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Application of Region Agricultural Circular Economy Measurement Model

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Abstract: For the comparison of regional agricultural circular economy development regularity, this study utilizes national 31 provinces or municipalities 1997~2011 panel data, designs region agricultural circular economy measurement model, analyzes the dynamic performance of technical efficiency level about agricultural circular economy. The result shows: The agricultural circular economy technology efficiency level in most places are lower but it has become a rising trend year by year; in the eastern, central and western three regional agricultural circular economy, the difference of technical efficiency is bigger and the volatility is stronger; eastern and central trends rather similar, present negative growth, only the west is positive growth. Results show that: Enhancing the technology efficiency of China's agriculture circular economy and reducing regional gap among efficiency is currently the crux of the problem, the method of this study can guide how to gain good sample region about agricultural circular economy development.

Key words: Region agricultural circular economy, measurement model, technical efficiency

INTRODUCTION

Agricultural circular economy is the application and outspread of circular economic theory in agricultural production in the field, namely, under the comprehensive constraints. Given the capacity of agricultural resources and the deposit of ecological environment, from of angle of saving agricultural resources, protecting ecological environment and improving the economic benefit, using the activities of agricultural production and organization of agricultural production system by recycling economics method, forming the material energy recycling closed-loop agricultural production system through the end of the material energy backflow (Huang, 2004).

The study of technical efficiency began with Koopmans (1951), Debreu (1951) and Shephard (1953). Koopmans (1951) gives the definition of technical efficiency of: A feasible input-output vector is called technology effective, if keeping other outputs (or other inputs), technically it is impossible to add any output (or reducing any input). According to the above definition: From the angle of output, technical efficiency refers to economic units under the same input, it's the ratio of actual output and ideal output (maximum likelihood output); from investment perspective, the technical efficiency means under the same output, it's the ratio of actual input and ideal input (minimum possibility input). Namely, it is used to measure under the existing technical level, the ability of producers getting maximum output (or minimum input costing), shows the extent of producers actual production close to the frontier, reflects the degree of existing technology played.

Currently, the technology efficiency of agricultural circular economy is not explicitly defined, based on the above definition we will define it: In a certain period, under certain technical equipment and agricultural resources, ecological environmental inputs, it is the ratio of actual agricultural output and ideal output (maximum likelihood output) by making full use of agricultural input resources for economic units (an area, agricultural enterprises or farmers). Visibly, the technology efficiency of agricultural circular economy reflects the relation of elements, ecological input and output under certain production function, reflects the production function effectiveness.

Farrell (1957) first advanced the technical efficiency measurement methods from the view of input point, simple calculation; the method of measuring the technical efficiency is widely used (1957). But Farrell's method has fault. Main show: (1) The frontier production function only by partial sample observation decision, not make use of all sample data, (2) The estimation of frontier production function is severely influenced by the data quality and (3) Due to the calculated parameters by this method without statistical properties, it isn't able to perform statistical tests and statistical inference. In 1966,

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Le Penn's from the output angle, made a new definition of technology efficiency, namely technical efficiency are the actual output to achieve the maximum output percentage in market prices unchanged, investment scale and factor ratio invariable. This is generally accepted, also applied (Wang *et al*., 2009).

About the estimating agricultural production technology efficiency, commonly used methods are parameters method and non-parametric methods, the parameters method is mainly stochastic frontier analysis and non-parametric methods is DEA. Because DEA as a mathematical programming method, without statistical characteristic, impossible to inspection and the boundary of measure production function is not affirmation and it's impossible to separate the influence from random factors and measurement error. Compared, in stochastic frontier analysis, the frontier is random, every decision unit does not need to use the same frontier and distinguish the error term, the more accurately reflect the actual technical efficiency level and the results can be inspected by hypothesis test (Wang *et al*., 2009). Combined with the purpose, we apply stochastic frontier approach to measure agricultural circular economy technical efficiency.

At present, there are more research by using nonparametric in existing research (Kang and Liu, 2005; Chen, 2006). These studies will help us to deepen understanding China agricultural technical efficiency. And there is relatively rare research by using parameter. Kalirajan using provincial data analysis agriculture TFP growth and compared them (Kalirajan *et al*., 1996); based on the cross-section data of rice farmers in Jiangsu province Xu compared the technical efficiency and technological progress between modern agriculture and traditional agricultural and tried to prove "Schultz hypothesis" (Xu and Jeffrey, 1998), Fan also used this example to illustrate the agricultural technology progress, technology and allocate efficiency (Fan and Pardey, 1997), he study of technical efficiency of agricultural production is relatively less.

