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ECONOMIC STUDY FOR ONION AND GARLIC PRODUCTION IN EGYPT

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ABSTRACT

Onion and Garlic are a popular food and they have a significant contributor to good health. The study uses the Malmquist index technique to measure the efficiency change of onion and garlic production in Egypt during 1995-2019. In the studied period, the mean of onion production is 1572.39 thousand ton and the mean of garlic production is 240.31 thousand ton. The minimum value of onion production (386.345 thousand ton) and garlic production (119.172 thousand ton) in 1995, while the maximum value of onion production (3077.316 thousand ton) and garlic production (363.46 thousand ton) in 2019. Gharbia governorate has the highest production and the largest area of onion, while Beni Suef governorate has the highest production and the largest area of Garlic, in 2019. Ismailia governorate has the lowest production and the lowest area of onion and Garlic in 2019. The results indicate growth in efficiency for onion production and some declining in efficiency for garlic production. The study recommends increasing the area of onion and garlic production.

Key words: : Onion, garlic, Malmquist index, Egypt

INTRODUCTION

Onions, garlic, leeks, and shallots are all members of the *Allium* family. The two basic types of onions are bulb-forming onions, which produce a bulb in one year, and perennial onions, which produce clusters of small onions that can be harvested and replanted for the next crop. The bulb-forming onions include storage onions and fresh or sweet onions.

Perennial onions include bunching or multiplier onions, Egyptian onions, shallots, and potato onions. Egyptian onions are the most cold hardy of all onions. They are not as tender and tasty as scallions or bulb onions, and are most useful in mid-winter when other onions are out of season (Musgrove and Smith, 2010). Garlic has proven itself as a popular food and nutrition item, and is gaining scientific credibility as a significant contributor to good health. One niche market that has grown tremendously is garlic. The strong surge in use likely reflects several factors, such as the rising popularity of ethnic foods and restaurants; persistent health messages circulating in the press about garlic; demand from the health supplements industry; and the never-ending quest by consumers for new taste experiences. Used primarily in cooking to flavor a wide variety of foods, garlic provides vitamin C, potassium, phosphorous, selenium, several amino acids, and a variety of sulfur compounds, including allicin (FAO, 2007). This study aims to estimate the efficiency of onion and garlic production in Egypt during 1995-2019.

METHODOLOGY

The Malmquist index was first introduced by Caves, Christensen and Diewert (1982). They defined the TFP index using Malmquist input and output distance functions, and thus the resulting index came to be known as the Malmquist index (Chaudhary, 2012).

Färe et al (1994) specify Malmquist index $[M_o(x^{t+1}, y^{t+1}, x^t, y^t)]$ as the geometric mean of two-period indices that is:

$$M_o(x^{t+1}, y^{t+1}, x^t, y^t) = \left[\left(\frac{D_0^t (x^{t+1}, y^{t+1})}{D_0^t (x^t, y^t)} \right) \left(\frac{D_0^{t+1} (x^{t+1}, y^{t+1})}{D_0^{t+1} (x^t, y^t)} \right) \right]^{1/2} \quad (1)$$

Where, $D_o^t (x^{t+1}, y^{t+1})$ is the output distance function at the observed input vector x and the observed output vector y. $D_o^t (x^{t+1}, y^{t+1})$ represents the distance from the period *t+1* observation to the period *t* technology. From equation (1), we can obtain the efficiency change through the following equation:

$$Efficiency\ change = \frac{D_o^{t+1} (x^{t+1}, y^{t+1})}{D_o^t (x^t, y^t)} \quad (2)$$

A value of efficiency change equal to one implies there has been no change in efficiency across the two time periods *t* and *t+1*, greater than one implies a growth in efficiency and a value less than one is interpreted as deterioration in efficiency.

DATA

The data that employed for this study obtained from FAOSTAT and MALR, Egypt. The panel data represents the production and area of onion and garlic in Egypt during 1995-2019. To measure the efficiency of onion and garlic production in Egypt between period *t* and period *t+1*, the study apply Malmquist index.

Table (1) shows the production, area, and yield of onion in Egypt (1995-2019). The mean of this period for production is 1572.39 thousand ton, for area is 47.82

thousand hectare, and for yield is 30.96 ton/hectare.

Table (2) shows the production, area, and yield of garlic in Egypt (1995-2019). The mean of production, area, and yield is 240.31 thousand ton, 10.44 thousand hectare, and 23.11 ton/hectare, respectively.

