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Evaluating the Environmental Efficiency of Iran Rapeseed Workers with Slack-Based Measure (SBM)

Mohammad Norozian [a], Seyyed Mehdi Hosseini* [b], Ahmad Akbari [c]
a. Ph.D. student of Agricultural Economics, Sistan and Baluchestan University, Iran
b. Corresponding Author Assistant Professor of Agricultural Economics, Sistan and Baluchestan University, Iran
c. Professor of Agricultural Economics, Sistan and Baluchestan University, Iran
*Email : norozianali@yahoo.com

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A B S T R A C T

Rapeseed has economic and commercial importance, due to the various application in today's world. Considering the high per capita consumption of vegetable oils and the high dependence on imported oils, special attention has been paid by the government to self-sufficiency in the production of oilseeds; therefore, the evaluation of this product is a very important factor and has an impact. In the present study, technical, allocation and economic measures were performed with Slack-Based Measure (SBM), in order to determine the water use efficiency and its environmental performance in the producing provinces of this product. The statistical data of this study were extracted from the Agricultural Jihad Iran in the years 2014-2015. The average economic efficiency, variable in relation to scale in environmental methods was 0.72. Environmental efficiency showed that the consumption of water and fertilizers was higher in some inefficient provinces. It is recommended that new technologies be used to improve the yield of rapeseed to reduce fertilizer and water use. The productivity of farmer's work rapeseed through their participation in extension classes, improving the irrigation practices and using wastewater treatment.

1. Introduction

In recent years, population growth and improved nutrition have increased the need for oilseed production worldwide. In Iran, considering the high per capita consumption of vegetable oils and the high dependence on imported oils, the need for coherent and long-term planning with the aim of achieving self-sufficiency in the production of vegetable oils is unavoidable (Rasooli et al., 2016). Rapeseed is the second largest crop in the world after soybeans (FAO 2017). In recent years, population growth and nutrition improvement have increased the need for oily seeds production in the world (Hosseini et al. 2013). In order to obtain a good quality product and good yield in Rapeseed, optimum nutrient values, especially chemical fertilizers, toxins and water consumption (Grant et al., 2011). However, numerous studies in different crops have shown that the lack of optimum use of nitrogen fertilizers in addition to environmental impacts can affect the quality of the plant, affect the ecological relationships between different food levels, including insect damage and the effectiveness of their natural enemies (Garratt et al., 2010). A glimpse into Rapeseed products reflects the inherent capacity of this industrial product to create job opportunities in the agricultural and industrial sectors, whose cultivation in the country is increasingly increasing, in recent years the government has special attention (Rasooli et al., 2016); therefore, the evaluation of this product is a very important factor and has an impact on increasing its production and performance without the need for additional costs. Efficiency and productivity are related to the input and output ratios of an economic system. The efficiency can be defined by the ability of an enterprise to obtain the maximum output from a given set of assumptions, assuming that the technology is known, or the ability of an enterprise to generate a given output with the minimum set of available inputs. On the other hand, productivity is a concept that shows firms' efficiency over each other over a period of time (Norouzan et al., 2012). Considering that the total per capita of domestic renewable resources in the country is decreasing and agricultural production is dependent on this institution, attention to this issue of water efficiency has deep roots in agricultural studies and also the application of fertilizers and pesticides in agriculture has multiplied several times. The excessive use of these inputs to meet the growing needs of the population has led to the cross-border production of high-fiber products, which has led to many harmful environmental consequences. Chemical pesticides play an important role in the production of agricultural products in developing countries. These inputs have made it possible to harvest more than one hectare of agricultural land at a lower cost and also increase the productivity of labor and capital inputs (Mollaei et al., 2018). Based on the statistics provided by FAO (2017), the application of fertilizers (nitrogen fertilizers, potash, and phosphate) and chemical pesticides is increasing. The challenge for researchers in this section is to minimize or eliminate these negative consequences for a cleaner environment for future generations, along with increased productivity and efficiency through advanced technologies to reduce environmental pollution. A review of the sources shows that a lot of studies have been carried out on the technical performance of various products, Dashti et al. (2017), Esfandiari et al (2011), Khibari et al. (2015) and Golan & Mauritti (2010), Kumar and Aurora (2012), Omar (2014), Herbbaldy et al. (2015), However, quantitative studies have been carried out in relation to the environmental performance estimation. Dorjani et al. (2005), Jafarnaia & Esmaeili (2013), Fathi et al. (2014) Shortal & Barnes (2013); two and colleagues (2015); Lamps & Hilgers (2015); Tang et al (2016); Yang & Lee (2017); and Xilong et al. (2018), Which is expected to play an important role in reducing environmental pollutants. In all of these studies, is estimated the environmental performance of the product-centric. With the explanation that in the production process, is produced along with a good product, a product or bad product (such as nitrogen, phosphorus or other pollutants) and their impact is evaluated on the performance. Production efficiency is a way to ensure that the products of an economic unit are in the best and most profitable way possible. Efficiency is important in every economic sector because of preventing the loss of resources (Silo et al., 2000). Therefore, any study on the efficiency of farmers in agricultural production to improve their productivity increases the productivity of production factors. Hence, the study of the efficiency of agricultural producers in a variety of ways can be helpful for the strategic products of the country. So far, researchers have tried to estimate the efficiency of various agricultural products using various methods of linear programming, econometrics, and many other studies. A lot of studies have been done about the measurement of efficiency using non-parametric methods and various methods have been used. Among them, Dehghanian et al. (2009) investigated the efficiency of 195 sugar beet producers in Khorasan province, that the need for better management on the production and distribution of modified seeds and the development of favorable extensions are considered as strategies for increasing efficiency. Jafarian & Ismaili (2013) studied the application of environmental impacts in the technical efficiency analysis (case study: Shiraz foraging units). The results showed that the efficiency values with environmental indicators were significantly lower than the efficiency without considering it. This suggests that environmental conditions significantly affect performance. Participation in health and dietary education classes, age, education level, and experience were evaluated factors affecting performance in terms of environmental criteria. Fathi et al. (2018) compared the energy and environmental performance of developing countries with an optimal and unfavorable output approach in a competitive environment. Their findings showed that through the combined assessment model in all the years

