ECONOMICAL ANALYSIS OF EFFICIENCY OF RICE FARMS IN AL-NAJAF ALASHRAF FOR THE AGRICULTURAL SEASON 2017

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ABSTRACT

The paper were carried on rice farmers in Al-Najaf Al-Ashraf province. It aimed for studying economical efficiency for a random stratified sample of 5%. 235 forms brand have been collected. The paper depended, to maintain its aims, on using Data Envelopment Analysis (DEA) upon the production and costs functions of farms of the research sample under discussion. Many conclusions have been achieved The results of estimating the technical efficiency upon production function refer that the jasmine Anbar 33, Anbar Al Baraka, 84.2%, 88.9%, 86.4%. The total economic efficiency of these cultivars were 30, 26 and 10, respectively Depending on the variables of the costs function, the results of Data Envelopment Analysis (DEA) showed that the economical, technical, and Allocative average efficiency of jasmine brand farms were 84.2%, 70.2%, and 60% respectively. While farm of Anbar brand 33, the economical, technical, and allocative average efficiency were about 88.9%, 70.7%, and 79.1% respectively. Finally, the technical, economical, and allocative average efficiency for Anbar AL Baraka brand farmers were 86.4%, 84.9, and 73.9% respectively.

Key words: economical efficiency, data envelopment (DEA) , allocative efficiency, technical efficiency.

***Part of M.Sc. thesis of the first author**

تحليل اقتصادي لكفاءة مزارع محصول الرز في محافظة النجف الاشرف للموسم الزراعي 2017

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المستخلص

نفذ البحث على مزارعي الرز في محافظة النجف الاشرف وهدف البحث الى دراسة الكفاءة الاقتصادية لعينة طبقية عشوائية شكلت نسبة 5% حيث تم جمع 235 استمارة واعتمد البحث في تحقيق أهدافه على استخدام اسلوب تحليل مغلف البيانات (DEA) Data Envelopment Analysis على وفق دالتي الإنتاج والتكاليف لمزارع عينة البحث. وقد تم التوصل الى مجموعة من الاستنتاجات حيث أشارت نتائج تقدير الكفاءة التقنية وفق دالة الإنتاج لمزارع الرز صنف الياسمين وعنبر33 وعنبر البركة 84.2% 88.9% 86.4% على الترتيب وكان عدد المزارعين المحققين للكفاءة الاقتصادية الكاملة لهذه الأصناف هي 30، 26، 10 مزارع على الترتيب كما بينت نتائج (DEA) وبالاعتماد على متغيرات دالة التكاليف. فقد كان متوسط الكفاءة التقنية والاقتصادية والتخصيصية لمزارعي صنف الياسمين بنحو 84.2% و70.2% و60% على الترتيب وهذا يدل على ان إعادة توزيع الموارد الاقتصادية سوف توفر تكاليف بنسبة 15.8% و29.8% و40% على الترتيب. اما مزارعي صنف عنبر33 فقد كان متوسط الكفاءة التقنية والاقتصادية والتخصيصية نحو 88.9% و70.7% و79.1% على الترتيب وأخيرا فقد بلغ متوسط الكفاءة التقنية والاقتصادية والتخصيصية لمزارعي صنف عنبر البركة 86.4% و84.9% و73.9% على الترتيب.

الكلمات المفتاحية: الكفاءة الاقتصادية، مغلف البيانات (DEA)، كفاءة تخصيصية، كفاءة تقنية.

