

Economic Performance Evaluation on Land Circulation in Modern Agricultural Planting Parks---- Based on Survey Data in Chengdu

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Abstract

This article made a field survey in the three modern agricultural planting parks of grape planting park in Chengdu, modern agricultural demonstration park and professional strawberry cooperative and made a comprehensive evaluation on land circulation economy by means of the evaluation index system and applying the analytic hierarchy process (AHP) and Multi-objective Linear Weighting Function. It concluded that, the land circulation of modern agricultural demonstration park had the highest economic performance, second was the grape planting park and the last was the professional strawberry cooperative. Considering the actual situations of the three parks, this article further analyzed causes for the difference and proposed establishing a new type of industrialized organization mode in land circulation, paying attention to guarantee of farmers' income.

Keywords: Modern agricultural planting park, Land circulation, Economic performance

1. Introduction

The topic of rural land circulation has become a hot issue that has received focus of the theoretical circle. Land circulation makes land to be concentrated among major planting households, cooperative organizations and agricultural enterprises, which not only has satisfied requirement of development of modern high-efficiency agriculture by enterprises for utilization of the scale of land, but also has been helpful to pushed forward standardized production and operation of enterprises and to increase income of farmers. In 2007, Chengdu was the pilot site for coordinating urban and rural comprehensive supplementary reforms all over the country. Furthermore, in 2008, Chengdu again started the experimental unit for the reform of rural property rights system, which realized the capitalization of land use right and promoted realization of scale operation in rural land circulation. Modern agricultural parks in Chengdu have developed rapidly and have become an important power to facilitate agricultural development. As an important resource for agricultural planting park, the economic performance of land circulation determines its stable and long-term development to a large extent.

According to Feng Bingying (2004), land circulation could realize scale operation of land, improve scientific content of agriculture, resolve contradictions between human kind and land and realize transfer of rural labor force. Moreover, land circulation was helpful for agricultural structure adjustment, increase of farmers' income and development of export-oriented agriculture. Cao Jianhua et al (2007) thought, land resources and labor force resources could be again allocated by means of land circulation and welfare and economic benefit of land suppliers and demanders got increased. Dong Guoli et al (2009) made a comparative analysis in the land agency performance under the three modes of private agency, government agency and market agency and pointed out that high-efficiency circulation of land should be based on making clear the land property rights, taking into consideration the rational and highly efficient market mechanism and land intermediary institute, and cooperating with the country in offering convenient institutional system. Yue Yiding et al (2010) applied network analytic hierarchy process to make a quantitative evaluation on economic performance of different land circulation modes.

A general survey of current research findings, it can be discovered that, quantitative studies on land circulation are relatively limited, especially studies were still blank about economic performance evaluation on land circulation in modern agricultural parks. In view of this, this article referred to relevant index system and applied AHP to empower the indexes. The authors made a field survey on modern agricultural planting parks in Chengdu, applied Multi-objective Linear Weighting Function to make an evaluation on the economic performance of land circulation in these parks, which offered reference value for enhancing economic performance of land circulation in modern agricultural planting parks in Chengdu and which further better promoted rural land circulation.

2. Establishment of evaluation system and confirmation of index weight

2.1 Establishment of index system

The index system of economic performance evaluation on land circulation proposed by Yue Yiding et al (2010) included altogether 11 indexes in the three aspects of rural economic development, improvement of farmers' living and agricultural industrial development.

2.1.1 Index of rural economic development

(1) Index of rate of utilization per unit land. This index is one that reflects utilization condition of land and can be observed through the annual average cultivation time per unit land.

$$A11 = (\text{Annual average cultivation time per unit land after its circulation} - \text{Annual average cultivation time per unit land before its circulation}) / \text{Annual average cultivation time per unit land before its circulation}$$

(2) This index is one that reflects utilization appreciation condition of land and is the ratio of average appreciation of output per unit land after its circulation to the average output per unit land before its circulation.

$$A12 = (\text{Output per unit land after its circulation} - \text{Output per unit land before its circulation}) / \text{Output per unit land before its circulation}$$

(3) Index of labor force input per unit land. This index is one that reflects the efficiency of labor force input per unit land and is the ratio of variation of labor force input per unit land after its circulation to the amount of labor force input per unit land before its circulation.

$$A13 = (\text{Amount of labor force input per unit land after its circulation} - \text{Amount of labor force input per unit land before its circulation}) / \text{Amount of labor force input per unit land before its circulation}$$

(4) Index of owned fund input per unit land. This index is one that reflects the utilization of owned fund after rural land circulation and is the ratio of appreciation of owned fund per unit land after land circulation to the amount of owned fund per unit land before land circulation.

$$A14 = (\text{Value of owned fund per unit land after land circulation} - \text{Value of owned fund per unit land before land circulation}) / \text{Value of owned fund per unit land before land circulation}$$