China and Poland had maximum energy and environmental efficiency. Other countries with bargaining chances do not enjoy the same prospects as the two countries of China and Poland.Mullay et al. (2017) in a study evaluated the environmental performance of the product-input axis and the effect of technology advancement and efficiency changes on the growth of productivity of agricultural sector of Iran in different provinces of the country. For this purpose, have been investigated the effects of changes in efficiency and technology on productivity growth using the data envelopment analysis method and Malek Quist model, during the period of 2004-2014. The results showed that the changes in efficiency have a dominant role in productivity growth and the share of technology changes is low. The findings also showed that the effect of labor force changes is positive on productivity growth and that capital changes have little effect on the productivity of production factors. Xilong et al. (2018) studied the measurement and decomposition of the overall environmental factors of China's green water industry by using the DEA-SBM model with undesired output. The results showed that most of the studied sectors have low environmental performance, which then uses biomass efficiency assessment in China to improve the productivity of China's green industrial water resources to save groundwater consumption. Rafiei & Amir Nezhad, (2007), investigated the productivity of production factors and the effect of its components on rainfed wheat production in 10 provinces of the country during two year periods, found that there was a significant correlation between productivity and technology changes in Khorasan province, however there is no significant correlation between productivity and efficiency changes in this region. Increasing efficiency in the firm is a sure way to increase competitiveness and profitability. Usually, in firms that operate in near-quasi-competitive markets and determine the price of inputs and outputs (such as the agricultural sector), the management of the factors of production in the firm will be a determining factor in the firm's profitability, What is said is the importance and necessity of reviewing and determining the efficiency of the process (Karimi et al., 2008). Due to the importance of cultivating crops in different provinces and the dependence of the rates of productivity changes in these products on technical efficiency, the efficiency could be increased by incrementing the management knowledge level. Despite the dependence of oil production and the industry on rapeseed and increasing water productivity, it is necessary to increase the management and production as well as to reduce the environmental pollution of groundwater resources, which results from excessive use of chemical and toxic chemical fertilizers. The performance of this rapeseed product is examined. The aim of this study was to determine the environmental performance of rangeland producers by using environmental quality measurement. In addition, Excel software is used to solve this problem. However, we study some statistical data from the current agricultural statistics from 2014 to 2015 for 14 provinces producing watery Rapeseed. Considering the inputs and outputs in this study, in order to calculate the relative efficiency of each province, the efficiency of this province indicates the average relative efficiency of the farmers in the mentioned provinces.

