Standard analysis of Egyptian foreign trade, fava beans

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I. INTRODUCTION:

The fava bean is considered one of the important Egyptian food crops, on which the majority of the Egyptian society depends on obtaining calories and protein due to its low price. Decreasing as it reached the average for the period (2017-2021) to about 100 thousand acres and due to the lack of application of modern technologies, the quantity produced reached 141 thousand tons, while the increase in population led to an increase in the amount consumed to reach about 1064 thousand tons, which made the policy executors resort to imports, which negatively affected the Egyptian agricultural trade balance

Research problem:

The problem of the research is the presence of a noticeable food gap for local beans, and this is due to the increase in demand for it, as it is considered a main meal for most members of the Egyptian society, and the high population increase of individuals led to an increase in demand at a time when production decreased, and the only way to provide it is the increase in imports, which was reflected in the Egyptian agricultural trade balance.

Search goal:

The research aims to shed light on the most important variables affecting the production and consumption of local beans through the use of a three-stage standard model to show the most important variables affecting the quantity produced, consumed and imported, with a statement of predicting you as a variable to rethink the policies used in the production of local beans.

Research method and data sources:

The study relied on the descriptive, quantitative and analytical method for the data using some different statistical measures such as general trend equations, and Stata program was used to estimate the consumption efficiency functions of the local bean crop using the method of least squares in three stages (3SLS), and the program was used ARIMA To predict the quantities produced and consumed from the local bean crop, it was also used to predict the possibility of reducing the size of the gap. The study relied on published and unpublished secondary data from the Ministry of Agriculture and Land Reclamation, the Central Agency for Public Mobilization and Statistics.

Discuss the results:
First: The evolution of area, production, consumption and imports of local beans during the period (2000-2021)

By studying the general temporal trend of the area cultivated with fava beans in Egypt, it is clear from Equation No. (1) In Table No. (1) the significant annual decrease significant, amounting to about 16.4 thousand feddans, representing about 7.7% of the average area for the study period, which amounted to about 213.1 thousand feddans, and the effect of this on production, as Equation No. (2) Shows the statistically significant annual decrease in the quantity produced, which is about 13.8 thousand tons, which represents about 6.1% of the average quantity produced for the study period, which is about 226.1 thousand tons, while it was shown from Equation No. (3) that the consumed quantity increased by about 22.2 thousand tons, representing about 3.1% of the average, which amounted to about 702.6 thousand tons, and this was reflected On the food gap of local beans, which increases annually by about 36.7 represents about 7.9% of the average gap of local beans, which amounts to about 465.4 thousand tons, and the coefficient of determination is estimated at about 0.66. -2021) amounting to about 447.3 thousand tons and a factorial estimate

determination was estimated at about 0.57. Although fava beans are considered the basic food for the majority of the members of the Egyptian society, there is a decrease in the area and production, and in return the imported quantity increases, which leads to a deficit in the Egyptian

agricultural trade balance due to the high bill for imports of fava beans.

Table No. (1) Equations of the general time trend for the area, production and imports of fava beans in Egypt during the period (2000-2021)

Mber	Variable	Equation402	R2	Annual Changing Rate
1	cultivated with fava beans (thousand acres)	$\hat{Y}i = 402 - 16.4\,Xi$ $(-11.6)**$	0.87	-7.7
2	Produced quantity (thousands of tons)	$\hat{Y}i = 384.9 - 13.8Xi$ $(-9.1)**$	0.81	-6.1
3	Quantity consumed (thousand tons)	$\hat{Y}i = 447.4 + 22.2Xi$ $**(3.1)$	0.35	63.2
4	(The gap of local beans (thousand tons)	$\hat{Y}i = 173 + 26\,Xi$ $**(9.4)$	0.66	7.9
5	(The quantity of imports of local beans (thousand tons)	$\hat{Y}i = 52.2 + 34.4Xi$ $(5.1)**$	0.57	7.6

Since $\hat{Y}i$ indicates the estimated value of the dependent variable and Xi refers to the element of time as an independent variable since i (1, 2, 3, 4... 22.)