Michael selecting agricultural output, land, mechanical power, chemical fertilizer and labor, five indicators, using China's 30 provinces, city, region's 1991-1997 year agricultural production panel data, build stochastic frontier production model and calculate the Chinese provinces, city, region agricultural efficiency of production technology, by random effects model estimate the result shows: the efficiency of agriculture production technology in various regions in China keep rising, the gap of technical efficiencies between the eastern and western regions widening; technology efficiency is the main driver of agricultural production growth in China (Baiding and McAleer, 2005). Zheng (2009) using stochastic frontier production function method, the selecting agricultural output, crop planting area, agricultural labor, chemical fertilizer and agricultural machinery power, per capita GDP, calculated the 2000-2007 China agricultural efficiency of production technology and studied its influencing factors and the analysis shows that China's agricultural production average technical efficiency is low, obvious differences between regions, the efficiency of agricultural production technology among 31 provinces, municipalities and areas basically concentrated in 0.5~0.9, agricultural production technology used in eastern region is more efficient than in central and western. It has not found in the literature temporary by using parameters method to measure agricultural circular economy technology efficiency.

Based on the circular economy theory, we first attempt to use since 1997 agricultural circular economy provincial panel data, apply stochastic frontier translog production function, analyze the technical efficiency regional agricultural circular economy and based on this we try to analyze and explain the regional gap and fluctuation.

Design of region agricultural circular economy measurement model: Stochastic frontier production function is put forward initially by Aigner *et al*. (1977) and Meeusen and van den Broeck (1977) and soon became a remarkable branch in econometrics. Stochastic frontier production function not only want to consider the factors leading technology progress but also consider the forefront of technological progress and productivity of input factors on the interaction effect and substitution effect between the input factors. Expresses as follows with the equation:

$$Y_i = f(X_i, \beta) \exp (\epsilon \equiv V_i\text{-}U_i) \quad (1)$$

$$\text{In } Y_i = \text{in } f(X_i, \beta)+V_i\text{-}U_I \quad (2)$$

Model (2) is the model (1) 'logarithmic, Y: The actual output; f(•): Certainty on the production possibilities frontier output, it represents the best available technology under the conditions of output; X_i: Inputs (including the land, capital, labor and other inputs); β: The unknown parameters; ϵ: Synthetic error term, V_i: For a sample unit in the production of factors beyond the control is used to determine measurement error and random interference effects, such as the statistical error, climate, natural disasters and V_i~(0, σ^2_v); tU^i: sample cell technical inefficiency of production parts, namely, the sample output and production-possibility frontier of the distance,

U_i obeys truncated normal distribution, that is $U_i > 0$, $U_i \sim N(m_t, \sigma^2_u)$ (Zhang *et al*., 2006). This study studies the sample was a panel data, each element on output with time and area contribution will vary from, so choose this kind of functional form. The general form for:

$$\text{Iny}_{it} = \beta_0 + \sum_j \beta_j \,\text{Inx}_{ijt} + \beta_t t + \frac{1}{2}\sum_j \sum_m \beta_{jm} \,\text{Inx}_{ijt}\text{Inx}_{mit} + \frac{1}{2}\beta_{tt} t^2 + \sum_j \beta_{jt} t \,\text{Inx}_{ijt} + v_{it} - u_{it} \quad (3)$$

$$\text{Te}_{it} = \exp(-u_{it}) \quad (4)$$

$$\begin{aligned} uit &= \beta(t) \bullet u_i \\ \beta(t) &= \exp[-\eta] \bullet (t - T) \end{aligned} \quad (5)$$

$$\sigma^2 = \sigma_v^2 + \sigma_u^2, \ \gamma = \sigma_u^2 / (\sigma_v^2 + \sigma_u^2) \quad (6)$$

Among them, type (4) that the i samples provinces in the period t rate the level of technology; type (4) and (5) quantitative description of the time factor is the impact on the u_{it}; in statistical tests, if $\gamma = 0$ this one of the original hypothesis is accepted, then no need to use stochastic frontier translog production function model to analyze the panel data, OLS method can be directly transported. The model should be used in parameter estimation maximum likelihood method; of these, the key step is the $\gamma = 0$ using the likelihood of this hypothesis testing; observation error variance, σ^2_v and the variance of technical efficiency, σ^2_u, hence, $\gamma \in (0, 1)$, the estimated value of the statistical test can reflect variations in technical efficiency of agriculture whether to have the statistical significance.

