



Research Article

A comparative study between organic farming and the traditional cultivation of some medicinal and aromatic plants in the New Valley Governorate

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Abstract

The policy analysis matrix for the fennel crop in organic agriculture in the New Valley Governorate indicates the average period (2019-2021), where the negative impact of both revenues and the total work element and the land rent, which was estimated at 0.69, 0.239, 0.919 thousand pounds/acre, while there is a positive impact for each of the requirements, the net return, which was estimated at 0.051 and 1.727 thousand pounds/acre, respectively. The nominal and effective protection factors and the cost of local resources for the cumin crop in organic agriculture in the New Valley Governorate during the period (2019-2021) indicate that the local price of a ton of cumin is greater than its price at the border, and this means that the cumin farmer gets only about 1.24% of the value produced at the global price, and this means that there are no implicit taxes borne by the survivor of the cumin crop. As for the fennel crop, the fennel farmer receives only about 2.09% of the value produced at the world price, which means that there are no implicit taxes borne by the fennel crop. The effective protection factor for cumin and fennel crops in organic agriculture in the New Valley Governorate during the period (2019-2021), for the cumin crop, the effective protection factor was about 0.76, meaning that the added value of the crop at local prices is less than its counterpart evaluated at shadow prices, which confirms that there are implicit taxes on the producers of the cumin crop amounted to about 0.24%. As for the fennel crop, the effective protection factor was about 0.84, meaning that the value added of the crop at local prices is lower than its counterpart evaluated at shadow prices, which confirms that there are implicit taxes. The results of the relative importance of the productive problems facing the farmers of medicinal and aromatic plants in the study sample also showed that the most important problems are low yield and low productivity, tenure fragmentation and small production.

Keywords: Organic farming, traditional farming, cumin, fennel. Governorate, prices



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Introduction

Organic agriculture is a comprehensive system of farm management and food production, combining best environmental practices (Reganold and Watcher, 2016) the highest level of biodiversity, the conservation of natural resources, and a production method in line with the preference of some consumers for products produced using natural materials and processes. Organic agriculture is also a comprehensive system for managing agricultural natural resources and agricultural production in a manner that maintains the integrity of

the agricultural ecosystem including biodiversity, biological cycles and soil biological activity (Bengtsson et al., 2005). It focuses on the use of management methods rather than the use of non-agricultural inputs, taking into account regional conditions that require systems adapted to local conditions. The expansion of organic agriculture aims to improve the Egyptian economy, export these products abroad and increase hard currency, in addition to the application of standards. Medicinal and aromatic plants are considered one of the most important products that are used in several fields, whether in the preparation of some medicines, the production of fixed oils, or the processing of food for the treatment of atherosclerosis and angina such as johoba oil, sunflower, flax, and castor, so the importance of expanding the cultivation of medicinal and aromatic plants, especially after the increasing demand for them locally and globally, and the economic importance and export return to them, Medicinal and aromatic plants in Egypt are non-traditional crops that provide part of the foreign exchange earnings to the state treasury and the economic importance of these crops depends on the relative relationship between the economic return from them, compared to the economic return of alternative crops or competition for them on the unit of ground materials, whether for the domestic return or the return from the foreign exchange earnings in agricultural exports. Egypt is considered one of the countries with a suitable environment for the production of many medicinal and aromatic plants, which are in increasing demand internally and externally, as the Agricultural Development Strategy 2030 included the expansion of integrated biological control programs, and began to be implemented in the governorates of the New Valley (El-Essawy et al., 2019). In addition to the application of organic agriculture in the national project for the development of the South Valley and the establishment of the Central Laboratory for Organic Agriculture, the Ministry of Agriculture issued Resolution No. 289 of 1994 to establish the central laboratory for the analysis of pesticide residues and heavy elements in food, and the implementation of control of pollution of agricultural products in the markets the total cultivated area in Egypt about 9192.5 thousand acres, including about 554.1 thousand acres cultivated area of medicinal and aromatic plants representing about 1.15% of the total cultivated area In 2020, Egypt produced about 4.2 million tons of medicinal and aromatic plants annually, while importing 3 million tons annually. Among the most important crops of medicinal and aromatic plants are coriander, wormwood, chamomile, cumin, basil, marjoram, hibiscus, and fennel, which represent about 75% of the total area of Egyptian medicinal and aromatic plants (Central Agency).

Research problem

The problem of research is the small cultivated areas of medicinal and aromatic plants in organic agriculture in the governorates of the Republic in general and the New Valley Governorate in particular, where the area of medicinal and aromatic plants is estimated at 80 thousand acres, representing less than 0.8% of the total cultivated area in Egypt, where Egyptian imports reached about 7.1 thousand tons. In contrast, exports reached about 59.7 thousand tons.

Research Objectives

The research aims in general to identify the current productive situation of medicinal and aromatic

plants in the New Valley Governorate by studying a set of sub-objectives, including:

- Study the area of medicinal and aromatic plants in Egypt.
- Study the area and production of cumin and fennel crops in the New Valley Governorate.
- Study of exports of cumin and fennel crops in Egypt.

- Study the marketing costs of cumin and fennel crops in the New Valley Governorate.
- Study of the matrix of analysis of production policies for cumin and fennel crops in the New Valley Governorate.
- Studying the productive problems facing farmers of medicinal and aromatic plants for cumin and fennel crops in the New Valley Governorate and reaching solutions to these problems.

Methodology

The research relied on general obtaining data from a set of sources, the first of which is the published secondary data, which was obtained from various sources such as the data of the Ministry of Agriculture and Land Reclamation, as well as unpublished data in the Directorate of Agriculture in the New Valley Governorate and its affiliates, the second is the primary data, which was collected from the data of the field study sample, and the research relied on the application of a set of descriptive and quantitative statistical analysis methods that are commensurate with the data, in addition to the matrix for analyzing productive policies.

Selection and characterization of the field study sample

To achieve the objectives of the research, it was necessary to obtain detailed data at the farm level, which required the need to conduct a field study on a sample of farmers in the New Valley Governorate, provided that the selection of that sample is consistent with the statistical principles in the selection of samples, as this sample was intended when selecting farmers, it was based on an intended sample consisting of about 13 farmers from farmers of traditional and organic medicinal and aromatic plants of fennel and cumin. The data was collected from farmers through a questionnaire form designed to achieve the objectives of the study and the data was collected during the 2021 agricultural season.

