The Technical and Economic Efficiency of Olive Oil Production in the Syrian Coast

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Abstract

The study was conducted to evaluate the Technical efficiency of the Olive Oils farms in the Syrian coast, in 2016-2017 using (Data Envelopment Analysis). Depending on some inputs represented by (organic fertilizer, Nitrogen fertilizers, Phosphate fertilizers and labor)

The technical efficiency output (production)was estimated by assuming to variable returns to scale by using production and costs function data.

The technical efficiency in 2017 was higher than in 2016. as it reached 59.8%. The allocative and economic efficiency increased to 91.2% and88.5% respectively

The third possessory category ((> 10) donums) was superior to the rest in achieving the technical efficiency (by both constant returns to scale and variable returns to scale), and the best allocative, economic efficiency.

The main conclusion of the study is the need to collect small agricultural holdings, which are smaller than 5 donums, and the farmers are recommended to use the optimal quantity of agricultural inputs, and chose the best select for the materials and inputs prices.

Keywords - *Technical Efficiency, Allocative Efficiency, Economic Efficiency, Data Envelopment, Olive.*

I. INTRODUCTION

The cultivation of olive trees is considered as one of the most important and oldest crops in Syria, which is the original home of it. Olive comes in the third place in terms of income after grain and cotton. Therefore it is considered as one of the most important crop for food security, and occupying more than 60% of the total area of the fruit trees in Syria. That appeared clearly by the increase of the area planted by olive trees during the crisis period.

Olive trees are considered as the most important trees in Syria, in terms of both the area, and the amount of annual production. The Average area planted with olive in Syria for years 2011-2016 was estimated at about 694 thousand hectares with total annual production at about 827 thousand tons. While the average area planted with olive trees for the years 2006-2010 was 625 thousand hectares, with the total annual production at about 792 thousand tons for the same years. (Statistical group of the Agriculture Ministry, 2016).

II. RESEARCH PROBLEM

The agricultural sector had suffered from the Syrian crisis of vandalism, neglect, high prices and the costs of agricultural operations, labor scarcity and its high prices. Syrian olives sector is also affected by some of those above, which is reflected on the production, and the efficiency of resources and inputs used by farmers. This leads to low agricultural income and makes the economic and technical efficiency of the olive production less than required.

III. RESEARCH IMPORTANCE AND OBJECTIVES

Olive tree in the Syrian coast is an important source of income for many rural families, whom are fed by its fruit and oil. This research helps to determine the efficiency and economic importance of olive oil production in the Syrian coast in general, under the current crisis. Therefore the research aims to:

1-Measur the technical efficiency of olive oil production in the Syrian coast by the constants returns to scale and the variable returns to scale in 2016-2017 seasons, relying on the production function, and measuring the economic efficiency, and the allocative efficiency of olive oil production depending on the function of the costs.

2. Measure technical economic, and allocative efficiency of the olive oil production in the Syrian coast in 2016- 2017 according to the category of possession.

IV. MATERIALS AND METHODS

A. Study Region

Olive production is concentrated on the northern and western areas of Syria. The research was carried out in Lattakia Governorate, (where olive trees occupied 42 thousand hectares, equivalent to 6% of the total area planted with olive trees in Syria, an average in (2010-2016), and Tartous Governorate

(where olive trees occupied 63 thousand hectares equivalent to 9% of the total area planted with olive trees in Syria) statistical group of agriculture ministry, 2016.

B. Methodology

Data sources: Two types of data were relied upon:

- Secondary Data: data has been collected from the statistical group of the Agriculture Syrian Ministry of 2016
- Preliminary Data: 383 application form for 2016-2017agriculture seasons were distributed on a sample of Olive growers in the Syrian coast governorates.(275 in Tartusand 108 in Lattakia).

C. Research Materials and Methods

Technical efficiency of the output (output oriented measures) was estimated by assuming variable returns to scale (VRS) for olive farmers, by using Data Envolepment Analysis (DEP). Which is based on the linear programming using N of variables (organic fertilizer, nitrogen fertilizer, phosphatic , and labor). Researchers interested in assessing the economic efficiency and its components by using the Data Envelopement Analysis. This appeared as one of the quantitative methods used to rationalize administrative decisions on the level of decision-making units. So it's a tool used to measure the Technical Efficiency by Data Envelopement Analysis depending on the linear programming by determining the optimal mix of inputs and outputs of similar administrative units for the goals and activities based on the actual performance of these units (Bahermz, 1996). The Efficiency: is the ratio between the amount of the planned resources and used resources (Alice, 2006), and its one of the economic concepts defined by the Organization of Economic Cooperation and Development(OECD) as the extent to which the inputs transform to the results by Economic manner . That means efficiency represents an economic relationship between available resources and production achieved by either maximizing production by a certain amount of input. or reducing the amount of inputs used to achieve a specific volume of production at a given level of technology. (Hussan, 2005)

The Basics Of The Efficiency Measurement: (Farrell,1957) showed that the economic efficiency of the facility consists of the allocative efficiency, and technical efficiency. according to" farrell there are two ways to measure the first efficiency indicators: first by inputs called Input Oriented Measure, and Second By outputs called Out Oriented Measures.

