J. Agric. Econom. and Social Sci., Mansoura Univ., Vol. 9 (5): 407 - 410, 2018

Comparison of the Egyptian and Spanish Tomatoes Crop

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ABSTRACT

The study uses the Malmquist index to measures the efficiency change and technical change for tomatoes production in Egypt and compares it with Spain at 1994-2013. The study finds that the mean of efficiency change and technical change for tomatoes production in Egypt are 0.987 and 1.026 respectively.

INTRODUCTION

Tomato is the main vegetable crop in Egypt for many factors; tomato in Egypt can be grown in any type of soil, from pure sand to heavy clay, changing Egyptian consumer attitudes have increased the demand for vegetables of high nutritional value like tomato, tomato can be grown all year round allowing three harvest seasons, and tomato enjoy the highest cropping intensity ratio in land use among all vegetable crops in Egypt. The largest acreage is carried out between July and October, followed by a season from November to February, while the smallest acreage is of the season from March to June (Alboghdady, 2014). In the Spanish horticulture, tomato is a basic product which occupies 14% of the horticultural surface cultivated and contributes to 23% of the value of the sector's production. Tomatoes satisfy the interior demand in Spain and have a strong export demand, about 25% of the fresh production and 50% of the canned fruit are exported (Tello, 1998).

Problem and Objective

The production of tomatoes in Egypt shows a vibration between increasing and decreasing at 1994-2013. The study aims to measure the efficiency change (EFFCH) and technical change (TECHCH) for tomatoes production in Egypt at 1994-2013 and compare it with Spain.

Methodology

The Malmquist TFP index measures the TFP change between two data points (period's *t* and *s*) (Coelli *et al.,* 2005).

$$\text{Malmquist TFP} = m_0(y_s, x_s, y_t, x_t) = \left[\frac{D_0^s(y_t, x_t)}{D_0^s(y_s, x_s)} \times \frac{D_0^t(y_t, x_t)}{D_0^t(y_s, x_s)}\right]^{1/2}. \quad (1)$$

An index of one indicates no change in productivity. A value less than one indicate a productivity decrease and a value larger than one represents a productivity increase.

Malmquist index for productivity change can be decomposed into efficiency change, technical change and scale change (Coelli *et al*., 2005). To decompose the Malmquist TPF index (Coelli *et al*., 2005), we calculate the technical efficiency change over time (from period *t* to *s*):

$$TE\ \Delta = TE_{it} / TE_{is} = \frac{D_0^t(y_t, x_t)}{D_0^s(y_s, x_s)}, \quad (2)$$

And the technical change:

$$T\Delta = \left[\frac{D_0^s(y_t, x_t)}{D_0^t(y_t, x_t)} \times \frac{D_0^s(y_s, x_s)}{D_0^t(y_s, x_s)}\right]^{1/2}. \quad (3)$$

The Malmquist TFP index is thus the product of the technical efficiency change and the technical change, i.e.

$$\dot{\text{TFP}} = \text{TE}\Delta \times \text{T}\Delta. \quad (4)$$

Furthermore, there are more refined decompositions of the Malmquist productivity index in literature. The output-orientated Malmquist productivity index can be decomposed into four factors (technical change $T\Delta$, technical efficiency change $TE\Delta$, scale effects *SEC* and an output mix effect *OME*) (Orea, 2002), i.e.

$$\dot{TFP} = T\Delta \cdot TE\Delta \cdot SEC \cdot OME.$$

Or, the Malmquist TFP index can be decomposed into technical efficiency change, and technical change which is further decomposed into input bias and output bias (Fuentes *et al*., 2001).

As the study measure the efficiency change (EFFCH) and technical change (TECHCH) of tomatoes production in Egypt and Spain, the input is tomatoes area, while the output is tomatoes production. Tomatoes production has been estimated in thousand ton and tomatoes area has been estimated in thousand hectare. In the following part the Annual average percentage growth rate represented by the abbreviation of AAPGR.

RESULTS

Table and figure (1) show the Egyptian and Spanish tomatoes production at 1994-2013.

Table 1. Egyptian and Spanish Tomatoes Production (1994-2013).