* Significant at the level of 5%.
** Significant at the level of 1%.
Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Economics Publications, Miscellaneous Editions

Second: The foreign trade model for fava beans in Egypt.
Estimating the multi-equation econometric model is relatively more difficult compared to those single-equation models, because it requires many stages and main steps, starting from the description of economic relations (according to economic logic) and then determining the most important variables that will be used according to the matrix of simple correlation coefficients, and then determining The best mathematical images that will be used in statistical analysis and after completing the preparation of the model parameter. The degree of definition of the model is determined, then the most appropriate methods of estimation are determined. In this regard, the study used the total form sometimes and the average form at other times, in addition to the logarithmic

images for each of them. All these permutations and reconciliations between the variables of the model used under certain criteria were economic logic, statistical significance and distance as possible from the problems of econometric measurement in order to ensure the accuracy of the

Description of an econometric model of the beans market in Egypt:
The model consists of three structural equations in addition to a defining equation:
1-Local consumption Equation of The Local beans: It is assumed that the most important factors affecting the consumed quantity of The Local beans are the produced quantity and the imported quantity of The Local beans, and number of population.
2-Local production Equation the Local beans it is assumed that the most important factors affecting the consumed quantity of The Local beans, the Area cultivated with local beans.
3-Imports Equation of The Local beans: It is assumed that the most important factors affecting the imported quantity of The Local beans are the consumed quantity, the import price of. and number of population.
4-Definition equation: in which the consumed quantity of The Beans = the local produced quantity + the imported quantity.

The model consists of Structural-Form Equations that measure the direct effect of the explanatory variable on the dependent variable, while the reduction equations measure the direct and indirect total effect of the specified variables on the internal variables, which cannot be clarified in the structural formula of the model, and the following is the mathematical

Description of the behavioral and definition equations of the model

Consumption Equation
$$QCO_t = \alpha + \beta_1 QPO_t + \beta_2 QIO_t + \beta_3 P_t + \beta_4 IN_t$$

Production Equation
$$QPO_t = \alpha + \beta_1 Area_t - \beta_2 QCO_t + \beta_3 RPO_t + \beta_4 IRPO_t$$

Import Equation
$$QIO_t = \alpha + \beta_1 QCO_t + \beta_1 IPO_t + \beta_3 P_t$$
As for the mathematical description of the definition equation, it is as follows:

Definitional Equation
$$QCO_t = QPO_t + QIO_t$$
Where :
QCO_t = Quantity of local bean consumed in million tons per year t
QPO_t = Quantity produced of local bean million tons per year t
QIO_t = Quantity of local bean imports in million tons per year t
$IPOX_t$ = Import price of local bean in dollars per ton per year t
RPO_t = real local price of local bean in pounds per ton per year t
P_t = Population in million people per year t
IN_t = real per capita income in pounds per year t
$Area_t$ = local bean Cultivated Area (Thousand Fadden)
 per year t

Interpretation of the results of the Egyptian local bean market model (2000-2021):
Consumed Quantity Equation
The function shows that the increase in the quantity consumed of local bean is due to the increase in the produced quantity, meaning that there is a direct relationship between them, i.e. with an increase in the produced quantity one unite quantity consumed of local bean increases by 1.929 thousand tons. The statistical significance of the quantity of imports and the number of the population was confirmed. With an increase in the quantity of imports of fava beans by one unit, the quantity consumed increases by about 0.502 thousand tons, and with an increase in the population by one million people, the quantity consumed increases by about 416 thousand tons,The coefficient of determination is estimated at about 0.64, meaning that 64% of the changes in the quantity consumed are due to The increase in the produced quantity and the the quantity of imports and the population number , and the calculated (F) value reached 44.66 which confirms the significance of the estimated model.

Produced Quantity Equation
It is clear from the function that there is a direct relationship between the produced quantity of Local beans, the cultivated area, the consumed quantity,. That is, by increasing by one unit, the produced quantity of local bean increases by about 0.913 the coefficient of determination is estimated at 0.98, meaning that 98% of the changes in the produced quantity, it is due to the previous factors, and the rest is due to unmeasured factors. The calculated value of (F) reached 1263 which confirms the significance of the estimated model.