Results and Discussion

Organic agriculture has many opportunities in the new lands through the use of support and incentive mechanisms to achieve this, especially since most of these lands use modern irrigation methods and irrigation sources mostly from fresh water, and the rates of pollution in water and soil are lower, and the sizes of farms are either medium or large, so they are more able to apply the rules of organic agriculture (Hassan, 2017).

The development of the area of medicinal and aromatic plants in Egypt during the period (2000-2020)

The data of Table1 indicate that the annual average of the area of medicinal and aromatic plants in the ancient lands in Egypt during the period (2000-2020) amounted to about 14184 acres, and that this average is located between the upper and lower limits of about 18605, 8622 thousand acres in 2018, 2000 respectively, and the difference between the upper and lower limits was about 9983 acres, representing about 70.4% of the annual average area during that period, and the equation of the general time trend Table 2 to increase the cultivated area statistically significantly amounted to about 229.9 acres, and an annual rate of change of about 2% of the annual average area during the study period, and the data of

Table 1 shows that the average area of medicinal and aromatic plants in the new lands in Egypt during the period (2000-2020) reached about 12230 acres, and that this average is located between two limits, the maximum reached about 26657 acres in 2020, and the minimum about 1885 acres in 2002, and the difference between the maximum and minimum limits reached about 24775 acres, representing about 202% of the annual average, and it was shown from Table2 that there was a statistically significant increase of about 1057 acres annually with an annual change rate of about 8.7% of the annual average of medicinal and aromatic plants during the same period. The data of Table 1 indicate that the average area of medicinal and aromatic plants in the old and new lands in Egypt during the period (2000-2020) amounted to about 26,387 acres, and that this average is located between two limits, the maximum is about 43,044 acres in 2020, and the minimum is about 12,463 acres in 2000, and the difference between the maximum and minimum limits was about 30,581 acres, representing about 116% of the annual average, and Table2 showed a statistically significant increase of about 1338 acres annually with an annual rate of change of about 5.1%. From the annual average of medicinal and aromatic plants.

Development of area and total production of fennel and cumin crops in Egypt during the period (2000-2020)

The data of Table 3 indicate that the annual average area of the fennel crop in Egypt during the period (2000-2020) amounted to about 2429 acres, and this average is located between two limits, above and below, amounted to about 3736, 1569 thousand acres in 2007, 2014, and the difference between the upper and lower limits reached about 2167 acres, representing about 89.2% of the annual average area during that period, and the equation of the general time trend Table 4 indicates an increase in the cultivated area Statistically significant amounted to about 24.2 acres, and an annual rate of change of about 1% of the annual average area during the study period, and it is clear from the same data of Table 3 that the annual average of fennel crop production in Egypt during the period (2000-2020) amounted to about 3070 tons and that this average is located between two upper and lower limits amounted to about 5338, 986 tons in 2007, 2015, respectively, and the difference between the upper and lower limits was about 4325 acres, representing about 141% of the annual average production during that period, The equation of the general time trend Table 4 indicates that the best images to express the shape of the function is the cubic form that production has taken a general ascending annual and non-statistically significant trend of about 567.8 tons, took a general downward and statistically significant trend of about 67.6 tons, then took a general upward annual and statistically significant trend of about 2.13 thousand, with an annual rate of change of about 180.2% of the annual average of production during the study period.

Table 1. Total area of medicinal and aromatic plants in Egypt during the period (2000-2020). (Area in acres).

Years	Area of medicinal and aromatic plants In the old lands	Area of medicinal and aromatic plants New Lands	Total area of plants Old and new medical
2000	8622	3841	12463
2001	11613	2807	14420
2002	14613	1882	16495

2003	11271	4679	15950
2004	14143	6288	20431
2005	14319	6439	20758
2006	13817	6621	20438
2007	13540	11744	25284
2008	13654	11897	25551
2009	13721	12354	26075
2010	13766	13592	27358
2011	14006	9791	23797
2012	12209	11511	23720
2013	13527	14583	28110
2014	15987	15268	31255
2015	16669	16047	32716
2016	12517	17273	29790
2017	16313	20372	36685
2018	18568	20983	39551
2019	18605	21637	40242
2020	16387	26657	43044
Average	14184.1	12203.1	26387.3
Maximum	18605	26657	43044
Bottom line	8622	1882	12463
The difference between the two terms	9983	24775	30581

Source: Compiled and calculated from the Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Statistics Bulletin, miscellaneous issues.

Table 2. Statistical Estimation of the Evolution of Medicinal and Aromatic Plants in Egypt during the Period (2000-2020). (Area in acres)

Statement	General time trend equation	R ₂	F	Annual rate of change %
The area of medicinal and aromatic plants in ancient lands	$Y^1h=11104.9+279.9sh$ (4.7)**	0.54	22.1**	2.0
Area of medicinal and aromatic plants in the new lands	$Y^2h=574.4+1057.1sh$ (15.7)**	0.93	247.7**	8.7
Total area of medicinal plants in old and new lands	$Y^3h=11665.6+1338sh$ (13.9)**	0.91	194**	5.1

where: p^1e : Total ancient land (acres) during the year e.

p^2e : Total area of new land (acres) during year e.

p^3e : Total area of old and new lands (acres) during the year e.

xe: A variable that expresses years as e = 1, 2, 3, ..., 2020.

The values between the parentheses below the x coefficient represent the calculated (t) vertice.

Annual rate of change = (coefficient x e / average period) * 100.

(**, *) indicates the significance of the regression coefficient or model at the level of significance 0.01 and 0.05 respectively.

Source: Calculated from Table 1 data.

Table 3. Total area and total production of fennel and cumin crops in Egypt during the period (2000-2020).

