The Relationship among Production, Area under Cultivation and the Operation of Tea in Iran

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ABSTRACT

Green Tea production function in Iran regarding to the effective factors are evaluated in this study using the annual time series data from 1980 to 2010. Variables values of required in this survey are collected from the website of Central Bank of Iran. To evaluate the effective factors such as the area under cultivation of the tea and the operation of tea product per hectare on tea production in Iran is applied the linear function and it is estimated using OLS method by SPSS, EVIEWS8 and Excel software. The results of the study exhibit the coefficients of two independents variables such as the operation of tea product per hectare and the area under cultivation of the tea during the period of study in Iran are 0.031859 and 3.410559, respectively means that with increasing one unit of the operation of tea product per hectare, the total production of tea will go up about three percent; also it goes up if the tea area under cultivation of the tea goes up one unit. The decision makers of the tea sector in Iran can be benefit of the study results.

KEY WORDS: ADF Test, Cultivation, Tea, Agricultural, Production and Iran.

INTRODUCTION

Due to Iran's economic construction, it is so important to investigate the Iranian agriculture sector [1-3]. Because ofIran is one of the major producer and consumer of tea in the world which provides much of the consumption needs of global markets. Tea is one of the oldest and most consumed beverages in the world. There are some unique characteristics in the agriculture sector and related industries in Gillan and Mazandaran provinces such as mild climate and fertile land rich soil and ability to produce high-quality agricultural products which make those provinces have been the optimum conditions to cultivate green tealeaves in Iran. More than 70 thousand households of farmers in these areas make money with producing tea. They sell the tea leaves from their farms to almost 160 factories which work in these provinces [4-8].

Tea industry is so important for Iran in terms of production and employment especially in the North of Iran. Increasing products and improving tea industry is not only a tool for achieving economic growth and increasing welfare in these regions but also there is a close relationship between this industry and the independence and economic self-sufficiency and social justice, and social and national aspirations. The tea sector compared other sectors is less dependent to the other countries. So, it can impact on the increasing of employment and makes goes up the growth rate in the country. Due to the mentioned subjects, it is so vital to study about tea sector in Iran [4-7, 9, 10].

Tea is a major drinking in Iran and many countries and is also one of the important goods in Iranian economy [7, 10]. There are several researches on tea production but none of them had not investigated the relationship among the total production of the tea and effective factors such as the operation of tea product per hectare and the area under cultivation of the tea on it in Iran. As an instance, the following studies are some of previous researches about related issues in Iran and other countries:

One of studies is the investigation the historical lack of capital accumulation in the Iranian Agricultural industry. The study stated high investment in the agriculture industry will make to reduce of the risks in this industry and it also increase the rate of productivity in the other industries, consequently, it is a motivation for agriculturalists to rise their investment in the agriculture industry [11].

Another research in agricultural industry determined the elasticity of output in this industry. This study believed that the output in the agriculture industry rises 0.601531, when the capital rises one percentage in this industry [12].

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Another research in Bangladesh examined energy productivity in the wheat farming [13]. Another survey investigated the approaches to rise wheat production respect to the rare of water in basin of Karkheh River, Iran [14].

As the following chart displays the Proportion of value added of the agricultural sector respect to the industrial value added declined over the time in Iran, in spite of the Iran's economy is with a huge agriculture structure (this figure was obtained by author after collecting data from Economic Time Series Database):
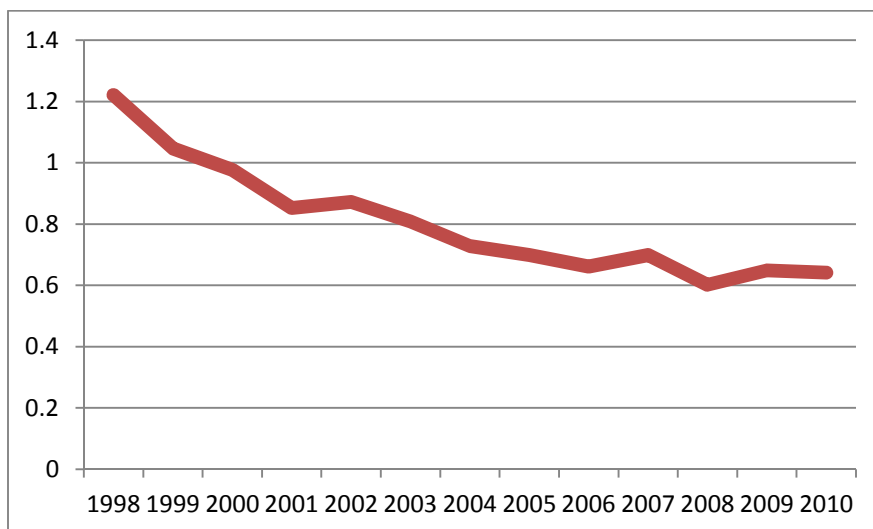
Figure 1. The Proportion of value added of the agricultural sector respect to the industrial value added