Table (3) shows the production, area, and yield of onion in the main governorates in Egypt (1995-2019). In 2019, Gharbia governorate has the highest production (751.46 thousand ton) and the largest area (41.58 thousand feddan), while Ismailia governorate has the lowest production (4.54 thousand ton) and the lowest area (0.45 thousand feddan).

Table (4) shows the production, area, and yield of garlic in the main governorates in Egypt (1995-2019). In 2019, Beni Suef governorate has the highest production (132.82 thousand ton) and the largest area (12.87 thousand feddan), while Ismailia governorate has the lowest production (0.13 thousand ton) and the lowest area (0.02 thousand feddan).

RESULTS

Table (5) shows the efficiency change for onion and garlic production in Egypt during the time period 1995-2019.

During 1995-2019, the mean of efficiency change for onion is greater than one (1.002), which implies a growth in efficiency during this period, while the mean of efficiency change for garlic less than one (0.988), which implies some declining in efficiency during this period.

CONCLUSION

Onion and garlic have a significant contributor to good health. The study aims to estimate the efficiency of onion and garlic production in Egypt during 1995-2019. The study used Malmquist index technique. During 1995-2019, the mean of production for onion and garlic is 1572.39 thousand ton and 240.31 thousand ton, respectively. The results indicate growth in efficiency for onion production and some declining in efficiency for garlic production.

RECOMMENDATIONS

The study recommends increasing the area of onion and garlic production; increasing the research with the purpose of taking advantage of genetic improvements, which should enable the introduction of new varieties with higher productivity; improve and increase the technology level of onion and garlic production; increase the training of labors.

Table 1. Production, Area, and Yield of Onion in Egypt (1995-2019).

Years	Production (Thousand Ton)	Area (Thousand Hectare)	Yield (Ton/Hectare)
1995	386.35	17.17	22.51
1996	447.73	19.29	23.21
1997	396.13	15.30	25.89
1998	722.67	30.32	23.83
1999	889.80	34.77	25.59
2000	762.99	28.60	26.68
2001	628.38	22.69	27.70
2002	754.86	26.97	27.99
2003	686.35	23.25	29.52
2004	895.49	29.06	30.82
2005	1302.13	42.60	30.57
2006	1119.89	36.39	30.77
2007	1485.93	46.47	31.98
2008	1948.94	52.83	36.89
2009	2128.58	59.78	35.61
2010	2208.08	61.54	35.88
2011	2304.21	63.72	36.16
2012	2024.88	58.09	34.86
2013	1093.23	52.72	20.74
2014	2505.19	68.49	36.58
2015	3049.61	83.04	36.72
2016	2458.62	69.43	35.41
2017	2965.22	81.43	36.41
2018	3067.21	85.77	35.76
2019	3077.32	85.78	35.87
Mean	1572.39	47.82	30.96

Sources: FAOSTAT and own elaboration

Table 2. Production, Area, and Yield of Garlic in Egypt (1995-2019).

Years	Production (Thousand Ton)	Area (Thousand Hectare)	Yield (Ton/Hectare)
1995	119.17	5.60	21.29
1996	255.49	10.66	23.96
1997	159.11	6.99	22.77
1998	173.56	7.56	22.94
1999	224.13	10.70	20.95
2000	266.56	12.52	21.29
2001	215.42	9.30	23.17
2002	190.00	8.67	21.93
2003	207.76	9.51	21.85
2004	187.83	8.35	22.50
2005	162.08	7.15	22.68
2006	164.26	7.27	22.59
2007	234.57	10.44	22.46
2008	339.62	11.79	28.80
2009	195.74	7.33	26.71
2010	244.63	9.67	25.29
2011	295.85	12.15	24.36
2012	309.16	12.30	25.14
2013	234.16	9.30	25.17
2014	263.17	10.10	23.93
2015	290.89	12.59	23.11
2016	272.77	12.88	21.19
2017	289.77	13.02	22.25
2018	348.70	17.00	20.51
2019	363.46	17.31	20.10
Mean	240.31	10.44	23.11

Sources: FAOSTAT and own elaboration

Table 3. Production, Area, and Yield of Onion in the Main Governorates in Egypt (1995-2019).