Economic Efficiency: its known as the use of resources in the form of which they can achieve more production by the same costs as previous, or achievement the previous production by lower costs . Economic efficiency is confined to the value between zero and one.(Al-akili, 2015)

The Components Of Economic Efficiency: Allocative Efficiency(AE): it implies the ability of the unit to use the optimal mix of inputs, taking into account the input prices, and technical productivity. Technical Efficiency (TE): It means the ability of the farm to use the optimal mix of available inputs for maximum production, And reflects the ability of farms to obtain maximum output power of a set of inputs and available technology (coelli, 1995).

V. RESULTS AND DISCUSSION

A. Estimating The Technical Efficiency Of Olive Farms In The Syrian Coast, Relying On The Production Function:

1. The Technical Efficiency Of Agricultural Season 2016 Olive Farms By The Constant Returns To Scale: The analysis results of the sample of the Syrian coast olive farms in 2016 showed that the average of the technical efficiency by the constant returns to scale reached 51.7% and olive growers had the capacity to increase their output to 48.3% without the use of any additional resources. These technical efficiency ranged between 29.2% - 100%, thus the following table shows the level of the technical efficiency of agricultural season 2016 olive farms in the constant returns to scale on the basis of the production function:

TABLE 1
The level of technical efficiency of the olive farms in the constants Returns To Scale

CREST	Farms umber	Relative importance%
< 40%	97.0	25.3
40-50%	112.0	29.2
50-60%	70.0	18.3
60-70%	55.0	14.4
70-80%	14.0	3.7
80-90%	21.0	5.5
90-100%	7.0	1.8
100%	7.0	1.8
Total	383.0	100.0

Source: research data analysis

2. The Technical Efficiency Of The Olive Farms Of The Syrian Coast For The 2016agricultural Season By The Variable Returns To Scale (VRSTE)

The technical efficiency average by the variable returns to scale (VRST) was 89.7% and the number of the farms which achieved a full efficiency was 70 which accounted for 18.3% of the total sample. This efficiency ranged between 69.4% - 100%.

TABLE2
The level of the olive farms technical efficiency by the variable returns to scale (VRSTE):

(VRSTE)	Farms number	relative importance%
60-70%	14.0	3.7
70-80%	56.0	14.6
80-90%	104.0	27.1
90-100%	139.0	36.3
100%	70.0	18.3
Total	383.0	100

Source: research data analysis

3. Scale efficiency of the olive farms (SCALE)

it is expressed in terms of the technical efficiency by the constant returns to scale to the technical efficiency by the variable returns to scale . The average of this efficiency was 57.4% and ranged between 32.7%- 100% .

TABLE3
The level of scale efficiency of olive farms

SCALE	Farms number	relative importance%
< 40%	49.0	12.8
40-50%	90.0	23.5
50-60%	84.0	21.9
60-70%	91.0	23.8
70-80%	28.0	7.3
80-90%	27.0	7.1
90-100%	7.0	1.8
100%	7.0	1.8
Total	383.0	100

Source: research data analysis

B. Estimating the efficiency of the olive farms for the season 2016 based on the cost function:

1. The Allocative Efficiency Of Olive Farms (AE):

The results showed that the average of allocative efficiency reached 79.9% which indicated to the good experience of the olive farmers in selecting the best inputs and optimizing them. The allocative efficiency was between 42.2% -100%. the following table shows the level of allocative efficiency of olive farms based on the cost function:

TABLE4
The level of allocative efficiency of olive farms

AE	Farms number	relative importance%
40-50%	14	3.7
60-70%	28	7.3
70-80%	153	40.0
80-90%	118	30.8
90-100%	56	14.6
%100	14	3.6
Total	383	100

Source: research data analysis

B. Economic Efficiency Of Olive Farms For The 2016 Season (CE):

The average level of economic efficiency of the olive farms was 71.6% and ranged between 40.8% - 100%. The following table shows the level of economic efficiency of olive farms in the agricultural season 2016 based on the cost function:

TABLE5
The level of economic efficiency of olive farms

CE	Farms number	relative importance%
40-50%	14	3.7
50-60%	56	14.6
60-70%	84	22.0
70-80%	152	39.6
80-90%	42	11.0
90-100%	21	5.5
100%	14	3.6
Total	383	100

Source: research data analysis

C. Determinating The Efficiency Of The Olive Farms For The 2017 Season Depending On The Production Function:

1. The Technical Efficiency Of Olive Farms By The Constant Returns To Scale (CRSTE):

The results showed that the average of the technical efficiency by the constant returns to scale (CRSTE)reached 59.8%. The increase in the previous agricultural season indicated to the farmers' awareness of the optimal investment of the inputs used the technical efficiency ranged between 38% - 100%.