Years	Fennel		cumin	
	Area	Production	Area	Production
2000	2973	3895	6867	3375
2001	2247	2762	7039	3230
2002	1739	2430	7817	3787
2003	1620	2251	7326	3637
2004	1892	2705	4915	2585
2005	2207	3394	5142	2722
2006	2224	3457	3772	2147
2007	3736	5338	4177	2608
2008	2649	3974	2128	1238
2009	2080	2620	3156	1795
2010	2677	2748	5448	3230
2011	2906	3287	3489	2122
2012	2925	3556	1941	1157
2013	2087	2574	1836	1132
2014	1569	2070	2846	1505
2015	1611	986	1943	2562
2016	1956	2654	1727	1081
2017	2598	2987	1987	1165
2018	2834	3054	2013	1682
2019	3021	3765	2468	1869
2020	3459	3974	2763	1987
Average	2429	3070	3847	2219
Maximum	3736	5338	5448	3787
Bottom line	1569	986	1727	1081
The difference between the two terms	2167	4352	3721	1081

Source: Compiled and computed by the Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Statistics Bulletin, Miscellaneous numbers.

Table 4. Statistical Estimation of the Development of Area and Total Production of Fennel and Cumin Crops in Egypt during the Period (2000-2020). (Area in acres and production in tons)

Statement		General time trend equation	R ₂	F	Annual rate of change %
Fennel	Area (acres)	$Y^1h=2162.7+24.2sh$ (1.1)	0.59	1.2	0.10
	Production (Tons)	$Y^2h=2085+567.8.1sh-67.6s2h+2.13s3h$ (1.6) (-1.8) (1.9)	19	1.3	180.2
cumin	Area (acres)	$Y^3h=6874.4-275.2sh$ (-6.7)**	0.70	44.9**	-7.1
	Production (Tons)	$Y^3h=3318.8-99.9sh$ (-4.4)**	0.50	16.0**	-4.5

Where: p¹ e Fennel message (in acres) during the year AH
p² e: Fennel production (tons) during the year e.
p³ AH Cumin message (in acres) during the year E
p⁴ e: Production of cumin (tons) during the year e.
x e : a variable expressing the years as e = 1, 2, 3, ..., 2020

The values between the parentheses below the x coefficient represent the calculated (t) vertice.

$$\text{Annual rate of change} = (\text{x coefficient} / \text{average period}) * 100$$

(**, *) indicates the significance of the regression coefficient or model at the level of significance 0.01 and 0.05 respectively.

Source: Calculated from Table 1 data.

The data of Table 3 indicate that the annual average area of the cumin crop in Egypt during the period (2000-2020) amounted to about 3848 acres, and that this average is located between two upper and lower limits amounted to about 5448, 1727 thousand acres in 2010, 2016 respectively, and the difference between the upper and lower limits reached about 3721 acres, representing about 96.7% of the annual average area during that period, and the equation of the general time trend Table 4 indicates a decrease in the cultivated area statistically significant decrease of about 275.2 acres, and a rate of change An annual area of about 7.1% of the annual average area during the study period, and it is clear from the same data of Table (3) that the annual average of cumin production in Egypt during the period (2000-2020) amounted to about 2219 tons And that this average is located between the upper and lower limits amounted to about 3787, 1081 tons in 2002, 2016 respectively, and the difference between the upper and lower limits reached about 2706 acres representing about 122% of the annual average production during that period, and the equation of the general time trend Table (4) indicates a decrease in production of cumin crop statistically significant about 99.9 acres, and an annual rate of change of about 4.5% of the annual average production during the study period.

The development of Egyptian exports of the most important medicinal and aromatic plants (cumin - fennel) in Egypt during the period (2000-2020)

The data of Table 5 indicate that the annual average of the most important Egyptian exports of medicinal and aromatic plants during the period (2000-2020) that the average quantity of cumin crop exports amounted to about 1574.3 tons, and that this average is located between two limits, the highest and the lowest, amounted to about 61.2861 tons in 2020, 2006, respectively, and the difference between the upper and lower limits was about 2800 tons, and the equation of the general time trend Table (6) indicates a significant increase in the quantity of cumin exports statistically, as it reached about 9.5%, as is also evidenced by Data Table (5) The average value of cumin exports amounted to about 17546.2 pounds, and that this average is located between two limits, the highest and the lowest, amounted to about 46881, 2189 pounds in 2013, 2005, respectively, and the difference between the upper and lower limits amounted to about 44692 pounds, and the equation of the general time trend Table (6) indicates a significant increase in the value of cumin exports statistically, as it amounted to about 8.1%, and it is clear from the data of Table 5 that the average price of cumin exports amounted to about 14.3 pounds / ton, and that this average is located between two limits above them The lowest amounted to about 19.05, 4.9 pounds / ton in 2012 and 2000 respectively, and the difference between the upper and lower limits was about 20 pounds / ton, and the equation of the general time trend Table 6 indicates a significant increase in the price of cumin exports, which amounted to about 1.2%.

The data of Table 5 indicate that the annual average of the most important Egyptian exports of medicinal and aromatic plants during the period (2000-2020) the average amount of fennel exports amounted to about 6062.9 tons, and that this average is located between two limits, above and below, amounted to about 13571, 223 tons in 2020, 2016, respectively, and the difference between the upper and lower limits was about 13348 tons,

and the general time trend equation Table (6) indicates that the amount of Egyptian exports of fennel crop is statistically insignificant, as also shown by the data of Table 5.

Table 5. Development of Egyptian exports of the most important medicinal and aromatic plants (cumin - fennel) in Egypt during the period (2000-2020).

Yield/Year	cumin			Fennel		
	Qty (Tons)	Value (thousand/pound)	Price (EGP/ton)	Qty (Tons)	Value (thousand/pound)	Price (EGP/ton)
2000	941	4581	4.9	3997	10046.5	2.5
2001	799	4233	5.3	3255	7711	2.4
2002	432	3634	8.4	3277	9656	2.9
2003	424	4281	10.1	3420	16220	4.7
2004	340	3427	10.1	4367	23458	5.4
2005	228	2189	9.6	4097	19880	4.9
2006	61	2458	7.5	6319	33592	5.3
2007	351	3813	10.8	9321	34740	5.5
2008	1125	21572	19.2	3550	34740	9.9
2009	2058	31780	15.4	5465	26280	4.8
2010	1183	21342	18.04	11394	60606	5.3
2011	1635	28630	17.5	8709	97716	11.2
2012	2084	39695	19.04	5737	85115	19.05
2013	2253	46881	20.8	3210	48589	15.1
2014	2691	18995	7.1	961	8720	9.1
2015	2642	10676	24.9	745	7568	10.2
2016	2648	15825	12.3	223	2506	11.2
2017	2716	22286	18.4	11305	35278	13.2
2018	2769	26541	19.5	12389	39347	2.5
2019	2819	27310	20.3	12008	44241	2.4
2020	2861	28321	21.8	13571	45231	2.9
Average	1574.3	17546.2	14.3	6062.9	32916.2	4.7
Maximum	2861	46881	24.9	13571	97716	5.4
Bottom line	61	2189	4.9	223	2506	4.9
The difference between the two terms	2800	44692	20	13348	95210	5.3

Source: Central Agency for Public Mobilization and Statistics, Foreign Trade Bulletin, miscellaneous.