The following figure shows the ratio of production of tea to population for Iran covering data from 1980 to 2010 (this figure was obtained by author after collecting data from Economic Time Series Database).
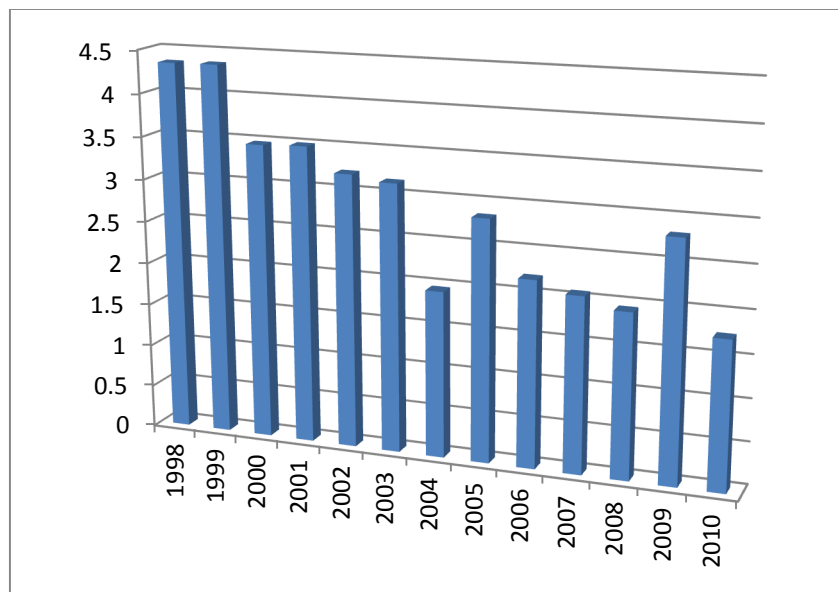
Figure 2. The ratio of production of tea to population

The above figure shows that the ratio of tea to population trends to decreasing in Iran covering data from 1980 to 2010. The major aim in this study is to determine the relationship between some factors such as the operation of tea product per hectare and the area under cultivation on the amount of tea production. Finding this relationship can be as a tool to reduce costs related to producing of tea and get much more output with the given inputs in Iran. Therefore, the analysis will care the Iranian tea producers to make best decision to produce tea.

The main hypotheses of the paper can be written as follows:
1- The operation of tea product per hectare impacts the tea total production in Iran covering data 1980 to 2110.
2- The area under cultivation of the tea impacts the tea total production in Iran covering data 1980 to 2110.

MATERIALS AND METHODS

Both theatrical and empirical models are used in this survey. The information about background and also required data related the study obtained in the library methods which used the internet, books and so on. Central Bank of Iran, the statistical center of Iran helped author to obtain the data. The first step for using the annual data is to reweave stationary of it. For achieve this aim, the survey sued Augmented Dickey-Fuller test (ADF test) which called also unit root test. To estimate the relationship between variables of model was used the linear function [3, 15-19]. This research uses the following model to investigate the relationship between the total production of the tee as a dependent variable and two independents variables such as the area under cultivation of the wheat, and the operation of tea product per hectare in Iran:

$$TP = f(OP, AR)$$
$$Or$$
$$TP = \alpha_1 + \alpha_2 (OP) + \alpha_3 (AR)$$

Where
TP indicates the total production of the tea,
α_1 shows the intercept of this function,
OP states the operation of tea product per hectare and
AR shows the area under cultivation of the tea in Iran during the year's between1980 to 2010.
As it can be seen at the above equation, the linear regression model was applied to investigate tea production and its effective factors in Iran with using annual time series data between1980 to 2010 which obtained from several databases such as the central bank of Iran, the statistical center of Iran. The EIEWS8 and SPSS Software were used in the research. The significant of coefficients is checked using some statistical methods such as t student, F test also R square and adjustment R square. The appropriate statistical helped to detect tests the significant of the coefficients of the function.

RESULTS AND DISCUSSION

First step to do study with the time series data is detecting to be or not to be the stationary of variables. It can be tested with some of statistical tests such as the ADF test or the Unit root test of Augmented Dickey-Fuller and so on which it can be done using STATA or EVIEWS8 or other software [20-30]. According to the results of Augmented Dickey-Fuller test statistic test, based on the 5% confidence level, the area under cultivation of the tea is stationary at the level but other variables such as the amount of the tea production and operation of production per hectare are not stationary at the level but they are stationary at the first difference. In other words, the area under cultivation has not unit root test at the level and other variables such as the amount of the tea production and operation of production per hectare have unit root test at the level but at the first difference they have not unit root test.
The following table shows the findings of the Augmented Dickey-Fuller test for this study:

1- The results of Augmented Dickey-Fuller test for total production of the tea is as follows:

Table 1. The results of Augmented Dickey-Fuller test

Null Hypothesis: D(TPP) 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		-7.764122	0.0000
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	
*MacKinnon (1996) one-sided p-values.			

