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Measurement of economic of wheat farms in Radhwaniya Area

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Abstract: *Wheat is one of the most important economic crops because it is a strategic crop that contributes to achieving food security and has a significant effect on the trade balance. Therefore, the objective of the research is to estimate the economic efficiency of wheat crop through its technical and customization branches. A random questionnaire was collected from 49 farmers from wheat farmers in Baghdad Governorate / Radhwaniya. The relationship between wheat production, seed quantity, fertilizer, labor, and area using the data envelopment analysis method and the Distributed Evolutionary Algorithms in Python (DEA) program was estimated. The average of technical, economic and customization efficiency at the sample level was 0.56, 0.43 and 0.24 respectively. Therefore, the research recommended attention to non-price factors as well, as they contribute to encouraging farmers to increase their areas and production, and to encourage farmers to use optimal quantities of resources and develop their administrative capabilities.*
Keywords*: Wheat. Data envelopment analysis. resources efficiency. cost efficiency****.***

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I. Introduction

The cereals in general and wheat in particular are of great importance in the world because of their direct association with the basic needs of the population. In addition to the relative importance it occupies in terms of cultivated area and production, as well as its role in achieving the food security of the population. Wheat is one of the most important agricultural products in human life during different times of civilization. It is cultivated in all countries of the world as a food source for people and enters into a number of important industries. This crop is a component of stability and international security in most cases. Therefore, many peoples of the world have taken a policy of self-sufficiency from this strategic crop, which controls its trade monopoly countries, which impose indirect economic and political control on many countries that lack this crop to cover the need for domestic consumption of their peoples. Wheat is one of the most important strategic food crops in the world also it ranks first in world cereal production, the wheat yield represents 38.16% of the agricultural production of cereals while in Iraq it contributed in agricultural production by (47.67%) (Aldulaimi, 2005). Wheat is also an important economic crop because it is a strategic crop that contributes to food security and has a significant impact on the trade balance. The average wheat production in Iraq during the period 1980 - 2013 was about 1550 tons (Fawzi 2014.). The efficiency can be defined as "the ratio between the total means and the effort used in the activity on the one hand and the actual use that represents the value of use on the other," as defined (Quraishi and Al Haj, 2012) the efficiency as "work to achieve the parity in the thing or work to be achieved," This is reflected either to achieve the maximum output of specific inputs or to achieve specific outputs at the lowest inputs, also it was defined by another researcher As "the ability to maximize value and reduce costs" (Arhoma and Meftah, 1996). Efficiency cannot be achieved only in the case of cost reduction or value raising. Both objectives must be achieved together. Efficiency also reflects the rational and rational use of the trade-off between alternatives and the choice of the best in a way that allows to reduce costs or maximizing profit to the maximum extent possible, when choosing a practical method to reach the object, that efficiency in this sense means "doing the best possible way in cost, time and profitability."

Research problem:

Despite the economic and nutritional importance of the wheat crop and the support provided by the state, however, there is a shortage of wheat cultivation on two levels. First level: the fluctuation of cultivated areas from one year to another and this is reflected in the fluctuation of production and low levels and therefore there is a deficit to fill the demand and resort to Imports. The second level is the low rate of productivity which may be attributed to the inefficient use of resources and their scientific blending, which makes wheat farms inefficient.

Study objectives:
The research aims to:
1. Identify the reality of Iraqi wheat production.
2. Measuring economic efficiency and its technical and customized branches.

The study hypothesis:
The research assumes that there are administrative factors that differ from farmer to farmer, although the same resources were reflected in the low efficiency and made the sample generally not achieved a level of efficiency.

Data sources and analysis method:
To achieve the objectives of the research questionnaire was distributed to a sample of wheat farmers in the province of Baghdad - the Radhwaniya district of 49 farmers and collected randomly. A quantitative approach based on linear programming was adopted, namely the method of data envelopment analysis method and the Distributed Evolutionary Algorithms in Python (DEAP) program.

II. Results and discussion

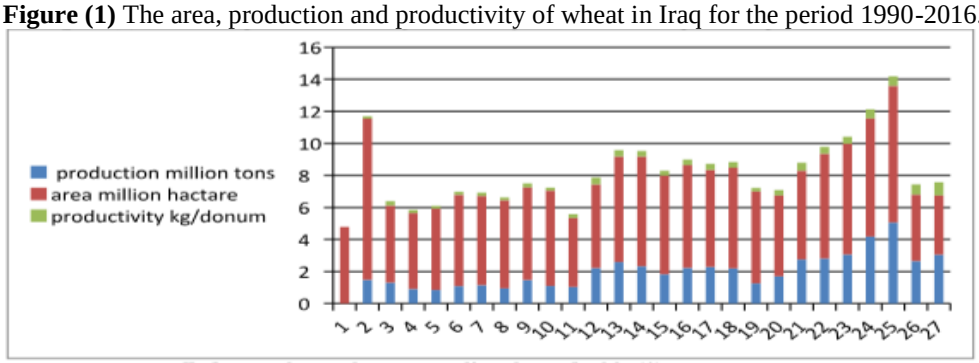
First: The reality of wheat production in Iraq for the period 1990-2016

