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The Analysis of the Effective Factors in Wheat Production in Iran

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ABSTRACT

This research estimates effective factors on wheat production in Iran covering data 1979 to 2010. The website of Central Bank of Iran helps the study to find the annual time series data about the required variables in this research. The linear function is used in order to evaluate the effective factors on wheat production in Iran which it involves OLS method using SPSS 20, EVIEWS8 and Excel software. The findings of the study indicate the coefficients of the area under cultivation of the wheat and the operation of wheat product per hectare in Iran are 0.757867 and 6.945184 means that when the area under cultivation of the wheat goes up one unit then the total production of the wheat in Iran increases 0.757867 and also if the operation of wheat product per hectare in Iran goes up one unit then the total production of the wheat in Iran increases 6.945184. The results of this study can be useful for decision makers of the wheat sector.
KEY WORDS: Cultivation, Wheat, Agricultural Sector, Production Function, Iran.

INTRODUCTION

Due to Iran's economic construction and the association among the agricultural sector and the other sectors in Iran, it is so vital to investigate on the agriculture sector in Iran. Wheat is a main food in the most countries such as Iran and it is also a strategic commodity so it is very important in Iran's economy (Aldesuquy, Haroun, Abo-Hamed, & El-Saied, 2014; Antwi-Agyei, Fraser, Dougill, Stringer, & Simelton, 2012; Zand et al., 2010; Zwart, Bastiaanssen, de Fraiture, & Molden, 2010). Accordingly, Iran government tries to increase the area of under cultivation and wheat producing. Due to adaptation of the cultivation widespread of wheat with different climatic conditions, simplicity of cultivation, holding of long-term, high nutritional value and ability to use various forms is a commodity with a high position. In Iran, spite of variation in climate different regions, wheat is cultivated in all provinces of it. The policy of guarantee purchase which is used in agriculture sector in Iran is one of the protectionist policy and stabilization of income and is also a minimum price which is a motivation for farmers who continue to produce (Andarzian et al., 2011; Battaleb-Looie, Moore, Malde, & Jacks, 2013; Haghverdi et al., 2014; Roostaei, Mohammadi, & Amri, 2014; Yan & Wu, 2014; Zhang et al., 2014). The main objectives of the law of guaranteed purchase of agricultural products are the supporting the basic agricultural products, creating balance in the production system, preventing agricultural waste and the losses of farmers using keeping the exchange relation. Increasing of cultivation area and improvement in the performance are two main factors for increasing product which each of them depend on some various factors. Policies of price direct and indirect supports are the most effective factors in increasing the cultivation area and advances in technology, infrastructure investment and suitable climatic conditions also effect the performance improvement (Faramarzi, Yang, Schulin, & Abbaspour, 2010; Haghverdi et al., 2014; Jat et al., 2013; Muthuwatta, Rientjes, & Bos, 2013; Rasouli, Kiani Pouya, & Karimian, 2013). There are some studies about wheat production or productivity but none of them did not investigate the relationship among the total production of the wheat in Iran and effective factors such as the area under cultivation of the wheat and the operation of wheat product per hectare on it. For example some of previous researches in Iran and other countries are as follows:

A study investigate the historical lack of capital accumulation in Iran' Agricultural sector. The authors believe that risks in the agriculture sector will be reduce if a great investment occurs in this sector and it also rise productivity in the other private sectors so it makes a motivation for farmers to increase their investment in the agriculture sector (Askaripour-Lahiji, Dadashpour, & Sameni-Keivani, 2013).

In the other study about the agricultural sector in Iran was determined the elasticity of the production factors of agricultural sector. The authors believe that the production in the agriculture sector increases 0.601531 if the capital in this sector increases one percentage (Sameni-Keivani, Bidarian, & Ashouri, 2014).