(5) Index of external capital attraction per unit land. This index is one that reflects the degree of attraction of rural land circulation to external capital and is the ratio of available external capital value per unit land after land circulation to the total value of capital input per unit land.

$$A15 = \text{Available external capital value per unit land after land circulation} / \text{Total value of capital input per unit land}$$

2.1.2 Index of the improved living of farmers

(1) Index of farmers' per capita net income variation. This index is an important one that measures the living condition of rural residents. The index of farmers' per capita net income variation is the ratio of the appreciation of farmers' per capita net income after land circulation to farmers' per capita net income before land circulation.

$$A21 = (\text{Farmers' per capita net income after land circulation} - \text{farmers' per capita net income before land circulation}) / \text{farmers' per capita net income before land circulation}$$

(2) Index of target realization of farmers' per capita net income. This index is one that reflects gap between farmers' per capita net income after rural land circulation and the value of target of building a well-off society in an all-around way. The target value in Chengdu is positioned at 8000 Yuan.

$$A22 = \text{Farmers' per capita net income after land circulation} / 8000$$

(3) Index of variation of the ratio of farmers' agricultural income to the total income. This index is one that reflects the variation condition of the ratio of farmers' agricultural income to the total income after land circulation.

$A23 = \frac{\text{Ratio of farmers' agricultural income to the total income after land circulation} - \text{Ratio of farmers' agricultural income to the total income before land circulation}}{\text{Ratio of farmers' agricultural income to the total income before land circulation}}$

2.1.3 Index of agricultural industrial development

(1) Index of realization of scale operation. This index is one that reflects the scale operation condition of land after land circulation and is the ratio of the area of land which has realized scale operation in the land circulated to the total area of land circulated.

$A31 = \frac{\text{Area of circulated land that has realized scale operation}}{\text{Total area of circulated land}}$

(2) Index of mechanical utilization rate per unit land. This index is an important one that reflects mechanization production of agriculture. In measuring mechanical utilization quantity, this article will conduct a monetization processing. Thus, this index is the ratio of appreciation of mechanical utilization per unit land after land circulation to the mechanical utilization value per unit land before land circulation.

$A32 = \frac{\text{Mechanical utilization value per unit land after land circulation} - \text{Mechanical utilization value per unit land before land circulation}}{\text{Mechanical utilization value per unit land before land circulation}}$

(3) Index of variation of scientific input per unit land. This index is one that reflects variation of scientific input per unit land after land circulation. Similarly, this article will conduct monetization processing on scientific input value. Thus, it is the ratio of value added in scientific input realized for new product development or starting new cultivation methods per unit land to the scientific input value per unit land before land circulation.

$A33 = \frac{\text{Scientific input value per unit land after land circulation} - \text{Scientific input value per unit land before land circulation}}{\text{Scientific input value per unit land before land circulation}}$

2.2 Confirmation of index weight

On the basis of evaluation index system, this article applies AHP to determine weight of all indexes. Based on judgment made by experts on the importance of all indexes, this article sets up a judgment matrix to give comparative scores on indexes at different levels. The weight can be classified into five degrees: 1, 3, 5, 7 and 9, which respectively represent the following five situations: two factors are similarly important, one factor is slightly more important than the other, one factor is comparatively more important than the other, one factor is much more important than the other and one factor is absolutely more important than the other. According to the scale of AHP and summarizing the judgment of all experts, this article gets the weight of relevant indexes (See Table 1) by employing AHP 0.5.2 analytical software.

<Insert Table 1 here>

3. Collection of data and selection of evaluation method

3.1 Collection of data

This paper selected the three representative parks as the research object, namely, grape planting park, professional strawberry cooperative and modern agricultural demonstration park. Grape planting park is a project to attract investment in Chengdu, which is led by a leading enterprise, professional strawberry cooperative is led by four major planting households, whereas Dujiangyan modern agricultural demonstration park is mainly agricultural production recovery for post-disaster reconstruction. The government put a huge amount of special funds to attract five companies to participate in the three parks. The three parks respectively represent different development modes of industrial parks led by different subjects and this paper makes an evaluation and study on the economic performance of land circulation.

According to requirement of relevant indexes, this paper made a field survey on data required, as is shown in Table 2.

<Insert Table 2 here>

Data source: survey data of the subject in May 2011

According to relative calculation formula of specific index, we got the following relevant index value of all parks, as is shown in Table 3.

<Insert Table 3 here>

3.2 Selection of evaluation method

The authors applied Multi-objective Linear Weighting Function to make an evaluation on the economic performance of land circulation in different planting parks. For details, please see the following formula:

$$S = \sum_{j=1}^m \left(\sum_{i=1}^n A_i B_i \right) C_j$$

Where, S is the total score; A_i is the score of the i^{th} single index

B_i is the weight of the i^{th} single index

C_j is the weight of the j^{th} theme

n is the number of indexes, which is 11 in this model

m is the number of child themes, which is 3 in this model

4. Evaluation result and analysis

4.1 Evaluation result

According to Multi-objective Linear Weighting Function and with reference to the specific value in Table 3, we get the economic performance evaluation of land circulation in the three planting parks, as is shown in Table 4.