.(Table (1) Area, Production and Productivity of Wheat Crop in Iraq for the Period (1990 - 2016

Year	**Total production Million tons**	**Area Million hactare**	**Productivty Kg.donum^{-1}**
1990	1.20	4.78	250
1991	1.48	10.07	147
1992	1.31	4.81	273
1993	0.91	4.74	192
1994	0.85	5.08	168
1995	1.09	5.70	191
1996	1.15	5.57	207
1997	0.95	5.50	172
1998	1.47	5.78	255
1999	1.10	5.95	185
2000	1.04	4.30	242
2001	2.22	5.22	425
2002	2.59	6.59	393
2003	2.33	6.85	347
2004	1.83	6.16	298
2005	2.23	6.41	348
2006	2.29	6.05	378
2007	2.20	6.28	351
2008	1.26	5.74	219
2009	1.70	5.05	337
2010	2.75	5.54	496
2011	2.81	6.54	429
2012	3.06	6.91	443
2013	4.18	7.38	566
2014	5.06	8.53	593
2015	2.65	4.15	638
2016	3.05	3.70	826
Mean	2.03	5.90	347
Standard deviation	1.02	1.31	163.30
Coefficient of Variation	50.07	22.20	47.06

Reference: by students based on data from the doctoral thesis of researcher Omar Abdel Jasim.

Figure (1) The area, production and productivity of wheat in Iraq for the period 1990-2016.



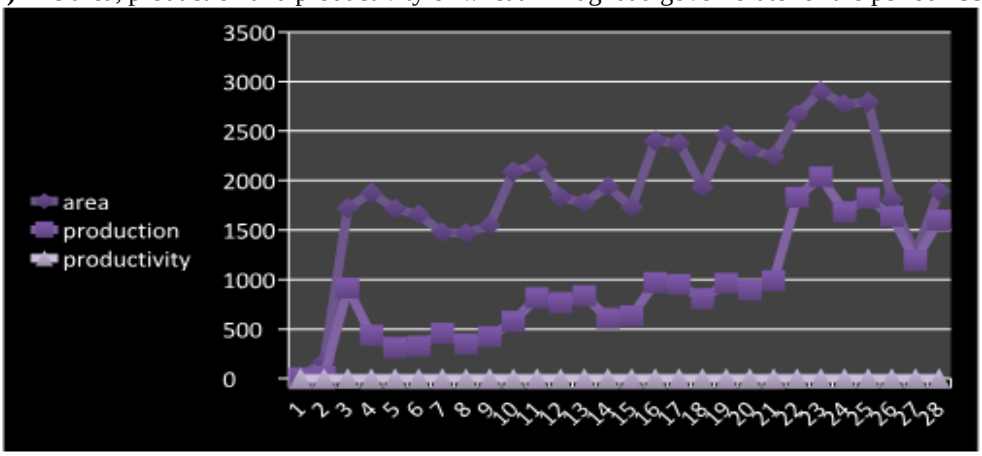
Reference by students according data of table (1).

Table (2) Area, production and productivity of wheat in Baghdad governorate for the period 1990-2016.

Year	**Area (100 donum)**	**Production (100 tons)**	**productivity**
1990	19.6	6.3	0.321429
1991	171.3	22.2	0.129597
1992	1722.9	914.8	0.530965
1993	1876.4	437.8	0.233319
1994	1715.5	312.8	0.182338
1995	1655.6	327.4	0.197753
1996	1474.5	457.7	0.31041
1997	1467.7	350	0.238468
1998	1549.5	424	0.273637
1999	2089.5	578.7	0.276956
2000	2164.9	818.1	0.377893
2001	1831.2	767.1	0.418906
2002	1776.9	835.8	0.47037
2003	**1937.9**	608.3	0.313896
2004	1733.2	633.4	0.365451
2005	2402.5	971.5	0.40437
2006	2378	950.1	0.399537
2007	1934.9	806.4	0.416766
2008	2464.3	962.7	0.390659
2009	2309.7	896.2	0.388016
2010	2246.9	989.4	0.44034
2011	2667.3	1831.3	0.686574
2012	2900.4	2036.4	0.70211
2013	2770.4	1684.6	0.608071
2014	2793.9	1822.5	0.652314
2015	1811	1638.1	0.904528
2016	1246.7	1191.4	0.955643
	1893.9	1599.8	0.844712

Reference: by students based on data from the master thesis of researcher Omar Khdaer.