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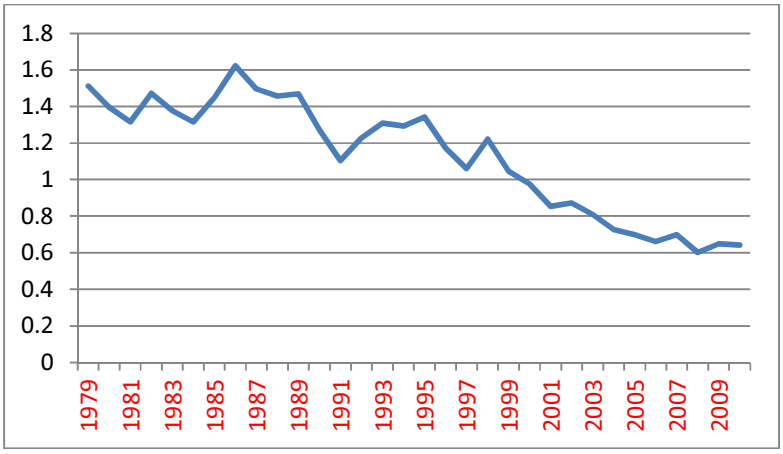
Sanzidur Rahmana and M. Kamrul Hasan explained the impact of conditions of environmental production in Bangladesh on efficiency of wheat farmers (2008). Nana Yan and Bingfang Wu in Hai Basin described crop water productivity of winter wheat with the integrated spatial–temporal analysis (2014).

A study in Bangladesh performed by Sanzidur Rahmana and M. Kamrul Hasan that analyzed carefully energy productivity in the wheat farming (Sanzidur Rahman & Hasan, 2014). L.P. Muthuwattaa,b and T.H.M. Rientjesa, M.G. Bosa investigated the approaches to rise wheat production subject to the rare of water in basin of Karkheh River, Iran (Muthuwatta et al., 2013).

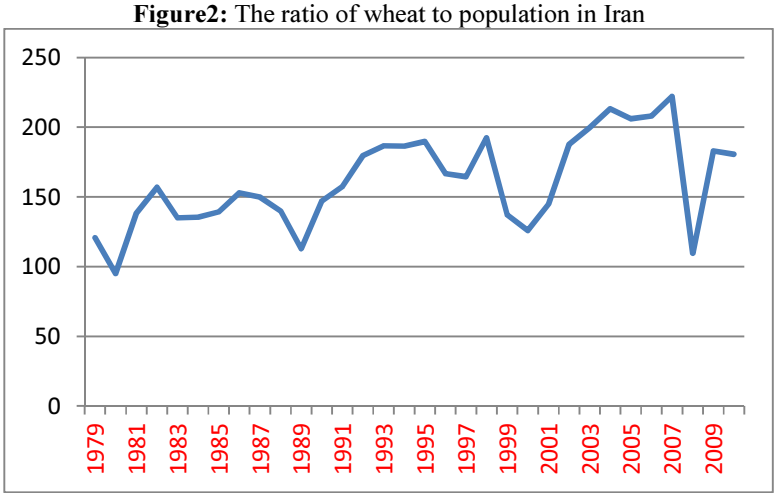
Following diagram shows the Ratio of the agricultural value added to the industrial value added in Iran. However, Iran's economy has an agriculture structure but the ratio of the agricultural value added to the industrial value added declined over the time (first collected data from Economic Time Series Database then estimated by author).

Figure1: the Ratio of the agricultural value added to the industrial value added in Iran



The ratio of wheat to population in Iran during the data 1979 to 2010 is shown in the following diagram (first collected data from Economic Time Series Database then estimated by author).

Figure2: The ratio of wheat to population in Iran



As we can see at the above shape, the ratio of the ratio of wheat to population in Iran during the data 1979 to 2010 has a lot of fluctuations.

The paper main is to recognize the effective factors on wheat production in Iran. Designation of this function is a tool to decrease additional expenditures of production and gain more product of wheat Iran. Hence, the survey will support the Iran wheat producers to make appropriate judgment to produce wheat.

The major hypotheses of this study are as follows:

1. The total production of the wheat in Iran has a significant relationship with the area under cultivation of the wheat in Iran during period 1979 to 2010.
2. The total production of the wheat in Iran has a significant relationship with the operation of wheat product per hectare in Iran in Iran during period 1979 to 2010.

