Econometric Analysis on Development of Grain Industry in Zhanjiang

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Keywords: Grain total output; Applying quantity of agricultural chemical fertilizer; Grain acreage

Abstract. In order to increase the total grain output in Zhanjiang, this paper uses econometrics method to establish the regression model of grain yield in Zhanjiang, and analyzes the factors such as the amount of chemical fertilizer affecting the grain yield of Zhanjiang and the cultivated area of grain crops. The research shows that the amount of chemical fertilizer and grain sown area are the main factors affecting the grain yield in Zhanjiang. Therefore, it can be concluded that the amount of chemical fertilizer is the most significant factor affecting Zhanjiang's total grain output and that the farmers benefit most from agricultural inputs. The cultivated area of food crops is also one of the important factors that affect the total output of grain. Crop acreage is an effective way to increase grain output.

Introduction

Food is the most basic consumer goods for life. The food issue of a country is a top priority for its own national economy and people's livelihood. Agriculture is the basis for the development of the national economy. Food is the foundation of the foundation. Therefore, food production is an eternal theme related to the survival and development of a country. Since the founding of our country, the grain output has fluctuated many times. This not only restricts the development of the national economy, but also has extremely adverse effects on both grain producers and consumers.

Zhanjiang is an agricultural market and a large consumer market. The city's total population is 7.1599 million, of which agricultural population is 5.1508 million, accounting for 71.9%. As the population continues to grow, the problem of food shortages is worsening. Therefore, it is still very important to ensure the basic consumption needs of local foodstuffs. We must pay close attention to food security. Through the study of grain yield in Zhanjiang, we can know what factors are affecting grain production in Zhanjiang and their degree of impact.

In order to increase the total grain output in Zhanjiang, this paper uses econometrics method to establish the regression model of grain yield in Zhanjiang, and analyzes the factors such as the amount of chemical fertilizer affecting the grain yield of Zhanjiang and the cultivated area of grain crops. The research shows that the amount of chemical fertilizer and grain sown area are the main factors affecting the grain yield in Zhanjiang. Therefore, it can be concluded that the amount of chemical fertilizer is the most significant factor affecting Zhanjiang's total grain output and that the farmers benefit most from agricultural inputs. The cultivated area of food crops is also one of the important factors that affect the total output of grain. Crop acreage is an effective way to increase grain output.

Model Setting and Data Description

Table 1 shows the statistical data obtained from Zhanjiang statistical information website.

Table 1 Grain output, applying quantity of agricultural chemical fertilizer and grain acreage etc of Zhanjiang

Year	Grain output (t) Y	Applying quantity of agricultural chemical fertilize (t) X_1	Grain acreage (mu) X_2	Total power of agricultural machinery (KW) X_3
2001	1275713	350077	4274354	1959889
2002	1376055	354757	4299236	2048478
2003	1388662	356972	4317529	2134059
2004	1413023	370917	4320514	2167270
2005	1424295	377682	4364597	2394399
2006	1428370	406721	4366780	2570982
2007	1475668	417979	4380454	2709244
2008	1477627	421886	4387671	3432319
2009	1481592	424829	4565388	3824919
2010	1487981	430183	4599010	4360508
2011	1525757	438838	4613882	4571801
2012	1540379	453551	4635882	4710263
2013	1551099	454216	4651428	4792941

As can be seen from Table 1, grain output in Zhanjiang has been increasing year by year, from 1275713 tons in 2001 to 1551099 tons in 2013.

The main factors affecting the grain yield in Zhanjiang are the amount of agricultural and chemical fertilizers applied, the sown area of grain and the total power of agricultural machinery.The following model is set up in this regard:

$$Y_t = \beta_0 + \beta_1 X_{t1} + \beta_2 X_{t2} + \beta_3 X_{t3} + \mu_t, \quad t = 1,2, \cdots ,13$$

Among them, Y_t is the grain production in the t year (tons), X_1 is the amount of fertilizer for agriculture (tons), X_2 is the sown area of grain (mu), and X_3 is the total power of agricultural machinery (kw).

Estimation and Examination of Model Parameters

By virtue of Eview software, the regression results between food production Y and its impact factors X_1, X_2 and X_3 can be derived as follows:

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Dependent Variable: Y
Method: Least Squares
Date: 12/10/16   Time: 09:50
Sample: 2001 2013
Included observations: 13
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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-67999.65	1293576.	-0.052567	0.9592
X1	1.852528	0.652250	2.840213	0.0194
X2	0.188841	0.307755	0.613608	0.5547
X3	-0.022125	0.047951	-0.461414	0.6555

R-squared	0.881741	Mean dependent var		1449709.
Adjusted R-squared	0.842322	S.D. dependent var		76426.53
S.E. of regression	30348.00	Akaike info criterion		23.72651
Sum squared resid	8.29E+09	Schwarz criterion		23.90034
Log likelihood	-150.2223	Hannan-Quinn criter.		23.69078
F-statistic	22.36812	Durbin-Watson stat		1.501223
Prob(F-statistic)	0.000165			

Figure 1 Regression results of food production and impact factors from 2001 to 2013 in Zhanjaing

The regression results show that the regression model is as follows

$$\hat{Y} = -67999.65 + 1.852528X_1 + 0.188841X_2 - 0.022125X_3$$

In the above equation, the sign of the coefficient of agricultural machinery total power X_3 is negative, which iscontrary to common sense, so X_3 should be removed.

The regression is conducted again and the regression equation is obtained:

$$\hat{Y} = 493517.2 + 1.678476X_1 + 0.062380X_2$$

Result

The results of the model estimation show that for every 1 ton increase of agro-chemical fertilizer application, on the assumption that other variables are unchanged, the average grain output will be increased by 1.68 tons. When the other variables are unchanged , when the sown area of grain is increased by 1 mu, the average grain output will increase 0.06 tons.

Conclusion

Through the analysis of the influencing factors of grain yield in Zhanjiang from 2001 to 2013, we can draw the following conclusions: The grain yield of Zhanjiang is affected by the amount of chemical fertilizer and grain sown area. It can be seen from the model that the amount of chemical fertilizer is the most significant factor affecting the increase of grain output in Zhanjiang, which shows that in the current agricultural production, farmers have the most benefit from the investment in agriculture. The cultivated area of food crops is also one of the important factors affecting the total output of grain. To expand the cultivated area of food crops is an effective way to increase grain output.

Acknowledgements

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