Year	Egyptian Tomatoes Production (Thousand Ton)	Spanish Tomatoes Production (Thousand Ton)
1994	5010.68	3108.82
1995	5034.20	2841.10
1996	5995.41	3326.40
1997	5873.44	3360.21
1998	5753.28	3560.40
1999	6273.76	3874.72
2000	6785.64	3766.33
2001	6328.72	3971.69
2002	6777.88	3979.72
2003	7140.20	3947.33
2004	7640.82	4383.20
2005	7600.00	4810.30
2006	8576.07	3800.55
2007	8639.02	4081.48
2008	9204.10	4049.75
2009	10278.54	4798.05
2010	8544.99	4312.71
2011	8105.26	3864.12
2012	8625.22	4046.40
2013	8533.80	3683.60
Mean	7336.05	3878.34
Rate[a]	2.84	0.90

Sources: FAOSTAT and researcher preparation
(a) AAPGR (1994-2013)

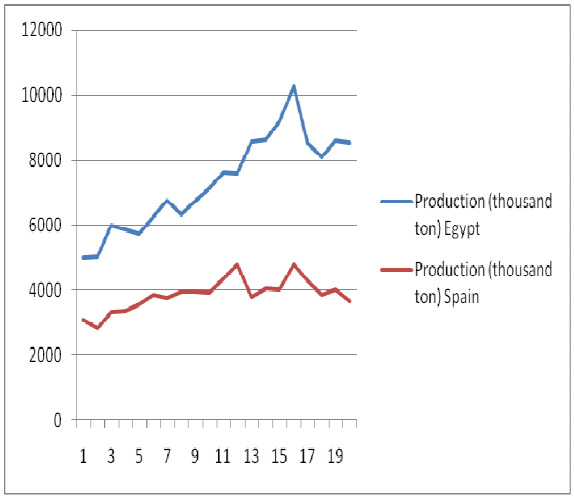

Figure 1. Egyptian and Spanish Tomatoes Production (1994-2013).
Source: Researcher preparation

The lowest production of tomatoes in Egypt is 5010.68 thousand ton at 1994 and 1998, in Spain is 2841.10 thousand ton at 1995, while the highest production of tomatoes in Egypt is 10278.54 thousand ton at 2009 and in Spain is 4810.30 thousand ton at 2005. The mean of tomatoes production at 1994-2013 in Egypt is 7336.05 thousand ton and in Spain it is 3878.34 thousand ton. The AAPGR at 1994-2013 for Egypt is 2.84% and for Spain is 0.90%.

Figure and table (2) show the Egyptian and Spanish tomatoes area at 1994-2013. The lowest area of tomatoes in Egypt is 148.52 thousand hectare at 1994 and in Spain is 45.30 thousand hectare at 2013, while the highest area of tomatoes in Egypt is 251.84 thousand hectare at 2009 and in Spain is 72.29 thousand hectare at 2005. The mean of tomatoes area at 1994-2013 in Egypt is 197.63 thousand hectare and in Spain is 58.81 thousand hectare. The AAPGR at 1994-2013 for Egypt is 1.91% and for Spain is declining -1.48%.

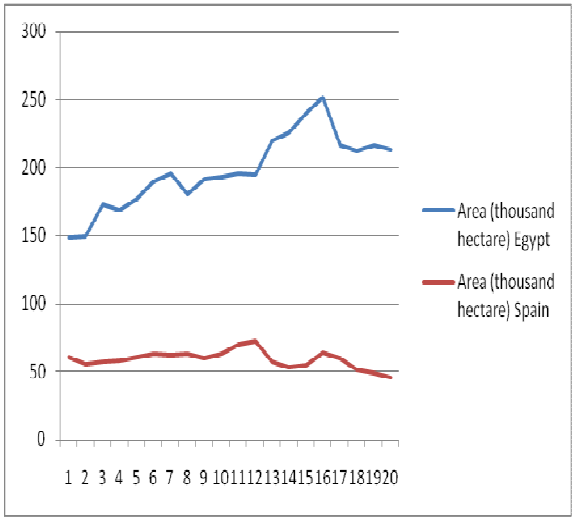

Figure 2. Egyptian and Spanish Tomatoes Area (1994-2013).
Source: Researcher preparation

Table 2. Egyptian and Spanish Tomatoes Area (1994-2013).

Year	Egyptian Tomatoes Area (Thousand Hectare)	Spanish Tomatoes Area (Thousand Hectare)
1994	148.52	60.16
1995	149.34	55.20
1996	173.15	56.80
1997	168.63	57.75
1998	177.24	60.20
1999	189.41	63.38
2000	195.44	62.29
2001	180.72	63.03
2002	191.17	59.27
2003	192.98	62.97
2004	195.16	69.90
2005	195.00	72.29
2006	220.11	56.69
2007	225.63	53.30
2008	240.17	54.87
2009	251.84	63.84
2010	216.39	59.27
2011	212.45	51.20
2012	216.40	48.60
2013	212.95	45.30
Mean	197.63	58.81
Rate[a]	1.91	-1.48

Sources: FAOSTAT and researcher preparation
(a) AAPGR (1994-2013)

Figure and table (3) show the Egyptian and Spanish tomatoes yield at 1994-2013. The lowest tomatoes yield in Egypt is 32.46 ton/hectare at 1998 and in Spain is 51.47 ton/hectare in 1995, while the highest tomatoes yield in Egypt is 40.81 ton/hectare at 2009 and in Spain is 83.26 ton/hectare at 2012. The mean of tomatoes yield at 1994-2013 in Egypt is 36.84 ton/hectare and in Spain is 66.41 ton/hectare. The AAPGR at 1994-2013 for Egypt is 0.91% and for Spain is 2.41%.