Table 6. Statistical Estimation of the Development of Egyptian Exports of the Most Important Medicinal and Aromatic Plants (Cumin - Fennel) in Egypt during the Period (2000-2020).

Crop	Statement	Equation	R ₂	F	Rate of change
cumin	Export quantity (tons)	$Y^1h=300602+150.34sh$ (8.94)**	0.81	79.9**	9.5
	Value of exports (EGP)	$Y^2h=-2853+1428.12sh$ (3.79)**	0.43	14.41**	8.1
	Export price (EGP/ton)	$Y^3h=-1475.63+0.74sh$ (5.5)**	0.57	25.49**	1.2
Fennel	Export quantity (tons)	$Y^4h=-5912-297.19sh$ (-2.17)*	0.19	4.71	-
	Value of exports (EGP)	$Y^5h=-2521+1270.81sh$	0.09	2.06*	2.7

		(1.44)*			
	Export price (EGP/ton)	$Y^6 = -1355.8 + 0.68x$ (6.79)**	0.71	46.21**	7.6

here: $p1^e$: quantity of exports of cumin crop (tons) during the year e.

$p2^e$: Value of exports of cumin crop (in pounds) during the year e.

$P3^e$: Export price of cumin crop (EGP/ton) during the year e.

$P4^e$: Quantity of exports of fennel crop (tons) during the year e.

$p.5^e$: Value of exports of fennel crop (in pounds) during the year e.

$P6^e$: Export price of fennel crop (EGP/ton) during the year e.

x_e : A variable that expresses years as $e = 1, 2, 3, \dots, 2020$.

The values between the parentheses below the x coefficient represent the calculated (t) vertice.

Annual rate of change = (coefficient x_e / average period) * 100.

(**, *) indicates the significance of the regression coefficient or model at the level of significance 0.01 and 0.05 respectively.

Source: Calculated from Table 5 data.

The average value of fennel exports amounted to about 32916.2 pounds, and this average is located between the upper and lower limits amounted to about 97716, and 2506 pounds in 2011, 2016 respectively, and the difference between the upper and lower limits of About 95210 pounds, and the equation of the general time trend Table (6) indicates a significant increase in the value of exports statistically, as it amounted to about 2.7%, and it is clear from the data of Table 5 that the average price of fennel exports amounted to about 8.9 pounds/ton, and that this average is located between two limits, above and below, amounted to about 19.05, 2.4 pounds/ton in 2012, 2001, respectively, and the difference between the upper and lower limits was about 16.65 pounds/ton, The equation of the general time trend Table 6 indicates a significant increase in the price of fennel exports, which amounted to about 7.6%.

Evolution of the value of aggregate, agricultural medicinal and aromatic plant exports during the period (2000-2020)

The data of Table 7 indicate that the total average value of total exports during the period (2000-2020) is that the average value of total exports amounted to about 20282.29 million dollars, and that this average is between two limits above And the lowest amounted to about 13720, 4140 million dollars in 2006, 2001 respectively, and the difference between the upper and lower limits about 9580 million dollars, and the equation of the general time trend Table (8) indicates a significant increase in the value of total exports statistically, as it amounted to about 7.06%, and it is also clear from the data of Table 7 that the average value of total agricultural exports amounted to about 2505.24 million dollars, and that this average is located between two upper and lower limits amounted to about 4380, 335 million dollars in 2014 and 2000 respectively, and the difference between the upper and lower limits was about 4045 million dollars, and the equation of the general time trend Table 8 To increase the significance of the value of total agricultural exports statistically, as it amounted to about 8.58%, and it is clear from the data of Table 7 that the average value of medicinal and aromatic plant exports amounted to about 34.64 million dollars, and that this average is located between two upper and lower limits amounted to about 48.0, 24.10 million dollars in 2019, 2004, respectively, and the difference between the upper and lower limits was about 23.9 million dollars, and the equation of the general time trend Table 8 indicates a significant increase in the value of medicinal and aromatic plant exports, as it reached About 2.94%, while the relative importance of medicinal and aromatic plant exports from agricultural exports fluctuated between 0.88% in 2009 and 2.76% in 2005, and

by estimating the instability coefficient for both the total export value and the value of medicinal and aromatic plant exports, their instability was evident.

Marketing costs of fennel and cumin crops in the New Valley Governorate

The data in Table 9 indicate that the total marketing costs (collection, first packaging, sorting, processing, second packaging, transportation) of the fennel crop represent about 500.96 pounds, while the total marketing costs of cumin serum represent about 743.404 pounds.

Table 7. Evolution of the value of total and agricultural exports and exports of medicinal and aromatic plants during the period (2000-2020) (Value in million dollars)

Years	Total export value	Total agricultural exports		Medicinal and aromatic plant exports		% Medicinal and aromatic plants exports from agricultural exports
		Value	Coefficient of instability	Value	Coefficient of instability	
2000	3729	335	55.8	25.9	25.9	7.73
2001	4140	350	62.8	28.2	28.2	8.05
2002	4660	390	81.4	31.9	31.9	8.18
2003	6160	490	12.8	29.9	29.9	6.1
2004	7680	710	23	24.1	24.1	3.39
2005	10650	890	31.4	24.6	24.6	2.76
2006	13720	980	35.6	25.1	25.1	2.56
2007	16170	1240	47.7	29.9	29.9	2.41
2008	25970	2540	10.8	32.9	32.9	1.29
2009	24180	3570	15.6	31.7	31.7	0.88
2010	26330	4090	18	43.1	43.1	1.05
2011	31580	3890	17.5	36.3	36.3	0.93
2012	29420	3540	15.5	33.4	33.4	0.94
2013	28780	4030	17.7	36.5	36.5	0.91
2014	26810	4380	19.4	37.58	37.8	0.86
2015	21970	2650	11.3	38.47	38.5	1.45
2016	25681	3483	15.2	40.5	40.5	1.16
2017	27853	3524	15.4	40.6	40.6	1.15
2018	28941	3581	15.7	43.1	43.1	1.2
2019	30247	3920	17.2	48	48	1.22
2020	31257	4027	17.7	45.7	45.7	1.13
Average	20282.3	2505.24	29.3	34.64	31.88	
Maximum	13720	4380	42.6	48	40.9	
Bottom line	4140	335	12.9	24.1	24.5	
The difference between the two terms	9580	4045	29.7	23.9	16.4	

Source: Central Agency for Public Mobilization and Statistics, Foreign Trade Bulletin, miscellaneous.