TABLE6
The level of technical efficiency of olive by the constants returns to scale (CRSTE).

CREST	Farms number	relative importance%
< 40%	7.0	1.8
40-50%	84.0	21.9
50-60%	139.0	36.3
60-70%	84.0	22.0
70-80%	28.0	7.3
80-90%	21.0	5.5
100 %	20.0	5.2
Total	383.0	100.0

Source: research data analysis

B. Technical Efficiency Of Olive Farms By The Variable Return To Scale (VRSTE): The results of the sample analysis showed that the average of the technical efficiency by the variable return to scale reached 96.1% and ranged between 87.1% - 100%. The following table shows the level of technical efficiency of the olive by the Variable Return to scale:

TABLE 7
The level of technical efficiency of olive by the variable returns to scale.

(VRST)	Farms number	relative importance%
80-90%	49.0	12.8
90-100%	181.0	47.3
%100	153.0	39.9
Total	383	100

Source: research data analysis

3. Scale efficiency of the olive farms (SCALE)

The average of volume efficiency of the olive farms for the 2017 season was 62% and ranged between 40.7% - 100%. The following table shows the capacity level of the Olive farms:

TABLE9
The level of scale efficiency of Olive farms

SCALE	Farms number	relative importance %
40-50%	70.0	18.3
50-60%	146.0	38.1
60-70%	84.0	22.0
70-80%	35.0	9.1
80-90%	28.0	7.3
%100	20.0	5.2
Total	383	100.0

Source: research data analysis

D. Determinating the Efficiency Of The Olive Farms For The 2017season Based On The Cost Function:

1. The Allocative efficiency of the olive farms based on the cost function (AE): The average of allocative efficiency increased to 92.1%. which indicated to the development of the ability to select good inputs at the best prices by olive growers .the value of allocative efficiency ranged 71.3% -100%

TABLE9
The level of allocative efficiency of olive farms:

AE	Farms number	relative importance%
70-80%	7	1.8
80-90%	118	30.8
90-100%	244	63.7
100%	14	3.7
Total	383	100

Source: research data analysis

B. Economic Efficiency Of Olive Farms Based On The Cost Function (CE)

The average level of economic efficiency of olive farms was at 88.5% and ranged between 71.3%-100% as a maximum. The following table shows the level of economic efficiency of olive farms in the agricultural season 2017 based on the cost function.

TABLE10
The level of economic efficiency of olive farms

CE	Farms number	relative importance%
70-80%	56	14.6
80-90%	139	36.3
90-100%	174	45.4
%100	14	3.7
Total	383	100

Source: research data analysis

E. Determinating the Technical, All0ocative And Economic Efficiency Of Agricultural Seasons 2016-2017 For Olive Farms By* Landholding *Category:

The areas planted with olive were divided into three categories to estimate the technical efficiency in each one , the first (less than 5) donums, the second (5-10) donums, and the third category (more than 10 donums). The following table shows the average of technical efficiency of each category Separately:

TABLE11
Technical, scale allocative and economic efficiency of the olive farms of 2016- 2017season in the Syrian coast *by* landholding *category:*

Landholding category (donum)	CRSTE	VRSTE	SCALE	AE	CE	Farms	%
< 5	59	89	66.3	86	77	167	43.6
5-10	54	90	60	83	76	132	34.5
> 10	62	92	67.4	86	79	84	21.9
Total	-	-	-	-	-	383	100

Source: research data analysis

The table(11) shows that the farmers of the three categories are able to increase their production by 41, 46 and 38%, respectively, if they use the same inputs optimally. While they can increase production by the variable returns to scale 11, 10, and 8% by using the same inputs. For scale efficiency, economies of scale were according to the holding category 33.7, 40, and 32.6%. the third category (more than 10 dunum) farmers were the most technically efficient, with constant return to scale and variable return to scale. the third possessory category farmers were able to obtain inputs at the best prices and achieved the highest economic efficiency.

VI. CONCLUSIONS

1- The Technical efficiency of the season 2017 increased to 59.8% compared to the previous season, and the increase in the allocative efficiency to 91.2% indicates to the experience of the farmer to select the production inputs at a better price efficiency. and use the appropriate quantities of inputs and resources and how to optimize them. economic efficiency also

reached 88.5%, so olive production is one of the successful and economically productive crops.

2- Owners of the possessory category (more than 10 donums) super pass the rest of the groups in achieving Technical Efficiency and the best allocative and economic efficiency.

VII. RECOMMENDATIONS

The research Recommends to collect the small holdings (less than 5 donums) to reach the optimal size of production, and overcome the economic pressure in managing these areas, which cannot absorb the technology in terms of scale accompanying costs. In addition to the need to activate the role of guidance in directing the farmer towards the optimal use of inputs in order to achieve optimal production.

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