Variables defined and data processing: Sample data used in this study is from 1997 to 2011 panel data in 31 provinces and from the "China Statistical Yearbook", "China Rural Statistical Yearbook", "China Agriculture Statistical Yearbook", Statistical Bulletin around and the China Agricultural Information Network. This is the reason why the selected sample data from 1997 and not be traced back to earlier years, Chongqing since 1997 was independent from Sichuan Province, became a municipality. If the sample data selected data in earlier years in order to ensure a consistent diameter, the practice is to refer to other literature after 1997, data for each year sum to Chongqing in Sichuan Province, which appears as a region of Sichuan Province. This article does not take this approach, because taking into account Chongqing becoming municipality before and after accepted policy support and so there are still some differences, even if the sum of the data will cause data Sichuan caliber not the same as a certain degree. So this year is the beginning and end of sample data from 1997 to 2011.

Variable determinations: In determining the variables, based on the existing literature on the research of agricultural technical efficiency, this study not only considering the input-output factors of agricultural circular economy elements but also the "3R" of recycle economy involved (Li *et al*., 2008), obtains the following variables:

- **Output variables Y:** Using gross index agricultural output value
- **Capital element variable K:** The capital essential factor's investment has selected the recycle fixed assets in production. In dealing with fixed assets for production, it will be productive rural households and rural households in the original value of fixed assets obtained by multiplying the production statistics for the original value of fixed assets, in order to make the data along the same lines, assuming that the sample interval of the productive fixed assets were purchased in 1997, so the sample interval for each year of the original value of fixed assets for production in 1997 is actually worth and then in 1997 as a constant 100 to the price deflated, this time the data will be met caliber consistency (Li *et al*., 2008)
- **Intermediate input variables I:** The selection responds the resources decrement input, such as t the mechanical animal operations, seedlings, fertilizer, plastic, pesticides, diesel fuel costs, as well as the security situation in response to resources and environmental costs of electricity and water for irrigation indicators
- **Human elements variables in the above L:** In the above, variables are used the magnitude of value that contains price information indicators, where if only by the number of agricultural employees, likely to bring the problems caused by different variable dimension, this here too should be characterized by the magnitude of value indicators but no direct access to the price of labor. To address this problem, we refer to Tu and Xiao (2005) approach, from the perspective of labor income, so human capital input factor is the number of agricultural employees and agricultural employees in net income to be multiply
- **Land elements variable E:** The use of land for agricultural activities is unique, this is the important input variable in the development of agricultural cycle economy but must be transformed the land as the value variable. Taking into account the recycling of agricultural land, the cropping situation, we have chosen a total sown area of agriculture and through the unit cost of land to be translated into value terms

Table 1: Stochastic frontier translog production function estimates results

Variables	Coef	Std-error	t-ratio	Variables	Coef	Std-error	t-ratio
C	-2.535***	0.601	9.732	0.5(lnK)2	0.031	0.020	-0.521
lnK	0.498**	0.079	1.818	0.5(lnI)2	0.069***	0.019	2.420
lnI	0.316	0.158	-0.172	0.5(lnL)2	0.049	0.007	-1.190
lnL	-0.164*	0.049	-1.289	0.5(lnE)2	0.126	0.046	-0.312
lnE	0.128***	0.237	4.263	0.5t2	0.118	0.004	-0.299
t	-0.241*	0.060	1.679	0.5(lnK)(lnI)	-0.259	0.021	0.009
t(lnK)	0.332	0.012	-0.809	0.5(LnK)(lnL)	-0.130	0.010	0.146
t(lnI)	-0.076	0.017	-1.129	0.5(lnK)(lnE)	0.069	0.022	-0.171
t(lnL)	0.141***	0.005	2.487	0.5(lnI)(lnL)	-0.258	0.016	0.612
t(lnE)	-0.036***	0.011	3.486	0.5(lnI)(lnE)	-0.149**	0.050	-2.011
				0.5(lnL)(lnE)	-0.039	0.014	0.567
C	0.701**	0.312	2.232	log-likelihood function value		-1.969***	
γ	0.979***	0.001	731.659				
ι	1.225***	0.239	5.285	LR Likelihood Ratio		6.757***	
η	0.005	0.009	-0.062				

***,**,*: Seperately 1, 5, 10% of the significant level, significance levels separately, two-tailed test

- **Time trend function T:** T = 1,...,13, corresponding 1997 to 2011, reflecting the technological change

In order to ensure the overall comparability of data on the magnitude of value indices excluding the price factor treatment, using a sample interval of rural areas and rural consumer price index retail price index of manufactured goods converted to constant prices of 1997.