Imported Quantity Equation
And the statistical significance was confirmed, as with an increase in the quantity consumed by one unit, the quantity of imports of local beans increases by about 0.586 thousand tons, and with an increase in the number of one million people, the quantity of imports of local beans increases by about 15.9 thousand tons, while the importer's price decreases by one unit, and the quantity of imports increases by about 0.577 thousand tons.. The coefficient of determination is estimated at 0.69, meaning that 0.83 of the changes in the imported quantity are due to the quantity of consumption and the population number the price of importing local beans and its value is (F) Calculated 112. Which confirms the significance of the estimated model

Table (2): production, consumption and imports equations of Local beans in the Egyptian market during the period (2000-2021)

Statement	Equation	R^2	F
Consumption	$QCOt = -2649 +1.929QPOt+0.502\ QIOt +0.41.6Pt +0.41.6INt$ (-2.17) (2.93**) (2.54)** (2.09)* (-1.37)	0.64	42.6
Production	$QPOt =34.1+.0.913AREt + 0.008\ QCOt + 0.026\ RPOt- 0.028\ IPOt$ (-1.29) (13.28)** (0.18) (0.7) (1.12-)	0.98	1264
Import	$QIOt =-814+ 0.586\ QCOt- 0.577\ \ IPOt + 15.9Pt$ (5.8)** (3.8)** (3.2) ** (5.83**	0.83	112

Source: Results of the local bean market model in Egypt in the appendix

Third: Forecasting the area, the quantity produced and consumed, the gap, and the quantity imported from local beans for the period (2022-2030)

The results of the study show that the area cultivated with local beans during the study period (2000-2021) tended to decrease, and this is reflected in the forecast for the period in 2025, when it will reach about 73.9 thousand feedings and will continue until it reaches about 24.4 thousand sedans until the year 2030, and the quantity produced of local beans decreases until It will reach 129 thousand tons in 2025. As for the quantity, As for the quantity consumed, it continues to increase due to the increase in the population, to reach about 1371 thousand tons in 2025

And it continues to increase to reach about 1577 thousand tons in 2030, and this affects the gap, reaching about 1233 thousand tons in 2025, and it continues to increase to reach about 1477 thousand tons in 2030, and the import bill increases to increase the quantity imported in 2025 to about 1188 thousand tons, and it continues to increase to about 1380 thousand tons. tons in 2030 .This calls for the implementers of the agricultural policy to think carefully about increasing the area and productivity of the bean crop, which is an important crop for the general Egyptian people due to its vegetable protein and its cheap price compared to animal protein.

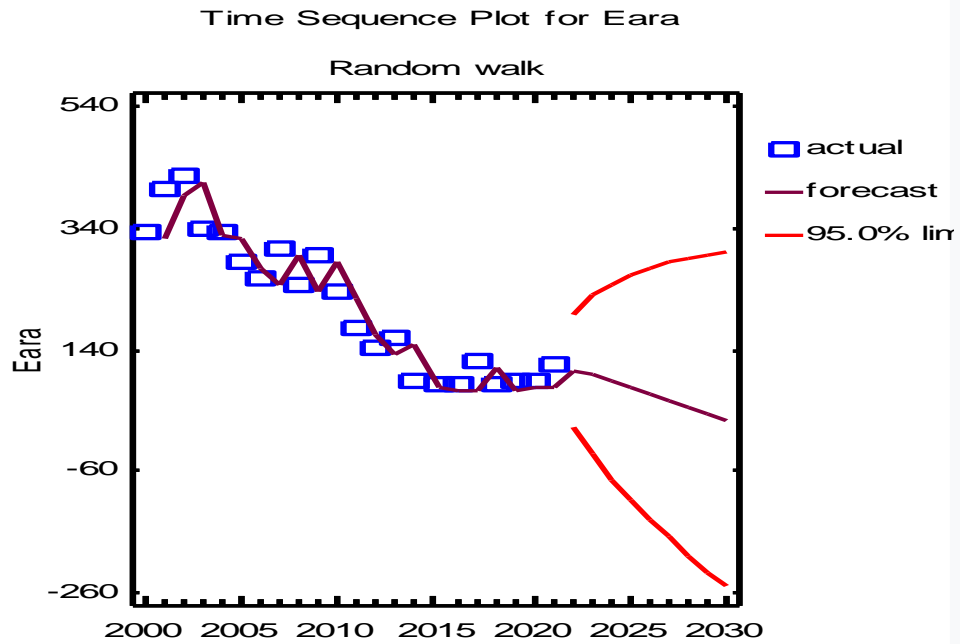| Period	EREA Forecast	Lower 95.0% Limit	Upper 95.0% Limit
2022	106.714	13.9565	199.472
2023	96.4286	-34.7508	227.608
2024	86.1429	-74.5184	246.804
2025	75.8571	-109.658	261.373
2026	65.5714	-141.841	272.984
2027	55.2857	-171.924	282.495
2028	45.0	-200.414	290.414
2029	34.7143	-227.644	297.073
2030	24.4286	-253.845	302.702