2. Materials and Methods

Absolute performance status of production units is not visible. Therefore, in order to evaluate the efficiency, the efficiency of a unit is measured relative to the other production unit. Two major methods for estimating the relative efficiency of production units are parametric and nonparametric methods (Norozian et al., 2019). The parametric method of the production function is to generate a random boundary, generated by Eugen et al (1977) and Müzen et al. (1977), it considers the functional relationship between inputs and product and uses statistical techniques to estimate the function parameters. The nonparametric method, Data Envelopment Analysis, which was proposed by Farrell (1957), uses a linear programming approach and does not take any preliminary assumption about the subordinate relationship between inputs and outputs. Methods of determination of efficiency have been developed by Bjork et al (1990), Charens et al. (1994) and Quillie (1995). However, is not easy choosing the best method for measuring performance. Many studies have been conducted to assess the sensitivity of measuring performance by choosing a method and methodology for estimating efficiency. Few of these studies show that the levels of performance obtained from each method are slightly different from each other. Evidence suggests that the choice of measuring performance measure is somewhat optional, but the degree of assurance for choosing existing methods depends on the research objectives.

2.1. Nonparametric Approach to Data Envelopment Analysis In this method, input data and the product of each production unit are used to construct a nonparametric generation boundary, in this case, all units observed are placed on or under the cover. Therefore, the efficiency of each unit is measured relative to the performance of all units in the sample. Data envelopment analysis models can be product oriented or inventive. In product-oriented models, the goal is maximum production based on a given amount of inputs, but in the inventive approach, the goal is to use the minimum input according to a given production level. Coverage levels of models (both product oriented and inventive) can have constant returns to scale or variable returns relative to scale (Norozian et al., 2019).

2.2 Input-oriented with constant returns to scale and variable to scale Specified models can be a stable yield to scale or variable yield to scale. Adaptive DEA: is maximizing our productivity with a constant input value. (Equation 2-2). In contrast, input-oriented: is minimizing the inputs required for the level of input (Equation 1)

$$\begin{aligned} &\min \theta \\ &s.t. \quad \sum_{j=1}^{n} \lambda_j x_{ij} \le \theta x_{i0} \qquad i = 1,2,\dots,m \\ &\qquad \sum_{j=1}^{n} \lambda_j y_{rj} \ge y_{r0} \qquad r = 1,2,\dots,s \\ &\qquad \sum_{j=1}^{n} \lambda_j = 1 \qquad j = 1,2,\dots,n \\ &\qquad \lambda_j \ge 0 \qquad j = 1,2,\dots,n \end{aligned} \tag{1}$$

In this regard, θ a scalar, λ is a vector of non-negative integer values; x_i and y_r represent the inputs and outputs of the firm j , m shows the number of inputs, ^{s} the number of leads, and ^{n} the number of firms. The θ value represents the technical efficiency of the firm j, which is less than or equal to one. The value of 1 indicates that the production unit is fully efficient and the unit is located on the efficient border. Therefore, the level of current inputs cannot be reduced. The above linear programming problem must be solved for each firm (n order). Value 1 represents the firm with full technical efficiency. The variable is obtained from the scale by adding $\sum_{j=1}^{n} \lambda_j = 1$ to the static return model relative to the scale (Norozian et al., 2019).

2.3 Slack-Based Measure Models (SBM) (Environmental Efficiency)Data Envelopment Analysis (DEA) is widely used in assessing the efficiency of agricultural units (Ulucan, Aydin.2011). Based on the non-radial and slack-based measure model while considering the undesirable output proposed by Tone (2009), this study sets up the following constant return-to-scale, undesirable output two-stage production system model based on the inputeoutput slack-based measure model and production possibility set (Zhao et al., 2017).