Estimation results analysis

Model estimation results interpretation: According to the model (3) and the above other hypotheses, making use of China 1997-2011 31 provincial-level panel data to estimate the region, the results shown in Table 1:

Results show that:

- Technical inefficiency mean μ passed the level of significance of 1% of the test, indicating that there is technical inefficiency in the various regions of the agricultural cycle economy
- γ = 0.979, about, after controlling the input factors and other non-controllable factors, 97.9% did not meet frontier level of output which is caused by technical inefficiency. LR test statistic were significant at 1% significant level, indicating the error term in type (1) has a very significant composite structure. Therefore, for the sample data using the stochastic frontier production function technique is very necessary
- η (time-varying technical efficiency) = 0.005, did not pass inspection, which indicates that the technical efficiency of all regions and time trend is not obvious

In the model the coefficient of time t for all items included in the regression were largely through the significant test, indicating that technological progress in agriculture and recycling economy exist and the time with each investment essential factor's cross term's regression

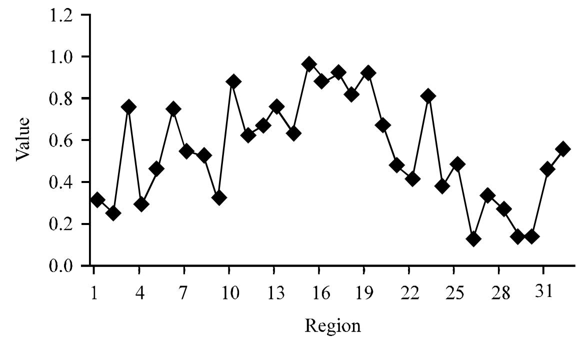

Fig. 1: Regional technical efficiency average level (in provinces No.)

coefficient through the examination, suggesting that technical is non-neutral, which means that technology is not independent of the factors of production.

The labor force essential factor L result is quite special, a regression coefficient for negative (two items not through examination). Presents this result the reason to have the possibility is the investment manpower essential factor makes the positive contribution by no means to the agricultural circulation economy development, some areas temporarily have not possibly realized to the development circulation agriculture importance, therefore still exists does not favor the agricultural circulation economic development the phenomenon.

Technical efficiency analysis

Technical efficiency of volatility: Figure 1, the gap was significant and volatile about the technical efficiency of the agricultural cycle economy. Through Table 2, average efficiency is uneven, the highest is 0.98, it shows China agricultural recycling economy across regions there is a big room to improve technical efficiency (compared with 1). Reason may be that since the 21st century began about agriculture circulation economy development, the

Table 2: Provinces, municipalities and autonomous regional technical efficiency value