Figure No. (1) and a table showing the prediction of the cultivated area of The beans during the period (2030-2022)

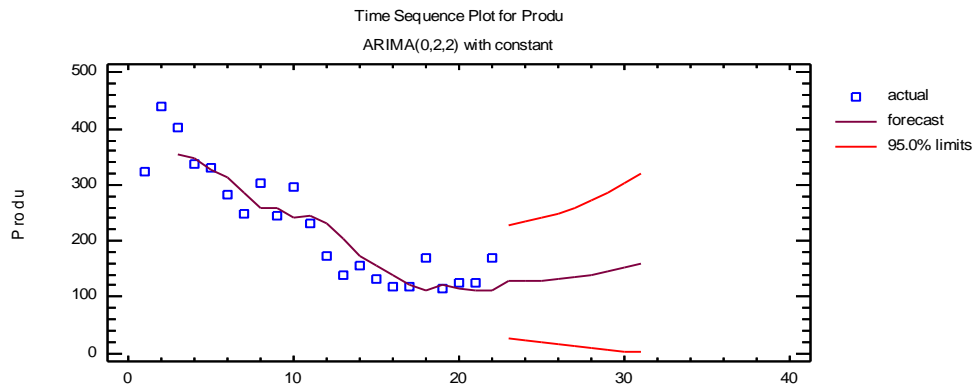|	Production	Lower 95.0%	Upper 95.0%
Period	Forecast	Limit	Limit
2023	126.974	26.2763	227.672
2024	127.512	22.0777	232.946
2025	129.086	18.1557	240.016
2026	131.696	14.5277	248.865
2027	135.343	11.2213	259.465
2028	140.027	8.27006	271.784
2029	145.747	5.71046	285.783
2030	152.503	3.57965	301.427
2031	160.296	1.91371	318.679

Figure No. (2) and a table showing the forecast of the produced quantity of local beans during the period (2030-2022)

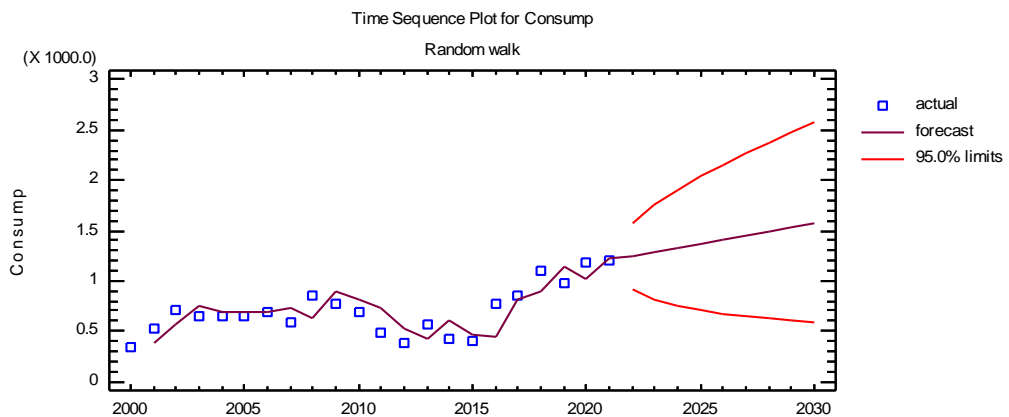|	Cosump	Lower 95.0%	Upper 95.0%
Period	Forecast	Limit	Limit
2022	1247.24	915.771	1578.71
2023	1288.48	819.711	1757.24
2024	1329.71	755.596	1903.83
2025	1370.95	708.018	2033.89
2026	1412.19	671.007	2153.37
2027	1453.43	641.503	2265.35
2028	1494.67	617.686	2371.65
2029	1535.9	598.373	2473.44
2030	1577.14	582.741	2571.55