MATERIALS AND METHODS

The collect the information of the background of the research is using the paper uses the library research methods and to analyze the data is applies the analytical methods. The data of required background information on empirical studiers and literature was collected by internet and library ways. The statistical data is obtained from some of the databases in Iran such as Central Bank of Iran, the statistical center of Iran and so on. To know the data is stationary or not, the study uses Augmented Dickey-Fuller (ADF) or unit root test (Jalali & Sameni-Keivani, 2013; Sameni-Keivani, 2013; Sameni-Keivani, Almasi, & Bayat, 2014; Sameni-Keivani, Almasi, Kamranzadeh-Ezmareh, & Bayat, 2014; Sameni-Keivani, Bidarian, Najibi, & Ghasemi, 2014; Sameni-Kievani, khodadadi, & Jouzbarkand, 2013). After that is used the linear function to detect the relationship between the wheat production in Iran as a dependent variable and two effective variables on it which are included the area under cultivation of the wheat in Iran, and the operation of wheat product per hectare in Iran as independents variables.

To show the relationship between the total product of wheat and the effective factors on it, the study applies the following model:

$$TP = f(AR, OP)$$

Or

$$TP = \alpha + \beta_1 (AR) + \beta_2 (OP)$$

Where

TP = total production of the wheat in Iran,

α = intercept of the function,

AR = the area under cultivation of the wheat in Iran, and

OP =the operation of wheat product per hectare in Iran.

So, in this research, the linear regression is used to evaluate the effective factors on wheat production in Iran. The statistical data about this survey limits to annual time series data of Iran economy which is obtained from the enteral bank of Iran, the statistical center of Iran and other database in Iran. The studied variables in this paper cover the data from 1979 to 2010. The EIEWS8 and SPSS 20 Software are used in this study. Finally, significant of the coefficients of the function investigate using appropriate statistical tests.

RESULTS AND DISCUSSION

To detect the variables in the time series data is stationary or not which it can create in several ways using STATA or EVIEWS8 or other software, we can use some ways which one of them is to use the ADF test or the Unit root test of Augmented Dickey-Fuller. The study applies this method. Subject to the test results, the Augmented Dickey-Fuller test statistic test, for 5% confidence level, the dependent variable, the amount of the wheat production, and one of the independent variable which is called the operation of production per hectare are stationary at the level and the other independent variable, the area under cultivation, is not stationary at the level but it is stationary at the first difference. Because a time series, for example Y, is stationary when:

$$\forall t\,;\ E\,(Y_t) = \mu$$
$$\forall t\,; Var(Y_t) = E(Y_t - \mu)^2$$
$$COV(Y_t\,, Y_{t+a}) = COV(Y_t\,, Y_{t-a})$$

In this study for the variable of area under cultivation is not stationary at the level because there are not above conditions but it is stationary at the first difference because for the first difference there are all of those conditions.

In other words, the amount of the wheat production and operation of production per hectare variables have not unit root test at the level and another variable, the area of cultivable, has unit root test at the level but it has not unit root test at the first difference.

The results of the Augmented Dickey-Fuller test statistic are as follows (first collected data from Economic Time Series Database then estimated by author):

1- The results of Augmented Dickey-Fuller test statistic test for dependent variable:

Null Hypothesis: PROD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.217257	0.0117
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

3- The results of Augmented Dickey-Fuller test statistic test for OP variable is as follows:

Null Hypothesis: OPE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.709406	0.0367
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

The results of Augmented Dickey-Fuller test statistic test for AR variable is as follows:

Null Hypothesis: D(ARE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.817468	0.0000
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

So, the results of the Augmented Dickey-Fuller test can be written as follows in the critical value at 5% for all of the variables:

Table1. The results of Augmented Dickey-Fuller test statistic test

The names of variables	**ADF statistics**	**The Critical Value at 5%**	**The Stationary at**	**Prob.**
TP	-4.217257	-3.562882	Level	0.0117
AR	-6.817468	-3.568379	1st difference	0.0000
OP	-3.709406	-3.562882	Level	0.0367

In order to identify the relationship between the total production of the wheat in Iran and the effectives variables such as the area under cultivation of the wheat and the operation of wheat product per hectare in Iran are applied the linear regression model. The coefficients of the variables can be found from the following table:

Table2. Coefficients of Model

Dependent Variable: TP
Method: Least Squares
Date: 06/24/14 Time: 23:15
Sample (adjusted): 1980 2010
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1016.139	571.3549	-1.778472	0.0862
AR	0.757867	0.248712	3.047168	0.0050
OP	6.945184	0.358449	19.37566	0.0000

R-squared	0.934598	Mean dependent var	9728.323
Adjusted R-squared	0.929926	S.D. dependent var	3184.715
S.E. of regression	843.0423	Akaike info criterion	16.40368
Sum squared resid	19900167	Schwarz criterion	16.54245
Log likelihood	-251.2570	Hannan-Quinn criter.	16.44891
F-statistic	200.0592	Durbin-Watson stat	0.559753
Prob(F-statistic)	0.000000		

So, due to the above table, we can write this model as following:

LS PROD C DA OPE

Estimation Equation:

==========

TP = C(1) + C(2)*AR + C(3)*OP

Hence, it is written as follows:

Substituted Coefficients:

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TP = -1016.1388486 + 0.757867007456*AR + 6.94518405737*OP

The findings of the study demonstrate, in this model, the coefficients of the area under cultivation of the wheat and the operation of wheat product per hectare in Iran are 0.757867 and 6.945184, respectively. According to the data of above table, both β_1 and β_2 are statistically significant at %5 confidence level. Actually, the coefficient β_1 show that if the area under cultivation of the wheat goes up one unit then the total production of the wheat in Iran increases 0.757867 and also if the operation of wheat product per hectare in Iran goes up one unit then the total production of the wheat in Iran increases 6.945184.

Due to ANOVA test, the coefficients for the independents variables are also statistically significant (we can see the following table which is ANOVA table):

Table 3. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1892.791	2	946.395	45.127	.000[b]
	Residual	587.209	28	20.972		
	Total	2480.000	30			

a. Dependent Variable: TP

b. Predictors: (Constant), OP, AR

According to the ANOVA table, we can see the above, the Sig is approximately zero it means that the correlations are significant among the total production of the wheat in Iran as a dependent variable and the operation of product per hectare in Iran and the area under cultivation of the wheat as two independent variables. On the other hand, the t-test statistic corroborates significant of the variables and also R-Square and Adj-R2 is enough big which shows that the contribution of AR and OP on the total production of the wheat in Iran enough big and it is more than 90%. Low distance between R2 and Adj-R2 indicates the fit goodness for data. In general, both of hypotheses are accepted means that:

1- The total production of wheat in Iran has a significant relationship with the area under cultivation of the wheat in Iran during period 1979 to 2010.
2- The total production of wheat in Iran has a significant relationship with the operation of wheat product per hectare in Iran in Iran during period 1979 to 2010.

The study shows that the total production of the wheat in Iran depends on the area under cultivation and the operation of wheat product per he
ctare. It also indicates increasing the operation of wheat product per hectare is more effective on production of wheat than the area under cultivation of the wheat. None of the previous studies did explain this matter in Iran in this period of time. In fact, the survey enriches both theoretical and empirical studies about wheat in Iran.

CONCLUSIONS

This study estimates the effective factors on wheat production in Iran using the linear function in Iran during 1979 to 2010. This survey shows that changing in the area under cultivation of the wheat in Iran how much effect on the change in the total production of the wheat in Iran. The results of this study demonstrate that increasing area under cultivation of the wheat causes to increase the total production of the wheat in Iran and increasing operation of wheat product per hectare causes to increase the total production of the wheat in Iran. Hence, the results of this study can be useful for decision makers of the wheat sector.

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