*** جزء من رسالة ماجستير للباحث الاول.**

***Received:5/6/2018, Accepted:5/11/2018**

INTRODUCTION

The Rice is considered to be a main and an important crop in the world. It comes second after the wheat in terms of importance. The average agriculture area in the world estimated with 140 million hectares distributed in more than 100 countries, mostly in tropical and subtropical regions. More than half of the world's population are consuming rice, especially in the Far East, India and Japan.The largest source of rice production is Asia, where it produces 90% of global production. Each person in Asia consumes from 100-120 kg annually, while in West Africa and Latin America the consumption is down to 40 kg annually and to 5 kg in Europe. China produces more than 30% of the world's production. China is consider to be the first producer and consumer of rice. Its harvest is consumed localy(4). Thailand and Vietnam are among the world's leading exporters of rice, with 50 percent of exports, while Iraq, is among countries which were known as cultivating rice crops since ancient times. Iraq has the convenient environmental conditions for planting rice, but the rate of yields in Iraq is low compared to other producer countries mentioned above. The problem of this research is concentrated on the reduction of cultivated areas of rice. This reduction is due to the decreasing of water rations, high production costs, and weak farm services for farmers. In addition, the high price of rice in the world markets is affecting on Iraq as it imports more than 90% of its needs. This import consumes the state budget with hundreds million of dollars annually. As the governorate of Najaf suffers from a decline in cultivated areas of rice, it has been possible to determine the nature of the problem of the research on how to identify the economical efficiency for various brands of rice and assess each brand by the application of economical efficiency criteria. At this point, we can see how far the study is important in that it should contributes in providing the necessary information on the efficiency of the brand in the agricultural production It can determine whether farmers are achieving economic efficiency of each brand. The importance of the research is related with the important of rice as well. This crop is characterized with many distinguish features. The most important feature is that it is forming 20-50% of the consumer's food budget (10). Iraqis have never given out of rice. Rice is also considered to be an important source of income for thousands of peasant families due to the good nature of water and soil. The aim of the study were to measure the economical, technical and Allocative efficiency of various rice brands through the application of economical efficiency criteria using the Data Envelopment Analysis (DEA).

MATERIALS AND METHODS

Many and different brands of rice are cultivating in Najaf Governorate, such as Jasmine, Anbar 16, Anbar 33, Anbar Al Baraka, Mishkhab1, Mishkhab 2, and Forat . Three main brands have been chosen, Jasmine, Anbar 33, and Anbar Al Baraka in three areas the Mishkhab- Al-Hera, Al-Manathera. The number of farmers that cultivated the three brands of rice were 4700 farmers. A random strotifed sample 5% of the study under discussion were taken with a assessment form prepared for this purpose. This assessment were made by face-to-face with 235 farmers for the agriculture season 2017. The number of jasmine brand in the sample of areas under discussion were 2400 farmers and 120 forms were collected. While the number of farmers of Anbar 33 were 1600 and 80 forms were collected i.e 5% of the total number of forms. Finally, the number of farmers for Albaraka brand were 700 and 35 forms were collected. An equal proportional distribution method for each stratified, upon its relative weight for the study under discussion, were chosen due to being the best and the most suitable method to the heterogeneous stratified groups. The table 1 shows that the farms ratio of Alhera area were 22.5 farms of the Anbar 33 brand with 18 farmers and 27.3% of the Jasmine brand farms with 34 farmers of the sample. While the ratio of farmers in the Manatherah area were 28.75% farmers of the Anbar 33 brand, with 23 farmers and 20% of the farmers of the Jasmine brand and 16 farmers of the sample under discussion.

Table 1. sample farmers' distribution by area in An-Najaf Al-Ashraf province

Elimination / side	Anbar 33		Jasmine		Anbar Al Baraka	
	The number of farmers	Ratio %	The number of farmers	Ratio %	The number of farmers	Ratio %
Al-Hera	18	22.5	34	27.3	0	0
Mishkhab	39	48.75	60	50.0	35	100
Manathera	23	28.75	26	21.7	0	0
Total	80	100	120	100	35	100

Source: Collected and calculated by the researchers

Data have been analyzed by using the Data Envelopment Analysis method (DEA), which is a non-parametric method that depends on linear programming to measure the technical efficiency and the economical performance of facilities as well as determining the typical mixture of the input and output sets of the correspondent units 1. The core point of this method is Pareto Optimality, which implied that any decision-making unit is inefficient if another unit or units will be able produce the same quantity of output with less quantity or input and without an increase in any resource, or vice versa (8). The Data Envelopment Analysis method (DEA) has many distinguish features, the most important one may be (2):

A. Identifying areas that will be most interesting to guidance efforts to be adopted on linear programming and therefore there will be less effort to achieve the target as a result of using such analytical technique .

B. Providing detailed information on the optimal use of inputs and mixture, and determines efficiency, measuring this efficiency and spots inefficiency

C. Neglegting restrictions imposed on the form of technician function that can affect the analysis or definition of efficiency (12)

D– Enhancing envelopment data by using computer programs to a great extent, as it is relatively easy.

E– Acquiring chang of total factor productivity by using the Malmkoist index.

Finally, this method depends on linear programming method to create envelopment or a field contains the data so that it can estimate the production efficiency in each unit. This is done according to resources used in this field (the envelopment) which resemble the equal output curve (18).