[http:// comstat.comesa.int](http://comstat.comesa.int), www.trademap.org.

Table 8. Statistical Estimation of the Evolution of the Value of Total Exports, Value of Total Agricultural Exports and Value of Medicinal Plant Exports and aromatic in Egypt during the period (2000-2020).

Statement	Equation	R ₂	F	Rate of change
Total export value (million US\$ value)	$Y^{1h} = -2917 + 1461.16sh$ (8.43)**	0.79	71.50**	7.06
Value of total agricultural exports (value in million dollars)	$Y^{1h} = -4269 + 214.99sh$ (7.49)**	0.75	56.25**	8.58
Value of exports of medicinal and aromatic plants (value in million dollars)	$Y^{1h} = -2011.3 + 1.018sh$ (8.08)**	0.77	65.34**	2.94

Where: $p1^e$: Value of total exports (value in million dollars) during the year e.

$p2^e$: Value of total agricultural exports (value in million dollars) during the year e.

$P3^e$: Value of exports of medicinal and aromatic plants (value in million dollars) during the year e.

xe: A variable that expresses years as $e = 1, 2, 3, \dots, 2020$.

The values between the parentheses below the x coefficient represent the calculated (t) vertice.

Annual rate of change = (coefficient x e / average period) * 100.

(** , *) indicates the significance of the regression coefficient or model at the level of significance 0.01 and 0.05 respectively.

Source: Calculated from Table 7 data.

Table 9. Marketing costs of fennel and cumin crops in the New Valley Governorate for the season 2021.

Crop/ Operation	Fennel		cumin	
	Costs ton/EGP	Materiality	Costs ton/EGP	Materiality
gather	121.65	24.28	310.65	41.79
First packing	66.84	13.34	120.47	16.21
Sort	95.88	19.14	0	0
processing	105.35	21.02	11.69	1.57
Second fill	65.87	13.15	245.58	33.03
transport	45.37	9.06	55.014	7.4
Total marketing costs	500.96	100	743.404	100

Source: Collected and calculated from the data of the study sample in the New Valley Governorate for the 2021 season.

Marketing differences (margins) for fennel and cumin crops in the New Valley Governorate

Marketing differences (margins) are defined as the difference between the purchase price and the selling price of one unit, as the difference between the value of equal quantities of a particular commodity at different levels of the marketing path that the commodity follows from the producer to the final consumer (9) as follows:

The data in Table (10) indicate that for the fennel crop, the agricultural price was about 8 pounds/kg, the wholesale price was about 10 pounds/kg, the retail price was about 17 pounds/kg, and the total marketing differences were about 52.94 pounds/kg. As for the cumin crop, the agricultural price was about 22 pounds/kg, the wholesale price was about 32 pounds/kg, the retail price was about 42 pounds/kg, and the total marketing differences were about 47.62 pounds/kg.

Table 10. Marketing differences for fennel and cumin crops in New Valley Governorate for the season 2021.

Crop	Cultivated price EGP/kg	Wholesale price EGP/kg	Retail Price EGP/kg	Marketing differences per kilogram			Total Marketing Differences*
				Wholesale price – farm price	Retail Price – Wholesale Price	Retail price – farm price	
fennel	8	10	17	2	7	9	52.94
cumin	22	32	42	10	10	20	47.62

*Marketing Differences = ((Retail Price – Farm Price) / Retail Price)*100

Source: Collected and calculated from the data of the study sample in the New Valley Governorate for the 2021 season.

Estimation of the matrix for the analysis of production policies for fennel and cumin crops in the New Valley Governorate

Policy analysis is one of the most important tools of economic and statistical analysis in economic studies (3), and although farm prices for any crop depend on supply and demand conditions, but the price and production policies for agricultural production inputs in developing countries, including Egypt, may be subject to some other policies, which necessitates affecting the efficiency of the use of agricultural resources used in their production. The matrix for analyzing production policies for fennel and cumin crops in the New Valley Governorate was estimated to measure protection factors such as the nominal protection coefficient of inputs, and the effective protection coefficient, in addition to measuring the cost of local resources and the financial profitability of the farmer, and the economic of the state, as well as by using production costs, and acre production returns (financially, and economically), in addition to the net acre return also evaluated (financially and economically), during the period (2019-2021), to identify the economic efficiency of using resources in the production of crops for fennel and cumin crops in the New Valley Governorate, and its global advantage according to their production season.

Estimation of protection coefficients, cost of local resources and financial and economic profitability of fennel and cumin crops in the New Valley Governorate

1- Nominal product protection factor (NPO)

It refers to the ratio between the return or price evaluated at the market price, return or price valued at the economical price, and thus reflects the convergence or distance of local prices from their global counterparts, as well as the extent to which the state bears the burden of supporting the crop or imposing taxes on producers, and can be found from the following equation:

Nominal product protection factor = yield of the crop at market price (financially) / yield of the crop at shadow price (economically).

2- Nominal Protection Coefficient for Supplies (NPCI)

It refers to the ratio between the cost of supplies traded at market price and the cost of inputs traded at the economic price, and can be found from the following equation:

Nominal protection factor of supplies = value of supplies at market price (financially) / value of supplies at shadow price (economically).

Increasing the coefficient from the correct one means that the producers receive support, while if the coefficient is less than the correct one, it means that the producers bear implicit taxes, and agricultural policies are considered fair if the coefficient is equal to the correct one.