$$E_0 = \min \frac{1 - \frac{1}{m+p}\left(\sum_{i=1}^{m} \frac{s_i^x}{X_{i0}} + \sum_{i=1}^{p} \frac{s_i^r}{R_{i0}} \right)}{1 + \frac{1}{s+g}\left(\sum_{i=1}^{s} \frac{s_i^y}{Y_{i0}} + \sum_{i=1}^{g} \frac{s_i^h}{H_{i0}} \right)}$$

$$\begin{aligned} &\text{s.t:} \quad X_0 = X\lambda^1 + s^x \quad Y_0 = Y\lambda^1 - s^y \qquad (2) \\ &F_0 \ge F\lambda^1 \qquad F_0 \ge F\lambda^2 \\ &R_0 = R\lambda^2 + s^r \quad H_0 = H\lambda^2 - s^h \\ &\lambda^1 \ge 0, \lambda^2 \ge 0 \\ &s^x \ge 0, s^y \ge 0, s^h \ge 0, s^r \ge 0 \end{aligned}$$

Where $s^x \ge 0, s^y \ge 0, s^h \ge 0, s^r \ge 0$ are stages of input and output slack intensity variables, which imply the lack of inputs and outputs. Compared with the radial inputeoutput model, the nonradial slack-based measure model conforms to the real production process (Avkiran and McCrystal, 2012), because the model considers the slack of input and output simultaneously in this study. The abovementioned model (2) can be transformed into a linear model by following Charnes and Cooper (1962, 1978). The numerator and denominator of the objective function of model (2) multiplied by a positive number t and making the denominator equal to 1 by adjusting the size of t moves the equation to the constraint conditions, as follows:

$$E_0 = \min\ t - \frac{1}{m+p}\left(\sum_{i=1}^{m}\frac{S_i^r}{X_{i0}} + \sum_{i=1}^{p}\frac{S_i^r}{R_{i0}}\right)$$

S.t: * $1 = t + \frac{1}{s+g}\left(\sum_{i=1}^{s}\frac{S_i^y}{Y_{i0}} + \sum_{i=1}^{g}\frac{S_i^h}{H_{i0}}\right)$

* $tX_0 = X\Lambda^1 + s^x$ * $tY_0 = Y\Lambda^1 - s^y$ (3)

* $tF_0 \geq F\Lambda^1$ * $tF_0 \geq F\Lambda^2$

* $tR_0 = R\Lambda^2 + s^r$ * $tH_0 = H\Lambda^2 - s^h$

* $\Lambda^1 \geq 0, \Lambda^2 \geq 0$ * $S^x \geq 0, S^y \geq 0, S^h \geq 0, S^r \geq 0$

Under the condition of keeping a constant input and output slack measure of model (2), this study obtains first-stage efficiency by considering undesirable output through the following model (Zhao et al., 2017).

$$Max \sum_{i=1}^{d}\frac{s_i^{f1}}{F_{i0}}$$

s.t: $X_0 = X\lambda^1 + s^{x^*}$ $Y_0 = Y\lambda^1 - s^{y^*}$ (4)

$F_0 = F\lambda^1 + s^{f1}$ $s^f \geq 0, \lambda^1 \geq 0$

where s^{x^*} and s^{y^*} are slack variables by solving model (2), and s^{f1} denotes the slack of the first-stage undesirable output. The fact that the number of undesirable outputs could be reduced is explicit by measuring the slack of the first-stage undesirable output. Based on the calculation of the slack s^{x^*} and s^{y^*} of input and output in model (2), and the slack s^{f1} of undesirable output in model (4), the water resource utilization efficiency of the first stage is defined as follows (Zhao et al., 2017):

$$E_o^1 = \min \frac{1 - \frac{1}{m}\left(\sum_{i=1}^{m}\frac{s_i^{x^*}}{X_{i0}}\right)}{1 + \frac{1}{s+d}\left(\sum_{i=1}^{s}\frac{s_i^{y^*}}{Y_{i0}} + \sum_{i=1}^{d}\frac{s_i^{f1^*}}{F_{i0}}\right)} \quad (5)$$

If $E_o^1 = 1$, the first-stage environmental utilization is effective. If $E_o^1 \pi 1$, the first-stage environmental utilization is not effective. However, as E_o^1 increases, first-stage environmental utilization becomes more effective. E_o^1 denotes the effectiveness of the firststage environmental utilization, considering the undesirable output. Obviously, model (5) considers only the external input and output of production in the environmental utilization system, and ignores the internal pollution-processing stage effect on overall efficiency. Evaluating stage efficiency through model (5) only is not an effective measure of the internal influencing factors of system efficiency. It is necessary to consider the internal structural system to analyze the water resource utilization efficiency of the production stage in the water resource utilization and pollutant treatment process (Zhao et al., 2017). Also, in our study, we used the following to estimate the environmental efficiency variable from consumer institutions: inputs are NPK, chemical pesticides and water consumed per hectare: Variable cost, seed, cultivated area, and yield Production is tone.