Governorate	Production (Thousand Ton) 1995	Production (Thousand Ton) 2019	Area (Thousand Feddan) 1995	Area (Thousand Feddan) 2019	Yield (Ton/ Feddan) 1995	Yield (Ton/ Feddan) 2019
Behairah	5.77	162.47	0.73	10.30	7.90	15.78
Gharbia	96.98	751.46	7.71	41.58	12.58	18.07
Dakahlia	36.22	363.60	3.37	26.98	10.75	13.48
Sharkia	16.08	199.35	2.24	15.74	7.20	12.67
Ismailia	1.18	4.54	0.31	0.45	3.82	10.04
Menoufia	7.11	17.84	0.92	1.25	7.70	14.25
Qalyoubia	66.43	150.44	5.90	11.37	11.26	13.24
Giza	42.62	23.59	4.51	2.27	9.45	10.40
Beni Suef	47.74	155.64	5.56	14.02	8.59	11.10
Fayoum	43.55	153.43	4.15	11.12	10.51	13.80
Menia	52.73	86.90	6.87	5.10	7.67	14.50
Assuit	79.81	57.21	6.73	3.54	11.86	16.18
Suhag	25.17	254.47	1.93	13.60	13.06	18.71
Noubaria	31.63	278.34	6.19	18.22	5.11	15.28
Mean	37.07	179.61	3.84	11.93	8.94	14.07

Sources: MALR in Egypt and own elaboration

Table 4. Production, Area, and Yield of Garlic in the Main Governorates in Egypt (1995-2019).

Governorate	Production (Thousand Ton) 1995	Production (Thousand Ton) 2019	Area (Thousand Feddan) 1995	Area (Thousand Feddan) 2019	Yield (Ton/ Feddan) 1995	Yield (Ton/ Feddan) 2019
Behairah	0.96	6.10	0.11	1.06	8.46	5.74
Gharbia	0.82	0.98	0.12	0.13	6.80	7.34
Dakahlia	1.09	7.70	0.23	1.32	4.68	5.85
Sharkia	9.83	6.28	1.33	0.92	7.38	6.82
Ismailia	-	0.13	-	0.02	-	6.00
Menoufia	0.88	0.45	0.12	0.07	7.57	6.64
Qalyoubia	3.88	0.94	0.40	0.15	9.77	6.39
Giza	3.68	20.65	0.55	2.49	6.63	8.29
Beni Suef	15.09	132.82	1.51	12.87	9.98	10.32
Fayoum	3.10	12.73	0.43	1.88	7.27	6.77
Menia	69.78	37.62	6.92	4.14	10.08	9.10
Assuit	3.54	7.45	0.24	0.83	14.61	8.94
Suhag	3.20	6.55	0.39	0.611	8.28	10.72
Noubaria	-	105.06	-	10.21	-	10.29
Mean	8.91	23.03	0.95	2.45	8.21	7.55

Sources: MALR in Egypt and own elaboration

Table 5. Efficiency Change for Onion and Garlic Production in Egypt (1995-2019).

Period	Onion	Garlic
1995-1996	0.968	1.057
1996-1997	1.033	0.879
1997-1998	1.000	1.095
1998-1999	1.000	0.850
1999-2000	1.000	0.975
2000-2001	1.000	1.048
2001-2002	1.000	0.936
2002-2003	1.000	0.945
2003-2004	1.000	0.986
2004-2005	1.000	1.016
2005-2006	1.000	0.990
2006-2007	1.000	0.957
2007-2008	1.000	1.111
2008-2009	1.000	0.961
2009-2010	1.000	0.939
2010-2011	1.000	0.956
2011-2012	1.000	1.071
2012-2013	0.824	1.386
2013-2014	1.214	0.654
2014-2015	1.000	0.962
2015-2016	1.000	0.951
2016-2017	1.000	1.021
2017-2018	1.000	0.938
2018-2019	1.000	1.021
Mean[a]	1.002	0.988

Source: Own elaboration
([a]) Geometric mean (1995-2019)

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الملخص العربي

دراسة اقتصادية لإنتاج البصل و الثوم في مصر

يحيي حامد الاسرج
قسم الاقتصاد الزراعي- كلية زراعة - جامعة القاهرة

تهدف هذه الدراسة إلى قياس كفاءة إنتاج البصل و الثوم في مصر خلال الفترة 1995-2019. خلال الفترة 1995-2019، بلغ متوسط إنتاج البصل و الثوم 1572.39 ألف طن و 240.31 ألف طن، على التوالي. استخدمت الدراسة مؤشر Malmquist. تشير النتائج إلى وجود نمو في كفاءة إنتاج البصل وبعض الهبوط في كفاءة إنتاج الثوم. توصي الدراسة بزيادة مساحة إنتاج البصل و الثوم؛ زيادة البحوث بغرض الاستفادة من التحسينات الجينية التي ينبغي أن تمكن من إدخال أصناف جديدة ذات إنتاجية أعلى؛ تحسين و زيادة المستوى التقني في إنتاج البصل و الثوم؛ زيادة التدريب للعمال.