0	17.1			100	4.17	0.12
Performance Management		perception food security		6	8	13	8		35		17.1	22.9	37.1	22.9		100	3.06	0.38
		perception of the Traceability system		3	8	19	5		35		8.6	22.9	54.3	14.3		100	17.46	0.00
		Competition change		27	5	3			35		77.1	14.3	8.6			100	30.40	0.00
		Changing consumer situation		20	13	2			35		57.1	37.1	5.7			100	14.11	0.00
		Product sales change		17	15	3			35		48.6	42.9	8.6			100	9.83	0.01
Agreements		Repeat the sample check		35	0	0	0	0	35		100	0	0	0	0	100	1.43	0.49
		export products	0	35					35	0	100					100		
		inspection methods		10	10	15			35		28.6	28.6	42.9			100		
competition market		The preferential policies of the government	10	25					35	28.6	71.4					100	6.43	0.01
		peer pressure or competition	19	16					35	54.3	45.7					100	0.3	0.61
	the expected to improve the competitive status of products	Traceability improves the company's competitiveness		4	7	2	8	14	35		11.4	20.0	5.7	22.9	40.0	100	12.0	0.02
		The company deals with the implementation of the Traceability system on the basis of a long-term strategic plan		4	7	2	9	13	35		11.4	20.0	5.7	25.7	37.1	100	10.57	0.03
		The company's mission is based on improving the international image of the product		3	8	3	6	15	35		8.6	22.9	8.6	17.1	42.9	100	14.0	0.01
		The company's mission is to achieve more markets		4	7	2	10	12	35		11.43	20.0	5.7	28.6	34.3	100	9.71	0.05
	Expect to improve the level of product quality	The Traceability leads to the quality of the product and the development and advancement of the export process	0	10	2	6	17		35	0	28.6	5.7	17.1	48.6		100	14.03	0.00
		The state supports - on a continuous basis - the process of continuous improvement of product quality in the long term	0	10	2	7	16		35	0	28.6	5.7	20.0	45.7		100	11.74	0.01
		The state participates in the process of improving product quality	0	10	5	4	16		35	0	28.6	14.3	11.43	45.7		100	10.37	0.02
		Traceability leads to ensuring product safety and not mixing one product with another damaged one	0	10	3	7	15		35	0	28.6	8.6	20.0	42.9		100	8.77	0.03
	The expectation of improving the economic	Traceability achieves an increase in the volume of exports	0	10	3	9	13		35	0	28.6	8.6	25.7	37.14		100	6.03	0.11
		Traceability achieves a tangible increase in the net income of producing and exporting companies	0	10	2	9	14		35	0	28.6	5.7	25.7	40.0		100	8.54	0.04

Source: Calculated from the results of the questionnaire analysis.

Summary:

Green beans are considered one of the most important crops of the vegetables due to the increase in their nutritional value, and the amount of Egypt's production reached about 176 thousand tons, and it exports about 18.24 thousand tons at a value of 30.13 million dollars during the average period (2019-2021) Hence, the proportion of exports is not commensurate with the available productive capacities, as the ratio of exports to domestic production was about 10.4% during that period. This is in addition to the presence of some exporting companies that do not adhere to the internationally agreed export rules, which leads to returning the green beans trucks that are not identical to the required specifications, The research aims to identify the current situation for the production and export of Egyptian green beans and the study of factors affecting the system for traceability their exports. The results indicate a decrease in the area by about 1.54 thousand feddans and Yield by about 0.051 tons annually, which led to a decrease in the total production of green beans by about 7.9 thousand tons annually, It was found that the amount of exports decrease at an annual non -moral rate statistically and that the export price increases at an annual statistically moral rate of about 84.6 dollars/tons, It turns out from studying the factors that affect the export traceability system in producing companies and exporting Egyptian green beans to the European Union markets, The increase in export experience, project size, and project management model leads to an improvement in following the traceability system by about 307%, 872%, and 329%, respectively. And that the increase in awareness of food security, awareness of the traceability system, changes in the situation of consumers, changes in product sales lead to an improvement in following the traceability system by about 168%, 409%, and a decrease in following the traceability system by about 81% and 94%, respectively.