Regions	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Beijing	0.27	0.28	0.29	0.29	0.30	0.31	0.31	0.32	0.33	0.34	0.34	0.35	0.36	0.37	0.37
Tianjin	0.21	0.21	0.22	0.23	0.23	0.24	0.25	0.25	0.26	0.27	0.27	0.28	0.29	0.29	0.30
Hebei	0.74	0.74	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78	0.78	0.79	0.79	0.80
Shanxi	0.25	0.25	0.26	0.27	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.32	0.33	0.34	0.34
Neimenggu	0.41	0.41	0.42	0.43	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.48	0.49	0.50	0.50
Liaoning	0.72	0.73	0.73	0.73	0.74	0.74	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78
Jilin	0.50	0.51	0.52	0.52	0.53	0.54	0.54	0.55	0.56	0.56	0.57	0.57	0.58	0.59	0.59
Heilongjiang	0.49	0.50	0.50	0.51	0.52	0.52	0.53	0.54	0.54	0.55	0.56	0.56	0.57	0.58	0.58
Shanghai	0.28	0.28	0.29	0.30	0.30	0.31	0.32	0.33	0.33	0.34	0.35	0.36	0.36	0.37	0.38
Jiangsu	0.87	0.87	0.88	0.88	0.88	0.88	0.88	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90
Zhejiang	0.58	0.59	0.59	0.60	0.61	0.61	0.62	0.62	0.63	0.64	0.64	0.65	0.65	0.66	0.67
Anhui	0.63	0.64	0.64	0.65	0.66	0.66	0.67	0.67	0.68	0.68	0.69	0.69	0.70	0.70	0.71
Fujian	0.73	0.74	0.74	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78	0.78	0.79	0.79
Jiangxi	0.59	0.60	0.60	0.61	0.61	0.62	0.63	0.63	0.64	0.64	0.65	0.65	0.66	0.67	0.67
Shandong	0.96	0.96	0.96	0.96	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98
Henan	0.87	0.87	0.87	0.87	0.88	0.88	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.90	0.90
Hubei	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hunan	0.80	0.80	0.80	0.81	0.81	0.81	0.82	0.82	0.82	0.83	0.83	0.83	0.84	0.84	0.84
Guangdong	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.94
Guangxi	0.64	0.65	0.65	0.66	0.66	0.67	0.67	0.68	0.68	0.69	0.70	0.70	0.70	0.71	0.71
Hainan	0.43	0.44	0.45	0.45	0.46	0.47	0.47	0.48	0.49	0.50	0.50	0.51	0.52	0.53	0.53
Chongqing	0.37	0.37	0.38	0.39	0.40	0.40	0.41	0.42	0.42	0.43	0.44	0.45	0.45	0.46	0.47
Sichuan	0.80	0.80	0.80	0.81	0.81	0.81	0.82	0.82	0.82	0.83	0.83	0.83	0.84	0.84	0.84
Guizhou	0.33	0.33	0.34	0.35	0.36	0.36	0.37	0.38	0.38	0.39	0.40	0.41	0.41	0.42	0.43
Yunnan	0.44	0.45	0.45	0.46	0.47	0.47	0.48	0.49	0.50	0.50	0.51	0.52	0.52	0.53	0.54
Xizang	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.16
Shanxi	0.28	0.29	0.30	0.31	0.31	0.32	0.33	0.34	0.34	0.35	0.36	0.36	0.37	0.38	0.39
Gansu	0.22	0.23	0.24	0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.29	0.30	0.31	0.32	0.32
Qinghai	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.16	0.16	0.17	0.17	0.18
Ningxia	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.17	0.17	0.18
Xinjiang	0.40	0.41	0.42	0.43	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.48	0.49	0.50	0.51

Table 3: Three regions technical efficiency value

Region	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Easten	0.61	0.61	0.62	0.62	0.63	0.63	0.64	0.64	0.65	0.65	0.66	0.66	0.67	0.67	0.68	0.63
Middle	0.63	0.64	0.64	0.65	0.65	0.65	0.66	0.66	0.67	0.67	0.68	0.68	0.69	0.69	0.70	0.65
Westrn	0.35	0.35	0.36	0.37	0.37	0.38	0.39	0.39	0.40	0.40	0.41	0.42	0.42	0.43	0.44	0.37

relationship of agriculture circulation economy system in all aspects is not very well straighten out, the circular economy in a variety of agricultural resources, technology has not integrated well. There can not be well-integrated environmental and economic phenomenon. Although the interval around the agricultural cycle of economic and technical efficiency is low, the rise year by year. This is because with the economic development of the agricultural cycle more and more important, all regions are active and reasonable correction of their own resources, technical configuration issues and thus more in line with the premise of the economic development of agricultural cycles.

To investigate the agricultural circular economy technology efficiency is convenient, the 31 regions divided into three regions: Eastern (Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan), central (Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan) and western (Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Inner Mongolia, Guangxi, Ningxia, Qinghai, Xinjiang, Tibet), for convenience, below the paper "areas" shall mean 31 provinces, "regions" shall mean the eastern, central and western. To make each region more representatives about the average technical efficiency, here we measure them by taking the weighted average. Weights for all areas are the proportions where agricultural output in its region total agricultural output (Shi *et al*., 2008).