3. Results & Discussion

In Table 1, the results of calculating the economic efficiency of the operators are presented, which indicate the status of the operators in maximizing production, minimizing the cost and maximizing the profit. In CRS and VRS methods, the average economic efficiency in the case of Efficiency and the Slack-Based Measure method (environmental performance) are respectively: 0/55, 0/68, 0/70, and 0/75, respectively. Theresults indicate that the units are relatively low in terms of environmental performance, which some provinces use in excess of water an chemical pesticides.Environmental efficiency in most provinces has low productivity; the provinces of Northern Khorasan, Sistan, and Baluchestan, Khuzestan, Mrkzy, Kerman, Khorasan Razavi and Alborz have the lowest economic efficiency in different situations, which were inefficient in managing the use of inputs and the cost of Rapeseed cultivation. Rapeseed production in inefficient areas can be increased by increasing the pattern of cultivation (due to climate change and multiple droughts in recent years), and the promotion of a new typology (pressurized irrigation, reduction of pesticide use and seed dressing). According to the results of Table 1, Rapeseed is more in densely populated areas with a relatively humid and mountainous climate with better performance than other areas. Table 2 shows the performance of scale in special performance models and deficiency variables in Rapeseed producing provinces in the growing season of 2014-2015 .

Table 1: Estimation of economic efficiency summary in different situations (environmental)				
	CRS	VRS	CRS	VRS
Provinces producing	SBM Efficiency	SBM Efficiency	Efficiency	Efficiency
East Azarbaijan	1	1	1	1
Ardebil	1	1	1	1
Esfahan	0.79	91	0.77	0.87
Alborz	0.84	94	0.62	0.75
Khorasan Razavi	0.75	90	0.61	0.85
North Khorasan	0.11	0.27	0.10	0.12
Khuzestan	0.19	0.35	0.14	0.19
Sistan and Baluchestan	0.15	0.27	0.15	0.14
Qazvin	0.85	91	0.71	0.75
Golestan	0.85	89	0.76	0.88
Lorestan	0.71	82	0.70	0.79
Mrkzy	0.37	0.63	0.15	0.16
Hamedan	1	1	1	1
Kerman	0.88	0.82	0.77	0.83
Average performance	0.70	0.75	0.55	0.68

(Research findings)

Table 2 Estimation of Scale Efficiency in Special Models and Deficit Variables in Rapeseed-producing Provinces in 2015				
Provinces producing	Technical efficiency		Economic efficiency	
	CRS	CRS	CRS	CRS
	Efficienc y	Slack-Based Measure Efficiency	Slack-Based Measure Efficiency	Efficiency
East Azarbaijan	1	1	1	1
Esfahan	0.81	84	0.72	0.82
Alborz	0.85	0.83	1	0.62
Khorasan Razavi	0.88	0.79	0.84	0.61
North Khorasan	0.48	0.32	0.75	0.10
Khuzestan	0.42	0.37	0.11	0.14
Sistan and Baluchestan	0.40	0.37	0.19	0.15
Ardebil	1	1	1	1
Qazvin	0.82	86	0.73	0.84
Kerman	0.87	0.86	0.71	0.77
Golestan	0.82	87	0.72	0.81
Lorestan	0.85	89	0.37	1
mrkzy	0.84	0.42	1	0.15
Hamedan	1	1	0.88	1
Average performance	0.82	0.75	0.69	0.65