Table (9): Logistic regression to measure the effect of factors affecting the Traceability system of green bean crop.

independent variables		B	S.E.	Wald	Sig.	Exp(B)	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R²	Chi-square	Sig.
Company characteristics	**export experience**	1.403	0.481	8.508	0.004	4.069	26.901	0.348	0.499	14.978	0.000
	Constant	-2.488	1.104	5.078	0.024	0.083					
	Project size	2.274	0.807	7.936	0.005	9.723	28.913	0.310	0.444	12.966	0.000
	Constant	-3.554	1.558	5.205	0.023	0.029					
	Project management model	1.456	0.570	6.530	0.011	4.288	33.827	0.206	0.295	8.052	0.005
	Constant	-2.180	1.217	3.208	0.073	0.113					
	The degree of completeness of the Traceability system	-21.113	8384.5	0.000	0.998	0.000	16.752	0.512	0.734	25.127	0.000
	Constant	43.142	16768.9	0.000	0.998	5.45E+18					
Performance Management	**perception food security**	0.986	0.437	5.096	0.024	2.681	35.760	0.160	0.230	6.119	0.013
	Constant	-1.514	1.088	1.938	0.164	0.220					
	Traceability system perception	22.351	6176.261	0.000	0.997	5.09E+09	6.028	0.641	0.919	35.851	0.000
	Constant	-46.647	12352.523	0.000	0.997	0.000					
	Competition change	-22.527	9858.777	0.000	0.998	0.000	14.259	0.546	0.782	27.620	0.000
	Constant	25.053	9858.777	0.000	0.998	7.59E+10					
	Changing consumer situation	-1.667	0.722	5.328	0.021	0.189	35.329	0.171	0.245	6.550	0.010
	Constant	3.560	1.269	7.868	0.005	35.172					
	Product sales change	-2.769	1.061	6.810	0.009	0.063	28.399	0.320	0.458	13.480	0.000
	Constant	5.817	2.055	8.010	0.005	335.850					
Agreements	inspection methods	0.490	0.455	1.161	0.281	1.633	40.693	0.033	0.048	1.186	0.276
	Constant	-0.100	0.987	0.010	0.920	0.905					
market competition	**peer pressure or competition**	21.308	10048.242	0.000	0.998	1.79E+09	26.287	0.359	0.515	15.592	0.000
	Constant	-0.105	0.459	0.053	0.819	0.900					
	Traceability improves the	2.486	0.930	7.141	0.008	12.012	12.646	0.566	0.811	29.233	0.000

company's competitiveness										
Constant	-6.214	2.330	7.113	0.008	0.002					
The company deals with the implementation of the Traceability system on the basis of a long-term strategic plan	2.514	0.931	7.286	0.007	12.349	12.689	0.566	0.811	29.190	0.000
Constant	-6.268	2.336	7.200	0.007	0.002					
The company's mission is based on improving the international image of the product	2.604	1.024	6.463	0.011	13.514	13.508	0.555	0.796	28.371	0.000
Constant	-6.503	2.518	6.671	0.010	0.001					
The company's mission is to achieve more markets	2.540	0.932	7.430	0.006	12.678	12.729	0.565	0.810	29.150	0.000
Constant	-6.320	2.341	7.287	0.007	0.002					
Traceability leads to product quality and the development and advancement of export science	35.880	5296.065	0.000	0.995	3.83E+15	0.000	0.698	1.000	41.879	0.000
Constant	-90.673	13926.644	0.000	0.995	0.000					
The state supports - on a continuous basis - the process of continuous improvement of product quality in the long term	35.921	5353.747	0.000	0.995	3.98E+15	0.000	0.698	1.000	41.879	0.000
Constant	-90.783	14099.044	0.000	0.995	0.000					
The state participates in the process of improving product quality	36.970	5528.821	0.000	0.995	1.14E+16	0.000	0.698	1.000	41.879	0.000
Constant	-92.935	14529.262	0.000	0.995	0.000					
Traceability leads to ensuring product safety and not mixing one product with another damaged one	36.417	5477.869	0.000	0.995	6.54E+15	0.000	0.698	1.000	41.879	0.000
Constant	-91.823	14432.713	0.000	0.995	0.000					
Traceability achieves an increase in the volume of exports	36.510	5614.116	0.000	0.995	7.18E+15	0.000	0.698	1.000	41.879	0.000
Constant	-92.070	14827.163	0.000	0.995	0.000					
Traceability achieves a tangible increase in the net income of producing and exporting companies	36.009	5479.888	0.000	0.995	4.35E+15	0.000	0.698	1.000	41.879	0.000
Constant	-91.017	14466.371	0.000	0.995	0.000					

The independent variables that did not appear were not significant.

Source: Results of the questionnaire analysis.

Recommendations:

1- Raising production efficiency and high quality by cultivating distinct varieties and good agricultural transactions suitable for export.

2- Expanding the application of the Traceability system for private and government companies exporting green beans, because of its positive effects at the level of the company and the Country.

3- Providing support and support for companies operating in the export of green beans with the Traceability system, especially for markets that have conditions such as the European Union markets.

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