3- Effective Protection Factor (EPC)

It refers to the ratio between the added value of a particular product at local prices prevailing in the market and its counterpart valued at international prices, and this coefficient shows fluctuations in both production markets and production inputs, which is

a more effective measure as it measures the net impact of domestic economic policy on both production markets and production inputs, and can be found from the following equation:

Effective protection factor = value added of the crop at market price (financially) / value added of the crop at shadow price (economically).

4- Local resource cost coefficient (DRC)

The cost factor of local resources shows the state's ability to replace its local resources to produce one unit of a commodity to provide a foreign exchange unit that could have been directed to import that commodity, and also reflects the concept of domestic production efficiency for the global market, it refers to the economic cost or economic return from the production of the commodity instead of importing it, so it is used as a measure of the comparative advantage of productive activity, and can be found from the following equation:

Local resource cost coefficient (comparative advantage) = value of local resources at shadow prices/value added of the crop at shadow price.

The lower value of this coefficient than the correct one means that there is a comparative advantage of the state in the production of the crop and vice versa.

The transactions of converting cash prices to shadow prices were used for each of the production inputs and agricultural products for cumin and fennel crops in the New Valley Governorate for organic agriculture, where the conversion factor for each of (preparing the land for agriculture, seeds, human labor, machinery wages, municipal fertilizers, other expenses, land rent about (0.75, 1.4, 0.87, 1.0, 1.2, 1.3, 0.75) for cumin, about (0.71, 1.1, 0.79, 1.0, 1.0, 0.99, 0.75) for the fennel crop.

Evolution of the average value of production costs, total revenue and net return of cumin and fennel crops in organic agriculture in New Valley Governorate during the period (2019-2021):

The data of Table No. 11 indicate the development of the average value of production costs, total revenue and net return for the cumin crop in organic agriculture in the New Valley Governorate during the period (2019-2021), where it is clear that the items of production costs represented in preparing the land for agriculture, seeds, human labour, land rent have accounted for about 67% of the average total production costs, where the average total revenue value was about 3.52 thousand pounds/acre, and the average net return was about 5.49 thousand pounds/acre for the crop Cumin.

The data of Table 12 also indicates the development of the average value of production costs, total revenue, and net return for the fennel crop in organic agriculture in the New Valley Governorate during the period (2019-2021), where it is clear that the items of production costs represented in preparing the land for agriculture, seeds, human labour, land rent have accounted for about 41.04% of the average total production costs, where the average total revenue value was about 1.32 thousand pounds/acre, and the average net return was about 5.67 thousand pounds/acre for the fennel crop.

The results of the matrix of analysis of production policies for cumin and fennel crops in organic agriculture in the New Valley Governorate during the period (2019-2021)

The data of Table 13 shows the items of production costs and total revenue for cumin and fennel crops in the New Valley Governorate for organic agriculture evaluated (financially, and economically) for an average for the period (2019-2021), where the results indicate that for the production requirements for the cumin crop, which include the value of seeds, the value of municipal fertilizer, several other expenses, as the financial value reached about 0.579, 1.232, 0.975 thousand pounds / acre, while the economic value amounted to about 0.811, 1.478, 1.268 thousand pounds/acre for each of them, respectively.

As for the value of local resources for the cumin crop, which includes the value of human labour, the value of mechanical labour, the total rent of the land, where the financial value was about 1.484, 0.440, 2.867 thousand pounds/acre, while the economic value was about 1.291, 0.440, 2.150 thousand pounds/acre for each of them respectively.

Table 11. Evolution of the average value of production costs, total revenue and net return of cumin crop in organic agriculture in New Valley Governorate during the period (2019-2021). (Items of costs and revenues in thousand pounds / acre)

Years	Preparing the land for planting	Seeds	Human labor wages	Machinery wages	Irrigation	Municipal manure	Agricultural Service	Pest resistance	Other expenses	Rent	Total costs	Total revenue	Net yield per acre
2019	0.958	0.437	1.357	0.376	0.896	1.026	0.896	0.737	1.363	2.7	7.829	2.578	5.251
2020	1.025	0.569	1.458	0.456	0.025	1.256	0.025	0.966	1.562	2.9	8.854	3.654	5.2
2021	1.256	0.733	1.636	0.489	1.236	1.435	1.236	1.124	1.639	3	10.365	4.325	6.04
Average	1.079	0.579	1.484	0.44	1.053	1.232	1.053	0.942	0.975	2.8	9.016	3.519	5.497
% of total costs	11.974	0.006	0.0165	0.005	0.012	0.014	0.012	0.01	0.01	0.03	0.1		

Source: Collected and calculated from the data of the study sample in the New Valley Governorate for the 2021 season.

Table 12. Evolution of the average value of production costs, total revenue and net return of fennel crop in organic agriculture in New Valley Governorate during the period (2019-2021).

(Items of costs and revenues in thousand pounds / acre)

Years	Preparing the land for planting	Seeds	Human labor wages	Machinery wages	Irrigation	Municipal manure	Agricultural Service	Pest resistance	Other expenses	Rent	Total costs	Total revenue	Net yield per acre
2019	0.786	0.485	1.024	0.451	0.52	0.876	0.658	0.65	0.686	2.7	6.136	1.562	4.574
2020	0.847	0.521	1.154	0.578	0.68	0.845	0.785	0.79	0.785	2.9	6.887	1.16	5.727
2021	0.958	0.658	1.235	0.785	0.78	0.954	0.897	0.896	0.856	3	7.949	1.246	6.704
Average	0.864	0.555	1.138	0.605	0.66	0.892	0.78	0.779	0.49	2.9	6.99	1.322	5.668
% of total costs	0.012	0.008	0.016	0.009	0.009	11.06	0.011	0.011	0.007	0.041	0.1		

Source: Collected and calculated from the data of the study sample in the New Valley Governorate for the 2021 season.

The total revenue for the cumin crop, amounted to a financial value of about 3.519 thousand pounds/acre, while the economic value amounted to about 2.829 thousand pounds/acre for each of them, respectively. As for the fennel crop, the data of Table 13 indicate that for the production requirements for the fennel crop, which include the value of seeds, the value of municipal fertilizer, and several other expenses, where the financial value amounted to about 0.55, 0.892, 0.490 thousand pounds/acre, while the economic value was about 0.611, 0.892, 0.485 thousand pounds/acre for each of them, respectively. As for the value of the local resources of the fennel crop, which includes the value of human labour, the value of mechanical labour, the total rent of the land, where the financial value

was about 1.138, 0.605, 2.867 thousand pounds/acre, while the economic value was about 0.899, 0.605, 2.150 thousand pounds/acre for each of them respectively.