(Research findings)

ccording to the table (2), in some provinces, there is a difference between the technical efficiency values obtained from both the VRS and the CRS, it can be concluded that we have inefficiency in these provinces. The rate of inefficiency for each inefficient province is calculated from the VRS-CRS relationship, which is presented in Table 2. According to this table, 45% of the provinces have a scale of inefficiency, the lowest and the highest levels of inefficiencies are 0/11 and 0/88, respectively, in the provinces of Khuzestan and Hamedan, respectively. According to these results, we can increase the efficiency of production of this strategic product with making studies of efficiency and determining the appropriate scale of inputs and transferring these gains to the provinces of the provinces through education and promotion of agriculture and supportive policy.The results in Table (3) show that the average technical efficiency is 0/76 with VRS method. The lowest and highest efficiency in inefficient provinces is equal to 0/35 (North Khorasan) and 0/85 (Lorestan), the difference between these two numbers indicates the difference between producer provinces in the production maximization, which is the result of the allocation of input abnormalities. In the variable model, Slack, water, chemical fertilizers (nitrogen, potassium, and phosphorus) and chemical pesticides are considered as slack-based variables in the model. The reason for this is controllable variables that make farm management better.

Table 3 Comparison of Types of Input-Efficient Performance Variable Returns to scale (Slack)

Provinces producing	Technical efficiency	Allocative efficiency	Economic efficiency	lambdas	
	VRS	VRS	VRS	RTS	
East Azarbaijan	1	1	1	Constant	
Esfahan	0.81	0.88	0.72	Decreasing	
Alborz	0.75	0.66	0.45	Increasing	
Khorasan Razavi	1	0.85	0.85	Increasing	
North Khorasan	0.35	0.33	0.12	Decreasing	
Khuzestan	0.42	0.44	0.19	Decreasing	
Ardebil	1	1	1	Constant	
Qazvin	0.80	90	0.72	Increasing	
Sistan and Baluchestan	0.39	0.32	0.15	Increasing	
Golestan	0.82	89	0.76	Increasing	
Lorestan	0.85	89	0.77	Increasing	
mrkzy	0.37	0.44	0.16	Increasing	
Hamedan	1	1	1	Constant	
Kerman	0.72	0.73	0.53	Decreasing	
Average performance	0.76	0.74	0.63		

(Research findings)

Table (3) shows the rate of change in inputs to reach efficiency boundaries for inefficient provinces. As a result, the government, with the efforts of the authorities, can take a step forward by adopting policies such as increasing agricultural water prices and increasing the credits for the development of irrigation systems in the country, in order to make the use of inputs more efficient and, in general, to increase the efficiency of Rapeseed production. According to Table 2, contrary to the impression, Khuzestan province, with less technical efficiency than Khorasan Razavi province, needs less adjustment in its inputs to reach the efficient border. By observing Table 3, we find that the average efficiency of assignment is 0/74 by the VRS method, and the lowest and highest efficiency in inefficient provinces is 0/32 (Sistan and Baluchestan) and 0/90 (Qazvin), respectively. The difference between these numbers indicates the difference between the provinces in the optimal allocation of resources in terms of input prices. In this case, the government can support the production of this product by introducing price discrimination policies and subsidies for inputs in inefficient provinces and increase the allocative efficiency of the provinces concerned. Considering that economic efficiency is the profitability criterion of the provinces, we can increase the economic efficiency of these provinces by increasing the technical efficiency and allocation of inefficient provinces. 29% of the farms have technical performance more than the average, and the rest of the farms are less than average, As well as 70 percent of farm variable technical efficiency assets were higher than the average and the rest of them had the performance below average. And, respectively, Allocative and technical performance was observed for 50 and 65 percent of the farms, 1. The results of the tables show that in the environmental sector and the conservation of water resources in most of the province, we have a poor performance that can be addressed with proper management. Environmental efficiency showed that the consumption of water and fertilizers was higher in some inefficient provinces. It is recommended that new technologies be used to improve the yield of rapeseed to reduce fertilizer and water use. But in recent years, this weakness has increased and the performance of this product in all respects(economic,technical and environmental) has decreased according to studied by Norozian et al. (2019)

Table 4: The necessary changes in the amount of inputs used to reach the production efficiency of the provinces