Figure No. (3) and a table showing the forecast of the Consumption of local beans during the period (2030-2022)

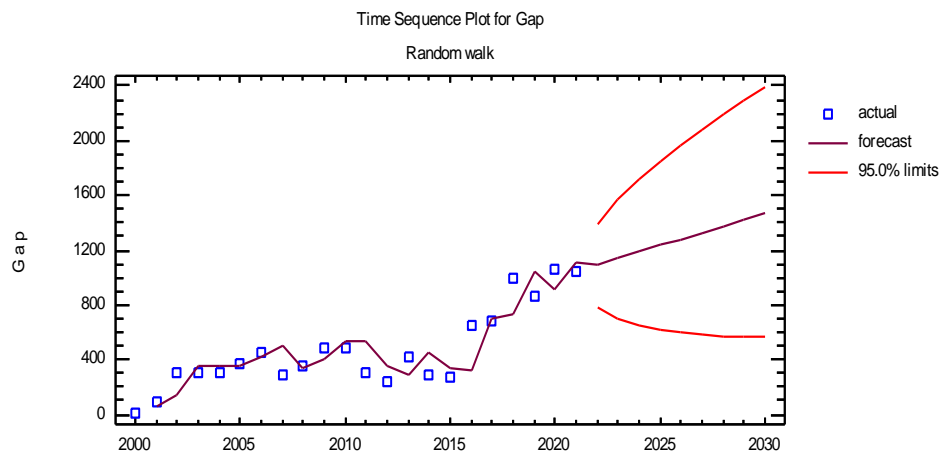| Period	Gup Forecast	Lower 95.0% Limit	Upper 95.0% Limit
2022	1086.76	781.828	1391.7
2023	1135.52	704.282	1566.77
2024	1184.29	656.125	1712.45
2025	1233.05	623.18	1842.92
2026	1281.81	599.957	1963.66
2027	1330.57	583.639	2077.5
2028	1379.33	572.554	2186.11
2029	1428.1	565.612	2290.58
2030	1476.86	562.055	2391.66

Figure No. (4) and a table showing the prediction of the gap amount of local beans during the period (2030-2022)

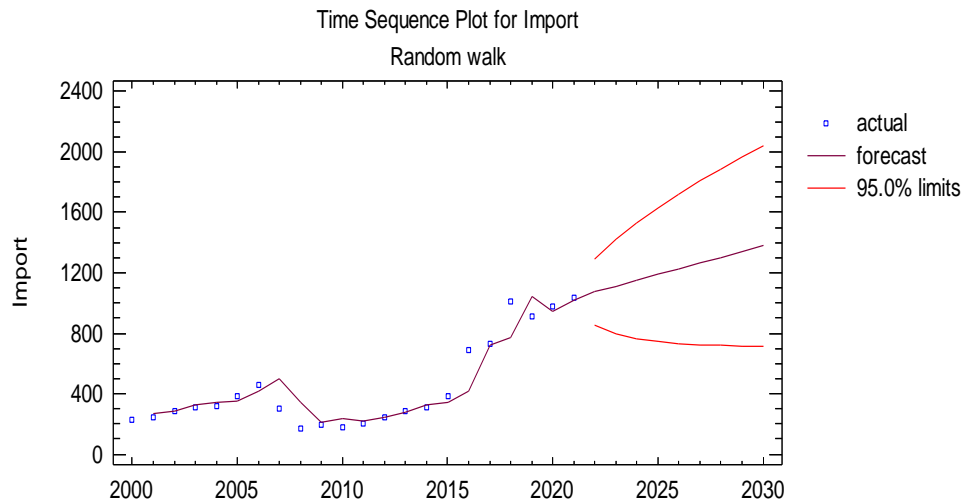| Period	Import Forecast	Lower 95.0% Limit	Upper 95.0% Limit
2022.0	1073.29	852.319	1294.25
2023.0	1111.57	799.077	1424.07
2024.0	1149.86	767.131	1532.58
2025.0	1188.14	746.209	1630.08
2026.0	1226.43	732.331	1720.53
2027.0	1264.71	723.458	1805.97
2028.0	1303.0	718.376	1887.62
2029.0	1341.29	716.296	1966.27
2030.0	1379.57	716.67	2042.47