As for the total revenue of the fennel crop, amounted to a financial value of about 1.323 thousand pounds/acre, while the economic value amounted to about 0.633 thousand pounds/acre for each of them, respectively. The data of Table No. (14) of the policy analysis matrix for the cumin crop in organic agriculture in the New Valley Governorate for the average period (2019-2021), where it is clear that the total financially evaluated production costs, which include the value of production inputs, the total labour element, the land rent amounted to about 2.786, 1.924, 2.867 thousand pounds/acre, while the total production costs economically evaluated amounted to about 3.557, 1.731, 2.150 thousand pounds/acre for each of them respectively, showing also the negative impact of both revenues and the total work element and rent The land, which was estimated at 0.69, 0.193, and 0.717 thousand pounds / acre, while there was a positive effect for each of the supplies, the net return which was estimated at 0.771 and 2.862 thousand pounds / acre respectively.

Table 13. Items of production costs and total revenue of cumin and fennel crops in organic agriculture in the New Valley Governorate during the period (2019-2021) (Thousand pounds / acre).

Items	Cumin crop		Fennel crop	
	Average value of cost elements and total revenue in pounds		Average value of cost elements and total revenue in pounds	
	Financial value	Economic value	Financial value	Economic value
	First: Production Requirements			
Seed value	0.579	0.811	0.555	0.611
The value of municipal fertilizer	1.232	1.478	0.892	0.892
Other expenses	0.975	1.268	0.49	0.485
Total production requirements	2.786	3.557	1.937	1.988
	Second: Local Resources			
The value of human labor	1.484	1.291	1.138	0.899
The value of automated work	0.44	0.44	0.605	0.605
Work item clause	1.924	1.731	1.743	1.504
Land rent	2.867	2.15	2.867	2.15
	Third: Revenue Sentence			
Revenue sentence	3.519	2.829	1.323	0.633

Source: F,A,O, Comparative Advantage and Competitiveness of Crops, Crop rotation and Live stock Products in Egypt regional office for Near East Cairo.

Table 14. Estimation of the policy analysis matrix for cumin crop in organic agriculture in the New Valley Governorate during the period (2019-2021).

Statement	Costs and revenues in pounds per acre				Net Return	Added Value
	Revenue	Supplies	Local Resources			
			Work item clause	Land rent		
Financial Valuation	3.519	2.786	1.924	2.867	5.497	10.862
Economic Valuation	2.829	3.557	1.731	2.15	8.359	14.265
Impact of agricultural policy	-0.69	0.771	-0.193	-0.717	2.862	-

The numbers in parentheses () are negative values.

Source: Compiled and calculated from Table 1

The data of Table 15 of the Policy Analysis Matrix for the fennel crop in organic agriculture in the New Valley Governorate for the average period (2019-2021), where it is clear that the total production costs are financially evaluated, which includes the value of production inputs, the total labor element, the land rent amounted to about 1.937, 1.743, 2.867 thousand pounds / acre, while the total production costs economically evaluated amounted to about 1.988, 1.504, 2.150 thousand pounds / acre for each of them respectively, showing also the negative impact of both revenues and the total work element and rent The land, which was estimated at 0.69, 0.239, and 0.919 thousand pounds / acre, while there was a positive impact for each of the supplies, the net return which was estimated at 0.051 and 1.727 thousand pounds / acre respectively.

The results of Table 16 indicate the nominal and effective protection coefficients and the cost of local resources for cumin and fennel crops in organic agriculture in the New Valley Governorate during the period (2019-2021), for the cumin crop, the nominal protection factor for the products reached about 1.24, which is greater than the correct one, and this means that the local price of a ton of cumin is greater than its price at the borders, and this means that the cumin farmer gets only about 1.24% of the value produced at the world price, and this means that there are no implicit taxes borne by Meat crop cumin.

As for the fennel crop, the nominal protection factor for the products was about 2.09, which is greater than the correct one, and this means that the local price of a ton of fennel is greater than its price at the border, and this means that the fennel farmer gets only about 2.09% of the value of the product at the world price, and this means that there are no implicit taxes borne by the fennel crop. The effective protection factor for cumin and fennel crops in organic agriculture in the New Valley Governorate during the period (2019-2021), for the cumin crop, the effective protection factor was about 0.76, meaning that the added value of the crop at local prices is less than its counterpart evaluated at shadow prices, which confirms that there are implicit taxes on the producers of the cumin crop amounted to about 0.24%. As for the fennel crop, the effective protection factor was about 0.84, meaning that the value added of the crop at local prices is lower than its counterpart evaluated at shadow prices, which confirms that there are implicit taxes on the producers of the cumin crop amounted to about 0.16%.

Table 15. Estimation of the policy analysis matrix for fennel crop in organic agriculture in the New Valley Governorate during the period (2019-2021).

Statement	Costs and revenues in pounds per acre				Net Return	Added Value
	Revenue	Supplies	Local Resources			
			Work item clause	Land rent		
Financial Valuation	1.323	1.937	1.743	2.867	5.668	10.534
Economic Valuation	0.633	1.988	1.504	2.15	7.395	12.572
Impact of agricultural policy	-0.69	0.051	-0.239	-0.919	1.727	-

The numbers in parentheses () are negative values.

Source: Compiled and calculated from Table 14.

Table 16. Results of Nominal and Effective Protection Transactions and Cost of Local Resources for a Crop Cumin in organic agriculture in the New Valley Governorate during the period (2019-2021).

Statement	cumin	Fennel
	Value	Value
Nominal protection coefficient of products	1.24	2.09
Nominal protection coefficient for production inputs	0.78	0.97
Effective protection factor	0.76	0.84
Cost of local resources	1.23	1.26

Economic surplus in thousand pounds	2.86	1.73
Economic surplus in thousand pounds	52.06	30.47
Percentage of net acre return to farms	0.66	0.77

Source: Collected and calculated from Table 14 and 15.