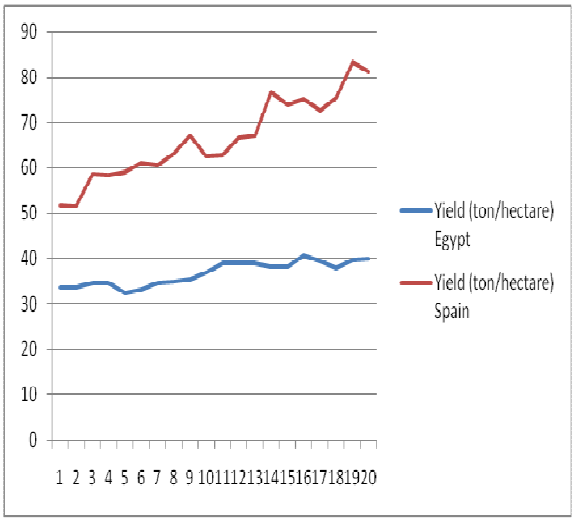

Figure 3. Egyptian and Spanish Tomatoes Yield (1994-2013).
Source: Researcher preparation

Table 3. Egyptian and Spanish Tomatoes Yield (1994-2013).

Year	Egyptian Tomatoes Yield (Ton/Hectare)	Spanish Tomatoes Yield (Ton/Hectare)
1994	33.74	51.68
1995	33.71	51.47
1996	34.63	58.56
1997	34.83	58.19
1998	32.46	59.14
1999	33.12	61.13
2000	34.72	60.47
2001	35.02	63.01
2002	35.45	67.15
2003	37.00	62.68
2004	39.15	62.70
2005	38.97	66.55
2006	38.96	67.04
2007	38.29	76.58
2008	38.32	73.80
2009	40.81	75.16
2010	39.49	72.77
2011	38.15	75.47
2012	39.86	83.26
2013	40.07	81.32
Mean	36.84	66.41
Rate[a]	0.91	2.41

Sources: FAOSTAT and researcher preparation

(a) AAPGR (1994-2013)

Table and figure (4) show the efficiency change (EFFCH) and technical change (TECHCH) for tomatoes production in Egypt at 1994-2013. The mean of EFFCH and TECHCH for tomatoes production in Egypt during the time period 1994-2013 are 0.987 and 1.026 respectively. The time period 2006-2007 has the less EFFCH (0.86) and higher TECHCH (1.142), while the time period 2002-2003 has the more EFFCH (1.118) and the less TECHCH (0.933).

Table 4. EFFCH and TECHCH for Tomatoes Production in Egypt (1994-2013).

Period	EFFCH	TECHCH
1994-1995	1.003	0.996
1995-1996	0.903	1.138
1996-1997	1.012	0.994
1997-1998	0.917	1.016
1998-1999	0.987	1.034
1999-2000	1.060	0.989
2000-2001	0.968	1.042
2001-2002	0.950	1.066
2002-2003	1.118	0.933
2003-2004	1.058	1.000
2004-2005	0.938	1.061
2005-2006	0.992	1.007
2006-2007	0.860	1.142
2007-2008	1.038	0.964
2008-2009	1.046	1.018
2009-2010	0.999	0.968
2010-2011	0.932	1.037
2011-2012	0.947	1.103
2012-2013	1.029	0.977
Mean	0.987	1.026

Source: Researcher preparation

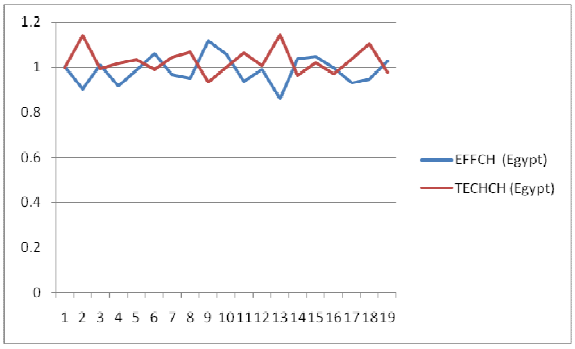

Figure 4. EFFCH and TECHCH for Tomatoes Production in Egypt (1994-2013).