Figure (2) The area, production and productivity of wheat in Baghdad governorate for the period 1990-2016.



Second. Economic efficiency and its components

1: **Technical and capacitance efficiency:**

Characterization is the first step that is initiated when trying to study any relationship between several variables. Therefore, this step is the most important steps by which the relationship between variables is formulated in a mathematical way to obtain the model by which the phenomena are applied in practice. This step is called the confirmed hypotheses and this step requires determining the dependent variable and the independent variables. The theoretical previous expectations which are theoretical parameters on which they are based when evaluating model estimation results. It also requires determining the mathematical form of the model in terms of the number of equations and their properties, whether linear or nonlinear, and because the model DEA is a nonparametric mathematical method, it depends on linear programming methods and provides an objective evaluation of the efficiency of several enterprises (Ajao.2013).

Two of these models for measuring efficiency as mentioned above depend on the stability of the return of the volume of production, ie, any change in the quantity of production factors used by the establishment have a constant effect on the quantity of production. This feature is suitable only when all the establishments are in comparison with their optimal size and then the exclusion of this model in the application because in fact there are many obstacles, especially in agriculture, which prevent agricultural enterprises from achieving these sizes such as incomplete competition and funding constraints. The use of the CRS assumption results in a confusion between technical efficiency and volume efficiency indicators.

Therefore, the return to scale of production (constant, diminishing, decrease) is used to separate the effect of technical and volume efficiency, ie, if the quantity of production factors increases by a certain percentage leading to a greater or lesser increase or equal in the volume of production. This adjustment is made by adding a constraint of N1 = 1, although this limitation may be insignificant in the long term (Coelli.1996).

In order to estimate the technical efficiency and estimate by the input to consider that the environmental conditions surrounding the farm make the farmer control his inputs more than his control in increasing the production in the sense that the inputs and them costs can be reduced more than the guarantee of increased production, and when there is statistical data in the field which represented by (K) of inputs, which included (the quantity of seeds / kg, quantity of fertilizers / kg, hours of manual labor /hour, area / donum) which are independent variables which prove to be the most important group of inputs that can affect the dependent (M) factor that represented the wheat production in tons for sample farms (N).

We make X_i the input value, Y_i the output value, i the farms and X the input matrix, K * N, Y the output matrix M * 1 and using Duality in linear programming, the DEA form becomes the used in terms of input and assuming VRS as follows (Abul issa, 2005).

Subject to :

Yʎ≥0+Y_i-

θ ẍ0 ʎ≥0 x -

0≤ ʎ, 1=ʎ N_i

As θ represents the measurement of (TE) technical efficiency of farm (Daoud.2007), The scale efficiency of farms (SE) require technical efficiency measurement under constant and variable return of capacity, For TE and AE efficiency and cost efficiency, production factors (PXS) prices were used in accordance with cost reduction assuming variable volume returns. This means the technical efficiency is calculated once to measure the scale efficiency and time to measure the customization efficiency) Vecente .(2004Customization efficiency is calculated by AE = EE / TE .While the economic efficiency is calculated by multiplying the Customization efficiency by technical efficiency (Ali, 2014.(

The results of the estimation of economic efficiency levels and their components by DEA method:

After the characterization and formulation of the model and the adoption of the study on the model of variable size returns with an objective approach to measuring the efficiency of farms because these farms did not reach their optimal economic size and adoption of this model means the possibility of increasing the output while maintaining a certain level of production factors and has been adapted to the data envelopment analysis program DEAP ver2.1Data Envelopment Analysis Charnes.11996).

The technical results indicate that the technical efficiency of the return of the capacity return was 46%. The technical efficiency of the change in yield was averaging 56%. This means that the farmers are moving away from the optimal production by 44%, which means that they can produce current production using only 56% of the current resources. . While the scale efficiency reached 86% at the sample level. However, the size yield indicates that most farmers are working with increasing returns to scale.

Table (3) Results of technical efficiency in case of stability, change of returns and scale efficiency.