2- The results of Augmented Dickey-Fuller test for operation of tea product per hectare is:

Table 2. The results of Augmented Dickey-Fuller test for operation of tea product per hectare

		t-Statistic	Prob.*
Null Hypothesis: D(OP) 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		-7.039226	0.0000
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	
*MacKinnon (1996) one-sided p-values.			

3- The following table shows the results of Augmented Dickey-Fuller test for area under cultivation of the tea:

Table 3.the results of Augmented Dickey-Fuller test for area under cultivation of the tea

		t-Statistic	Prob.*
Null Hypothesis: AREA 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		-4.243006	0.0113
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	
*MacKinnon (1996) one-sided p-values.			

Hence, the results of the Augmented Dickey-Fuller test, in the critical value at 5%, were rewritten into the following table:

Table 4.The results of Augmented Dickey-Fuller test

The names of variables	ADF statistics	The Critical Value at 5%	The Stationary at	Prob.
TP	-7.764122	-3.574244	1st difference	0.0000
OP	-7.039226	-3.574244	1st difference	0.0000
AR	-4.243006	-3.568379	Level	0.0113

To finding the objectives of survey is applying the linear regression model. It can be shown the relationship between the total productions of the tea as a dependent variable and the operation of tea product per hectare and the area under cultivation of the tea as the independents variables in Iran. The following table shows the coefficients of variables in this research:

Table 5. Coefficients of Model

Dependent Variable: DTP				
Method: Least Squares				
Date: 08/22/14 Time: 15:07				
Sample (adjusted): 1981 2010				
Included observations: 30 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-110.4894	30.56156	-3.615307	0.0012
DOP	0.031859	0.002165	14.71601	0.0000
AREA	3.410559	0.939263	3.631103	0.0012
R-squared	0.892675	Mean dependent var		0.500000
Adjusted R-squared	0.884724	S.D. dependent var		39.19777
S.E. of regression	13.30853	Akaike info criterion		8.109326
Sum squared resid	4782.155	Schwarz criterion		8.249446
Log likelihood	-118.6399	Hannan-Quinn criter.		8.154152
F-statistic	112.2856	Durbin-Watson stat		1.759628
Prob(F-statistic)	0.000000			

Thus, according the above results, the equation for this study can be written as following:

Estimation Command:

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LS DTP C OP AREA

Estimation Equation:

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$$DTPP = C(1) + C(2)*OP + C(3)*AREA$$

Therefore:

Substituted Coefficients:

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$$DTP = -110.4894 + 0.031859*OP + 3.410559*AREA$$

The results of the study exhibit the coefficients of two independents variables such as the operation of tea product per hectare and the area under cultivation of the tea during the period of study in Iran are 0.031859 and 3.410559, respectively. As the table shows, both α_2 and α_3 are statistically significant respect to %5 level.In fact, the coefficientα_2 demonstrates that with increasing one unit of the operation of tea product per hectare, the total production of tea will go up about 3 percent; also it goes up 3.410559 if the tea area under cultivation of the tea goes up one unit.

As the ANOVA, in the following table, shows the coefficients for this model are also significant.

Table 6. ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39775.345	2	19887.672	112.286	.000[b]
	Residual	4782.155	27	177.117		
	Total	44557.500	29	19887.672		
a. Dependent Variable: TP						
b. Predictors: (Constant), Area, OP						

As the above table, The ANOVA table, shows the sig of F test is nearly to zero, it means that there is a significant relationship between the dependent variable, the total production of the tea, and independent variables

such as the area under cultivation of the tea and the operation of product per hectare in Iran during the time of research.

In addition, as the prior table shows the R-Square and Adj-R2 are 0.89 and 0.88, respectively which shows those are enough big and the distance between is low which stats the fit goodness for data. So both of hypotheses will be accepted means that:

1- The operation of tea product per hectare impacts the tea total production in Iran covering data 1980 to 2110.
2- The area under cultivation of the tea impacts the tea total production in Iran covering data 1980 to 2110.

Conclusions

This paper determine the relationship the effective factors on and amount of tea production in Iran covering data 1980 to 2110. , the results demonstrates that with increasing one unit of the operation of tea product per hectare, the total production of tea will go up about three percent; also it goes up 3.410559 if the tea area under cultivation of the tea goes up one unit. This research will be so useful for the decision makers of the tea sector in Iran.

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