The marketing path for fennel and cumin crops in the New Valley Governorate

It is clear from Figure (1) of the appendix, which shows the marketing path of the fennel and cumin crop in the study sample in the New Valley Governorate, that both fennel and cumin crops from the beginning of receiving them from farmers have four outlets for marketing, which are as follows: The first path is the direction from the farm to the wholesaler, and from it goes to the retailer until it reaches the local consumer, and the second path is the direction from the farm to the wholesaler, and from it it goes to the factory until it reaches the local consumer, and the third path It is the direction from the farm to the wholesaler, and from it it goes to the source until it reaches the external consumer, while for the fourth path it is the direction from the farm to the final consumer directly.

Problems of production of medicinal and aromatic plants in the study sample in the New Valley Governorate

It is clear from the data of Table 17 the relative importance of the productive problems facing the farmers of medicinal and aromatic plants in the study sample in the New Valley Governorate, arranged in descending order for the agricultural season 2021, represented in low yield and low productivity, seminary fragmentation and small production, lack of government support for organic agriculture by about 10.67%, 10.05%, 9.43%, followed by the high prices of fertilizers and pesticides, the lack of a role and support from the cooperative society, the lack of a role for the agricultural guide by about 8.81%, 8.22%, 7.72%, followed by the high wages of trained and skilled workers, scarcity of information For organic agriculture by 7.1%, 6.5%, followed by the spread of weeds, the increase in the prices of vital compounds by about 5.92%, 5.3%, followed by the incidence of diseases and fungi by about 4.71%, Followed by lack of awareness of the killings and the lack of awareness of the whole pregnancy by 4.21%, followed by high transportation costs, weak agricultural policies, institutions and organizations by about 2.62%, followed by weak research and development, marginalization of the organic sector, which is an emerging sector by about 2.37%, 1.73%, followed by the length of the process of popularizing organic products It may take many years of support and research and development by about 1.13%.

Table 17. Productive problems facing farmers of medicinal and aromatic plants in the study sample in the New Valley Governorate.

M	Productive problems facing farmers of medicinal and aromatic plants in the study sample in the New Valley Governorate	Materiality
1	Low yield and low productivity	10.67
2	Fragmentation of holdings and small-scale production	10.05
3	Lack of government support for organic agriculture	9.43
4	High prices of fertilizers and pesticides	8.81
5	Lack of role and support from the cooperative	8.22
6	Lack of role for the agricultural guide	7.72
7	High wages of trained and skilled workers	7.1
8	Scarcity of information on organic farming	6.5
9	Weed infestation	5.92

10	High prices of vital vehicles	5.3
11	Infection with diseases and fungi	4.71
12	Lack of awareness, they kill them, they are not being put together, they are all	4.21
13	High transportation costs	3.51
14	Weak agricultural policies, institutions and organizations	2.62
15	Weak R&D	2.37
16	Marginalization of the organic sector, which is an emerging sector	1.73
17	The length of the organic rollout process may take many years of support and research and development	1.13

Source: Collected and calculated from field study sample data.

Conclusion

The results of the policy analysis matrix for the cumin crop in organic agriculture in the New Valley Governorate for the average period (2019-2021) indicate that the total production costs are financially evaluated, which includes the value of production inputs, the total labor element, land rent amounted to about 2.786, 1.924, 2.867 thousand pounds / acre, while the total production costs economically evaluated amounted to about 3.557, 1.731, 2.150 thousand EGP / acre for each of them respectively, it also showed the negative impact of each of the revenues and the total work element and the rent of the land, which was estimated at 0.69, 0.193, 0.717 thousand pounds / acre, while there was a positive impact for each of the supplies, the net return estimated at 0.771 and 2.862 thousand pounds / acre respectively.

The policy analysis matrix for the fennel crop in organic agriculture in the New Valley Governorate also indicates the average period (2019-2021), where it is clear that the total production costs are financially evaluated, which includes the value of production inputs, the total labor element, the land rent amounted to about 1.937, 1.743, 2.867 thousand pounds / acre, while the total production costs economically evaluated amounted to about 1.988, 1.504, 2.150 thousand pounds / acre for each of them, respectively, showing also the negative impact of both revenues and the total work element and the rent of the land, which was estimated at about 0.69, 0.239, 0.919 thousand pounds / acre, while there is a positive effect for each of the supplies, the net yield estimated at 0.051 and 1.727 thousand pounds / acre respectively.

The nominal and effective protection coefficients and the cost of local resources for the cumin crop in organic agriculture in the New Valley Governorate during the period (2019-2021), indicate that the nominal protection factor for products amounted to about 1.24, which is greater than the correct one, and this means that the local price of a ton of cumin is greater than its price at the borders, and this means that the cumin farmer gets only about 1.24% of the value produced at the international price, and this means that there are no implicit taxes borne by the survivor of the cumin crop.

As for the fennel crop, the nominal protection factor for the products was about 2.09, which is greater than the correct one, and this means that the local price of a ton of fennel is greater than its price at the border, and this means that the fennel farmer gets only about 2.09% of the value of the product at the international price, and this means that there are no implicit taxes borne by the fennel crop.

The effective protection factor for cumin and fennel crops in organic agriculture in the New Valley Governorate during the period (2019-2021), for the cumin crop, the effective protection factor was about 0.76, meaning that the added value of the crop at local prices is less than its counterpart evaluated at shadow prices, which confirms that there are implicit taxes on the producers of the cumin crop amounted to about 0.24%. As for the fennel crop, the effective protection factor was about 0.84, meaning that the value added of the crop at local prices is lower than its counterpart evaluated at shadow prices, which

confirms that there are implicit taxes on the producers of the cumin crop amounted to about 0.16%.

The results of the relative importance of the productive problems facing the farmers of medicinal and aromatic plants in the study sample also showed that the most important problems are low yield and low productivity, tenure fragmentation and small production. Therefore, the research is recommended as follows:

- 1- The need to plant fennel and cumin in close and homogeneous crops to cause more efficiency in the use of agricultural resources.
- 2- Focusing on agricultural production plans by increasing the areas planted with fennel and cumin crops, especially in environmentally appropriate areas that achieve the highest productivity.
- 3- Motivating the graduates, facilitating internal marketing procedures and improving marketing functions.

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