Input Slacks					Output Slacks			
Provinces producing	Seed (kg)	The amount of N P K (kg)	consuming water (m3)	The area under cultivation (ha)	Chemical pesticides (L)	Variable Cost	total p (kg)	RTS Input
Kerman	5.91	22.28	0.00	511928.4	0.79	0.00	0.00	Increasing
Alborz	0.00	41.30	4505.93	8430.21	0.02	349758	232.0	Increasing
Khorasan Razavi	7.30	91.30	1427.35	0.00	0.00	861584	700.9	Increasing
North Khorasan	0.00	84.32	2563.53	137931.2	0.72	0.00	0.00	Decreasing
Khuzestan	1.34	0.00	2059.63	153712.2	0.43	0.00	816.1	Decreasing
Sistan and Baluchestan	0.00	57.44	1451.18	56150.02	0.00	0.00	133.9	Increasing
mrkzy	0.00	187.3	4571.87	0.00	0.79	818022	0.00	Increasing
Kerman	5.91	22.28	0.00	511928.4	0.79	0.00	0.00	Increasing

(References: Research results)

.As can be seen in Table (4), some producing provinces (North Khorasan and Khuzestan) need to reduce the consumption levels of some of the inputs used in Rapeseed production to the level indicated in Table 4 for reaching the production boundary. Considerable points from the estimation of the results can be seen from the inefficiency of Rapeseed production by Rapeseed farmers in terms of consumption of two important inputs of water and crop area. For example, North Khorasan Province has reduced its water consumption to a limit of 2563.53 cubic meters to reach the effective border. Other necessary changes in the amount of inputs used to reach the effective production boundary by province are shown in Table 4. Provinces (Kerman, Alborz, Khorasan Razavi, Sistan and Baluchestan and mrkzy) need to increase the consumption levels of some of the inputs used in Rapeseed production to the level indicated in Table 4 for reaching the production boundary.

4. Conclusions

The results of this study indicate that despite the high ability of the provinces to operate on an optimum scale, there is a low economic efficiency for Rapeseed cultivation. One of the most important factors and solutions to solve this problem is to reform agricultural water pricing policy and increase the credits for the development of irrigation systems of the country and to implement appropriate plans for reviewing supportive policies, promotion, facilities and bank credit for promoting various types of efficiency. The high level of managerial efficiency shows that technical knowledge in the use of the not so advanced technology, with regard to available resources that are expressed using the technical efficiency, has a great impact. In fact, this shows that most Rapeseed farmers do not have to use their own inputs and can continue to increase Rapeseed production in the region by increasing their inputs.Therefore, it seems necessary to improve the efficiency by examining the technical efficiency of Rapeseed production in the provinces and the use of appropriate policy tools and appropriate executive solutions. In order to enhance efficiency, can be determined the technical efficiency of Rapeseed production in the provinces, which has been achieved through the use of policy tools and appropriate executive solutions. Therefore, studying the types of farmers' efficiency show that Rapeseed producers are not at a high level in terms of technical efficiency and the average technical environmental efficiency of the provinces is 76%. Therefore, increasing the production of Rapeseed by increasing the technical efficiency of farmers is not so practical and effective, and production technology must be advanced to increase production. Therefore, it is suggested that new technologies should be planted and picked up at the top of government policies to increase the production of this product. On the other hand, in order to increase Rapeseed production in order to provide more domestic needs to domestic farmers, the government will policy in a way that will be the basis of products with higher technical and economic efficiency, In particular, the government's incentive policies in this area should also be based on high-performance products, which, however, according to new Rapeseed cultivars, have higher qualities, in addition to higher yields per unit area, this problem is, to some extent, also resolved.Regarding the results presented in this paper and the high ability of selected provinces to operate on the optimum scale of rapeseed crop cultivation and the lack of economic and environmental efficiency, we suggest the following:

1- Training of agricultural Jihad and farmers in order to know about modern crops and pressured irrigation methods to reduce technical, economic, environmental and water consumption in the provinces.

2- Applying the policy of price discrimination and subsidies for inputs in inefficient provinces to support the production of this product.

3- Increase in agricultural water prices and increase of credits for the development of irrigation systems of the country, in order to increase efficiency

4- To implement effective plans for reviewing supportive, promotion, pricing and credit policies in order to promote various types of efficiency, take an effective step.

5. By increasing the technical and allocation efficiency of inefficient provinces, increase the economic efficiency of the provinces mentioned.

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