RESULTS AND DISCUSSION

First: Results of the technical efficiency estimation for rice farmers in the sample under discussion for the production season 2017 by Data Envelopment Analysis according to the variables in the production function The results showed that the technical efficiency rate, according to the production function when there is a change in the crop of rice farmers, Jasmine brand were 84.2%. This means that farmers can increase their production by 15.8% without using additional resources. It were ranging from a maximum limit of 100% to minimum limit of 56.3%. The results also showed that the technical efficiency rate, according to the production function when there is a change in the crop of rice farmers, Anbar 33 brand were 88.9%. This means that farmers can increase their production by 11.1% without using additional economical resources used in production. So, the farmers bear additional costs of about 11.1%. The reason is due to the fact that the technical efficiency means that the farms can make same amount of production with less in put. In other words, farms can make same amount of production with using less amount of resources if the farms are active on the technical level. This also means that the actual production deviate or decrease by 11.1% in average in compare to optimal production, which could have been achieved if only the available inputs had been used in optimal way by farmers. It is also clear in the table that there is clear difference in the technical efficiency level between the sample farms. This is due to the different experience and managerial skill of the sample farms, which

were ranging from the maximum limit 100% to minimum limit 66.7%. Finally, the technical efficiency rate, according to the production function when there is a change in the crop of rice farmers, Anbar Albaraka brand were 86.40%. This means that farms can increase their production by 13.60% without using additional resources. It were ranging from a maximum limit of 100% to minimum limit of 45.30%. Table 2 also shows that farms, which maintained full technical efficiency 100%, are the farms that are working on the optimum productive potential curve. The number of farmers of Jasmine brand maintaining full technical efficiency is 30, with a ratio of 25% of the number of farmers the said brand. The number of farmers of Anbar 33brand maintaining full technical efficiency is 26 with a ration of 32.5% of the number of farmers of the said brand. Finally, the number of farmers of Anbar Albaraka brand who have maintained full technical efficiency is 10 i.e with a ration of 28.58%. The rest ratios of the farms are in distance of optimum productivity potential curve with different ratios. This means that these farms can reduce the amount of inputs used to obtain the same production level or use the same input quantities that have been used to obtain a higher production level.

Table 2. Technical efficiency levels of rice farmers in the sample under discussion for the production season 2017 and the number of farmers and their ratios in the study sample

Varietirs	Technical efficiency	Number of farmers	Ratio %
Jasmine	100	30	25
	100 > TE ≥80	55	45.8
	80 > TE ≥60	33	27.5
	60 > TE	2	1.7
	Total	120	100
Anbar 33	100	26	32.5
	100 > TE ≥ 80	43	53.75
	80 > ≥60	11	13.75
	60 > TE	0	0
	Total	80	100
Anbar Al Baraka	100	10	28.58
	100 > TE ≥80	14	40.00
	80 > TE ≥60	9	25.71
	60 > TE	2	5.71
	Total	35	100.00

Source: Collected and calculated by the researchers based on the results of the DEA analysis.

Second: Results of the technical efficiency estimation and their components for rice farmers in the sample under discussion for the production season 2017 by Data Envelopment Analysis according to the variables in the production function. The economical efficiency and its components (technical and Allocative efficiency) of the rice farmers, in the sample under discussion, has been estimated by the data envelopment analysis method and according to the cost-function variables depending on the amounts of resources used and the prices of the resources assuming a change in incomes. The results of the economical, technical and Allocative efficiency showed that the level of the technical efficiency of the Jasmine brand ranged from maximum limit 100% to minimum limit 56.3 with an average of 84.2% and the number of farms which maintained efficiency of 100% were 30 farms with ratio of 20%. The allocative efficiency for this brand ranged from maximum limit 100% to minimum limit 8.4% with an average 70.2%. This means that the redistribution of economical resources used in planting this brand will save 29.8% of the whole costs of rice production of jasmine brand. The number of farms which maintained 100% efficiency were 9 farms with ratio of 8%. The research results also refer that the level of economical efficiency ranged from 100% to 9.1% with an average 60% and the number of farms maintained 100% efficiency were 9 farms with ratio of 8%. The level of technical efficiency of the Anbar 33 brand ranged from maximum limit 100% to minimum limit 66.7% with an average of 88.9%. The number of farms maintained 100% efficiency were 23 farms with an average of 29% . The allocative efficiency for this brand ranged from maximum limit 100% to minimum limit