Figure No. (5) and a table showing the forecast of the imported quantity of local beans during the period (2030-2022)

Recommendations:
The research recommends that the cultivated area of fava beans should be increased in the new lands, as it is good for its cultivation and can be loaded on some crops.

II. SUMMARY

The research aims to shed light on the most important variables affecting the production and consumption and important of local beans through the use of a three-stage standard model to show the most important variables affecting the quantity produced, consumed and imported, with a statement of predicting you as a variable to rethink the policies used in the production of local beans. The research showed that although fava beans are considered the basic food for the majority of the members of the Egyptian society, there is a decrease in the area and production, and on the other hand, the imported quantity increases, which leads to a deficit in the Egyptian agricultural trade balance due to the high bill for imports of fava beans. results of the model that the most important factors affecting the consumption of local beans are the quantity produced, the quantity of imports, per capita income, and the population, and that the direct relationship between these factors and the quantity consumed shows that the cultivated area is the only factor affecting the amount of production. Population has a direct effect on the quantity of imports versus the inverse effect of the import price. The research predicts in 2030 that the quantity produced of local beans will reach 160.3 thousand tons, compared to an increase in the quantity consumed to reach 1577.4 thousand tons. The research recommends that the cultivated area of fava beans should be increased in the new lands, as it is good for its cultivation and can be loaded on some crops.

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Appendix
Three-stage least-squares regression
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----------------------------------------------------------
Equation        Obs  Parms    RMSE    "R-sq"    chi2    P
----------------------------------------------------------
QCO             22    4    114.6323   0.6446    42.66  0.0000
QPO             22    4    14.37132   0.9818  1263.56  0.0000
QIO             22    3    99.59851   0.8328   112.39  0.0000
----------------------------------------------------------
     Coef.  Std. Err.    z   P>|z|   [95% Conf. Interval]
-------------+--------------------------------------------------
QCO        |
QPO| 1.929245 .6624298   2.91  0.004    .6309069   3.227584
QIO| .5024225 .1981655   2.54  0.011    .1140251   .8908198
Pt| 41.64338 19.90291    2.09  0.036    2.634388   80.65238
IN| -1.052811 .7685121  -1.37  0.171   -2.559066   .4534454
_cons| -2649.226 1221.503 -2.17  0.030  -5043.327  -255.1253
QPO        |
EARY| .9134124 .0692135  13.20  0.000    .7777564   1.049068
QCO| .008302 .0458969    0.18  0.856   -.0816543   .0982582
RPO| .0025982 .0037262   0.70  0.486   -.0047051   .0099014
IPO| -.0281431 .0250431  -1.12  0.261   -.0772266  .0209404
_cons| 34.13274 26.36422  1.29  0.195   -17.54018   85.80565
QIO        |
QCO| .5859843 .1527726   3.84  0.000    .2865555   .8854131
IPO| -.5772734 .1804337  -3.20  0.001   -.930917  -.2236299
Pt| 15.91159 2.726797    5.84  0.000    10.56717   21.25602
_cons| -813.5992 150.5071 -5.41  0.000  -1108.588  -518.6
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