Through the Table 3 can be seen, the average technical efficiency of the eastern, middle and western regions three regions are at three different levels and there is a clear difference among, the middle owns the highest technical efficiency, followed by the east and western minimum. Table 2 can be combined, the average technical efficiency is not high for all areas of the middle region which owning the highest technical efficiency, low level of technical efficiency in some areas and some even lower than the east and western regions, such as Shanxi. The western region is not included in the technical efficiency of all regions are at the lowest level, where the level of technical efficiency in Sichuan exceeds the average level of the middle region. The reason why the agriculture is a relatively traditional sector, although its related

Table 4: Average growth rate of three regions technical efficiency 1997-2011

Region	Easten	Middle	Westrn
Average growth rate	0.00476	0.00469	0.00619

Table 5: 1997~2011 31 Provincial level area technical efficiency coefficient of variation

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Coefficient of variation	3.367↑	3.418↑	3.439↑	3.537↑	3.569↑	3.624↑	3.657↑	3.767↑	3.796↑	3.868↑	3.936↑	3.987↑	4.088↑	4.124↑

Expressed separately compares the change direction with the last year

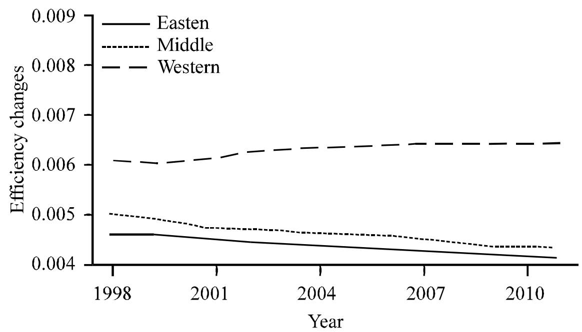

Fig. 2: Regional technical efficiency changes track

technologies continue to progress, compared to similar industrial sector, is still slower. If the agricultural cycle economy technology in a few areas in the region is advanced, then other areas will be at the cutting edge below the corresponding region. Only when the technology of agricultural cycle economy in most regions contained has improved to some extent, then there is a clear increase in efficiency only when the technology makes the region as a whole. From Fig. 2 we can see the technological growth rates of efficiency of agricultural cycle economy in western region are significantly higher than other regions.

Regional difference analysis: And from Table 4, in regional agricultural circular economy technology efficiency coefficient of variation changes also can see, the gap of 31 provincial areas of agricultural circular economy technology efficiency is in constant fluctuations. 1997~2011 regional gap has been enlarging. In order to narrow differences among areas, to assume the stable development, the state should be give policy support, in implementing policy should provide the proper guidance and make the resource, technology in accord with agricultural circular economy development premise conduct optimum integration.

From the points of view area, as shown in Table 5 shows, the variety track of eastern and central two regions' agricultural circular economy technical efficiency compare similar, 1997~2011 fluctuated declines in trend but the central region down faster than the eastern region, the eastern region decline relatively gentle. The change track of western region is opposite with eastern and central. Western region is 1997~2011 increasing year by year, rises relatively gentle. From the fluctuation, with range to measure, the western range is about 0.00028, eastern range is about 0.00039, while in the middle of the fluctuation is the largest, for 0.00052. Visibly, central region is obviously higher than the east, west about the fluctuation extent.

CONCLUSION

By constructing a Stochastic frontier translog production function model, 1997~2011, 31 areas agricultural circular economy panel data, we study the technical efficiency of agricultural circular economy, regional fluctuations and differences, found:

- Studying agricultural circular economy, stochastic frontier translog production function model is a suitable model
- 1997~2011, agricultural circular economy technology efficiency low level, reason might be since the 21st century began about agriculture circular economy development of agriculture circular economy system in all aspects of relationship is not very good, straighten, agricultural circular economy of various resources, technology also failed to integrate well, existing environmental and economic cannot very good fusion phenomenon. But agriculture circular economy technology efficiency standards were to increase year by year trend, this is due to agriculture with the development of circular economy more and more attention to various areas were actively reasonable rectification of its own resources, technology configuration, thus more in line with the agricultural circular economy development of premise
- In the eastern, central and western agricultural circular economy, technical efficiency level difference is bigger and volatility is stronger. Eastern and central change trend rather similar and present negative growth, only to the west is positive growth. To narrow differences between areas to assume the stable development, the state should be policy support and guidance, make resources, technology in accord with agricultural circular economy development premise can conduct optimum integration

Therefore, the key current issues are improving the technical efficiency of agricultural cycle economy and narrowing the efficiency gap among regions.

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