16.7% with an average 79.1%. This means that the redistribution of economical resources used in planting this brand will save 20.9% of the whole costs of rice production of Anbar 33 brand. The number of farms, which maintained 100% efficiency, were 9 farms with ratio of 11%. The research results also refer that the level of economical efficiency ranged from 100% to 13.9% with an average 70.7% and the number of farms maintained 100% efficiency were 7 farms with ratio of 9%. Finally, the level of technical efficiency of the Anbar Albaraka brand ranged from maximum limit 100% to minimum limit 66.7% with an average of %86.4. The number of farms which maintained 100% efficiency were 10 farms with ratio of 29%. The research results also refer that the level of economical efficiency ranged from 100% to 13.9% with an average 70.7% and the number of farms maintained 100% efficiency were 4 farms with ratio of 11%. The level of technical efficiency of this brand ranged from maximum limit 100% to minimum limit 32.8% with an average of 84.9%. This means that the redistribution of economical resources used in farming this brand will save 15.1% of the whole costs of rice production of Anbar Albaraka brand. The research results also refer that the level of economical efficiency ranged from 100% to 27.6% with an average 70.7% and the number of farms maintained 100% efficiency were 4 farms with ratio of 11%.

Table 3. Technical efficiency levels and its components of rice farms in the sample under discussion for the production season 2017and the number of farmers and their ratios in the study sample

Varietirs	efficiency	Technical efficiency		Allocative efficiency		Economic efficiency	
		Number of farmers	Ratio	Number of farmers	Ratio	Number of farmers	Ratio
	100	30	25	9	8	9	8
	100 > TE ≥80	55	45.8	32	27	13	11
Jasmine	80 > TE ≥60	33	27.5	46	38	30	25
	60 > TE ≥ 40	2	1.7	20	17	47	39
	Less than40	120	100	13	11	19	16
	total	26	32.5	120	100	120	100
	100	43	53.75	9	11	7	9
Anbar 33	100 > TE ≥80	11	13.75	41	51	22	28
	80 > TE ≥60	0	0	21	27	33	41
	60 > TE ≥ 40	80	100	5	6	11	14
	Less than40	10	28.58	4	5	7	9
	total	14	40.00	80	100	80	100
Anbar Al	100	9	25.71	4	11	4	11
Baraka	100 > TE ≥80	2	5.71	22	63	12	34
	80 > TE ≥60	35	100.0	8	23	11	32
	60 > TE ≥ 40	30	25	0	0	6	17
	Less than40	55	45.8	1	3	2	6
	total	33	27.5	35	100	35	100

Source: Collected and calculated by the researchers based on the results of the DEA analysis.

The research concluded depending on the production function estimated according to the data envelope analysis method, it is clear that the rice farmers of jasmine brand can achieve the same level of production using less economical resources, is in average about 16.2%. This means that the average technical efficiency is about 83.8%.The number of farms for full technical efficiency 16 were about 20% of the whole number of farms in the study under discussion. rice farms of Anbar 33brand can maintained the same level of production using less economical resources, averaging about 11.1%. This means that the average technical efficiency were about 88.9%. While the number of farms maintaining full technical efficiency were 26 farmers, it were about 32.5%. of the whole number of farms in the study under discussion. Finally, the number of rice farms of Anbar Albaraka brand can maintaine the same level of production using less quantities of resources on average about 13.6%. This means that the average of the technical efficiency were about 86.4% while the number of farms which maintained full technical efficiency were 10 , that form about 28.58% of the whole number of farms in the study under discussion. The technical, economical, and Allocative average efficiency, through technician efficiency estimation according to Data Envelopment Analysis (DEA) depending on the function of the costs variables, of farmers of jasmine were 83.3%, 59.3%, and 69.8% respectively. This

shows that the redistribution of economical resources will save costs by 16.7% , 40.7%, and 30.2% respectively. The farmers of Anbar 33 brand had an average of technical, economical and Allocative efficiency of about 88.9%, 70.7%, and 79.1% respectively. This refers that the redistribution of economic resources will save costs with 11.1%, 29.3%, and 20.9% respectively. Finally, the average technical, economical and dedicative efficiency of farmers of Anbar Albaraka brand were 86.4%, 84.9%, and 73.9% respectively. This refers that the redistribution of economical resources will save costs of 13.6%, 15.1%, and 26.1% respectively .

The research recommended activating agricultural guidance in training and directing farmers to adopt modern brands and providing sufficient seeds of the said brands to be used as well as holding Farm days in creator and distinguish farms sites and workshops along crop agriculture season.

Redirecting economical resources included in the productivity process by agricultural crop of rice to maintain optimal exploitation of resources so as to reduce lost in economic resources available. This could be achieved by depending on experts and professional of this kind of crop who have maintained optimal economic efficiency.

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