Source: Researcher preparation

Table and figure (5) show the efficiency change (EFFCH) and technical change (TECHCH) for tomatoes production in Spain at 1994-2013. The mean of EFFCH and TECHCH for tomatoes production in Spain during the time period 1994-2013 are 1 and 1.026 respectively. The time period 2002-2003 has the less TECHCH (0.933), while the time period 2006-2007 has the more TECHCH (1.142). The EFFCH during the time period 1994-2013 has the value of one.

Table 5. EFFCH and TECHCH for Tomatoes Production in Spain (1994-2013).

Period	EFFCH	TECHCH
1994-1995	1.000	0.996
1995-1996	1.000	1.138
1996-1997	1.000	0.994
1997-1998	1.000	1.016
1998-1999	1.000	1.034
1999-2000	1.000	0.989
2000-2001	1.000	1.042
2001-2002	1.000	1.066
2002-2003	1.000	0.933
2003-2004	1.000	1.000
2004-2005	1.000	1.061
2005-2006	1.000	1.007
2006-2007	1.000	1.142
2007-2008	1.000	0.964
2008-2009	1.000	1.018
2009-2010	1.000	0.968
2010-2011	1.000	1.037
2011-2012	1.000	1.103
2012-2013	1.000	0.977
Mean	1.000	1.026

Source: Researcher preparation

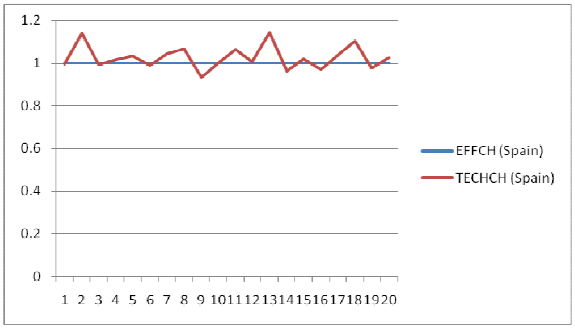

Figure 5. EFFCH and TECHCH for Tomatoes Production in Spain (1994-2013).

CONCLUSION

In Egypt tomatoes enjoy the highest cropping intensity ratio in land use among all vegetable crops. In Spain tomatoes is a basic product, and it occupies 14% of the horticultural surface cultivated. The study aims to measure EFFCH and TECHCH for tomatoes production in Egypt at 1994-2013 and compare it with Spain. For 1994-2013; the mean of tomatoes production in Egypt is 7336.05 thousand ton and the AAPGR is 2.84%. The mean of tomatoes area in Egypt is 197.63 thousand hectare and the AAPGR is 1.91%. The results indicate that the mean of EFFCH and TECHCH for tomatoes production in Egypt at 1994-2013 are 0.987 and 1.026 respectively. The study recommends increasing the effects of scale by the implementing of land consolidation system to increase the scale efficiency and reduce the costs; improve and increase the technology level of tomatoes production; and increase the area of tomatoes production through the reclaimed agricultural areas.

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مقارنة بين محصول الطماطم المصري والإسباني

يحيى حامد امين الاسرج

قسم الاقتصاد الزراعي ، كلية الزراعة ، جامعة القاهرة

تتمتع الطماطم بأعلى نسبة كثافة للمحاصيل في استخدام الأراضي بين جميع محاصيل الخضراوات في مصر, و الطماطم منتج أساسي في البستنة الإسبانية وتحتل 14٪ من سطح البستنة المزروعة. تهدف الدراسة إلى قياس التغير في الكفاءة والتغير التقني لإنتاج الطماطم في مصر خلال 1994-2013 ومقارنتها مع إسبانيا. اثناء 1994-2013 بلغ متوسط إنتاج الطماطم في مصر 7336.05 ألف طن وبلغ معدل النمو السنوي 2.84٪. بلغ متوسط مساحة الطماطم في مصر 197.63 ألف هكتار وبلغ متوسط معدل النمو السنوي 1.91٪. تشير النتائج إلى أن متوسط التغير في الكفاءة والتغير التقني لإنتاج الطماطم في مصر خلال الفترة الزمنية 1994-2013 هو 0.987 و 1.026 على التوالي. توصي الدراسة بزيادة تأثير الحجم من خلال تنفيذ نظام التجميع الحيازي للأراضي لزيادة كفاءة الحجم وتقليل التكاليف؛ تحسين وزيادة مستوى التكنولوجيا في إنتاج الطماطم؛ وزيادة مساحة إنتاج الطماطم من خلال المناطق الزراعية المستصلحة.