Farm number	technical efficiency in case of stability	technical efficiency in case of returns change	scale efficiency	Yield kg
1	0.477	0.571	0.835	drs
2	1	1	1	-
3	0.392	0.454	0.864	irs
4	1	1	1	-
5	0.589	0.657	0.896	irs
6	0.278	0.32	0.867	drs
7	0.456	0.609	0.75	drs
8	0.191	0.211	0.905	irs
9	1	1	1	-
10	0.352	0.466	0.754	irs
11	0.9	1	0.9	drs
12	0.239	0.246	0.971	drs
13	0.277	0.277	1	-
14	0.282	0.4	0.704	irs
15	0.484	0.491	0.986	drs
16	0.392	0.511	0.768	irs
17	0.488	1	0.488	drs
18	0.392	0.414	0.946	irs
19	0.545	0.55	0.991	drs
20	0.463	0.756	0.613	drs
21	0.26	0.284	0.915	irs
22	0.263	0.362	0.727	irs
23	0.367	0.408	0.898	drs
24	0.372	0.373	0.998	drs
25	0.336	0.753	0.446	irs
26	0.583	0.643	0.907	drs
27	0.556	0.698	0.796	drs
28	0.482	0.531	0.908	drs
29	0.238	0.455	0.523	irs
30	0.668	0.902	0.74	drs
31	0.452	0.537	0.842	drs
32	0.405	0.459	0.883	drs
33	0.479	0.507	0.944	drs
34	0.486	0.673	0.722	drs
35	0.539	0.755	0.715	drs
36	0.38	0.486	0.781	drs
37	0.662	0.762	0.868	drs
38	0.51	0.57	0.895	drs
39	0.352	0.409	0.859	irs
40	0.496	0.594	0.835	drs
41	0.437	0.522	0.837	drs
42	0.447	0.469	0.953	drs
43	0.42	0.439	0.956	drs
44	0.393	0.395	0.995	drs
45	0.596	0.679	0.877	drs
46	0.381	0.386	0.989	drs
47	0.516	0.549	0.939	drs
48	0.584	0.628	0.93	drs
49	0.468	0.485	0.965	drs
mean	0.476	0.564	0.855	

Reference: by students using DEAP prog.

3. Allocative efficiency and economic efficiency:

In order to calculate the allocative efficiency and the technical efficiency was calculated once again to calculate the economic efficiency which is the result of the multiplication by using the same resources that were used by calculating the technical efficiency which included the seeds, fertilizers, pesticide and area plus the prices of those resources and estimated by the same program and the results of which are explained in Table (4) that allocative efficiency was at the sample level 0.43, which means that there is a waste of resources of 57%.

While The economic efficiency, which combines the technical and allocative efficiency, which reached 24%, indicates that farmers can produce the current amount of production using 24% of the cost, ie, the producers do not produce using the optimal quantities, and therefore their mixture is not economically and therefore their production level below the level of efficiency.

Table 4. Economic, allocative and Technical Efficiency

Farm number	Technical efficiency	Allocative efficiency	Economic Efficiency
1	0.571	0.215	0.123
2	1	1	1
3	0.454	0.555	0.252
4	1	0.43	0.43
5	0.657	0.532	0.35
6	0.32	0.232	0.074
7	0.609	0.116	0.07
8	0.211	0.3	0.063
9	1	1	1
10	0.466	0.475	0.222
11	1	0.266	0.266
12	0.246	0.333	0.082
13	0.277	0.445	0.123
14	0.4	1	0.4
15	0.491	0.415	0.204
16	0.511	0.569	0.29
17	1	0.052	0.052
18	0.414	0.468	0.194
19	0.55	0.557	0.306
20	0.756	0.084	0.063
21	0.284	0.48	0.137
22	0.362	0.425	0.154
23	0.408	0.392	0.16
24	0.373	0.296	0.11
25	0.753	0.587	0.442
26	0.643	0.345	0.222
27	0.698	0.361	0.252
28	0.531	0.41	0.218
29	0.455	0.451	0.205
30	0.902	0.295	0.266
31	0.537	0.437	0.234
32	0.459	0.493	0.226
33	0.507	0.421	0.213
34	0.673	0.428	0.288
35	0.755	0.454	0.343
36	0.486	0.521	0.253
37	0.762	0.306	0.233
38	0.57	0.39	0.222
39	0.409	0.504	0.206
40	0.594	0.406	0.241
41	0.522	0.453	0.236
42	0.469	0.448	0.21
43	0.439	0.479	0.21
44	0.395	0.518	0.205
45	0.679	0.339	0.23
46	0.386	0.53	0.204
47	0.549	0.387	0.213
48	0.628	0.335	0.21
49	0.485	0.423	0.205
mean	0.564	0.436	0.247

Reference: by students using DEAP prog.

III. Conclusions and recommendations

We conclude from the study:

The values of cultivated area, production and productivity were volatile despite the existence of a clear policy to support the crop by receiving the quantities produced at subsidized prices and the reason may be due to the presence of factors other than price such as possession and size as well as some administrative procedures in the marketing process.

2. Farmers of the research sample were able to achieve an acceptable level of technical efficiency, but when calculating prices and technology, their economic efficiency decreased to 24%, which indicates the weakness of the administrative capabilities of farmers and there are difficulties hindering the scientific use of resources.

Recommendations:

According to the study results, we recommend the following:

1. Taking care of the non-price factors also because they contribute to encouraging farmers to increase cultivation area and production.
2. Encouraging farmers to use optimum quantities of resources and develop their administrative capacities.

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