<Insert Table 4 here>

According to calculation result, the economic performance of land circulation in the grape planting park is 242.56, the total score of modern agricultural demonstration park is 310.29 and the total score of professional strawberry cooperative is 79. Thus, it can be discovered that, the economic performance of land circulation in modern agricultural demonstration park has the highest score, second is the grape planting park and the professional strawberry cooperative has the lowest economic performance of land circulation.

Through calculation of AHP, we can get the weight of the three first-class indexes constituting economic performance of rural land circulation --- index of rural economic development, index of farmers' improved living and index of agricultural industrial development, respectively with the weight of 0.4322, 0.3019 and 0.2659. Among the secondary indexes, the following several indexes have the highest weight: index of farmers' per capita net income variation, index of output rate per unit land, index of realization of scale operation and index of variation of scientific input per unit land. It indicates that, we can enhance the economic performance of rural land circulation in modern agricultural planting park by means of greatly promoting farmers' income increase, increasing the output rate per unit land and boosting scientific input.

4.2 Analysis of conclusion

(1) First of all, in terms of funds, as a project of post-disaster reconstruction, modern agricultural demonstration park obtains a huge amount of special funds from the government, which attracts five companies to participate, with strong financing capacity. In terms of technology, with huge funds input, the modern agricultural demonstration park seeks for extensive cooperation with scientific institutions and universities to bring in and attract advanced foreign technology, which lays perfect technical foundation. In terms of land use, the modern agricultural demonstration park has high level of scale operation and intensive land use, which means high output efficiency of land. Finally, the modern agricultural demonstration park has set up perfect technical service promotion system and farmers benefit a lot. Thus, this park has high scores in the development index of all indexes, which decides that the economic performance of land circulation in this park is the highest.

(2) As an organic grape development base with a large scale in mid-western China, the grape planting park has the second highest economic performance, which might attribute to the independent operation of this park. The agricultural facilities in this park are more complete and modernized planting technology is more advanced. Thus, the agricultural industrial development index of this park has the highest score. Nevertheless, this park has lower output rate of land than the modern agricultural demonstration park and its financing capacity is also slightly inferior. Thus, its comprehensive evaluation determines that the economic performance of land circulation in this park ranks the second.

(3) The professional strawberry cooperative has the lowest economic performance of land circulation, which has something to do with its insufficient funds and technology. This park is mainly led by major planting households, which determines that its financing capacity of funds has definite gap with the other two parks. Then, in terms of scientific input, this park is slightly inferior. Its scale utilization of land is low and is still led by disperse planting. All these elements decide that this planting park has the lowest economic performance of land circulation.

5. Policies and suggestions

5.1 To set up new type of industrialized organization modes

From the above analysis, it can be found that, the economic performance of land circulation is necessarily low if

only several major planting households are engaged in agricultural production and operation. It has to be supported by a leading enterprise, together with a quaternary industrial organization mode of “government + leading enterprise + professional cooperative organization +farmers” or “government + leading enterprise + base + farmers”. The government carries out correct guidance, attracts more leading enterprises to take part, realizes connection of small production and the market and enhances organized and commercialized agriculture, which, in the mean time, helps to enhance the comparative benefit of agriculture and maintain the rights and interests of farmers, and which can better realize scale operation of land and enhance the economic performance of land circulation.

5.2 To pay attention to guarantee of farmers’ income

Land has strong dependence upon farmers. Thus, we have to pay attention to social security of farmers after land circulation, transfer workforce of deprived farmers step by step, increase the circulation price per unit, carry out a variety of pooling of land and drawing dividends on these land shares, guarantee income of farmers to the largest extent and resolve troubles back home of farmers, which can then ensure successful running of land circulation and which can better enhance the economic performance of land circulation.

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Table 1. Index system and index weight of economic performance evaluation of land circulation

	First class index	Weight	Secondary index	Weight
Economic Performance Evaluation	Index of rural economic development A1	0.4322	Index of rate of utilization per unit land A11	0.0824
			Index of rate of output per unit land A12	0.1390
			Index of labor force input rate per unit land A13	0.0506
			Index of owned fund input per unit land A14	0.0929
			Index of external capital attraction per unit land A15	0.0812
	Index of improved farmers’ living A2	0.3019	Index of farmers’ per capita net income variation A21	0.1182
			Index of realization of farmers’ per capita net income target A22	0.0555
			Index of ratio of farmers’ agricultural income to the total income A23	0.0784
	Index of agricultural industrial development A3	0.2659	Index of realization of scale operation A31	0.1233
			Index of mechanical utilization rate per unit A32	0.0645
Index of scientific input variation per unit land A33			0.1140	

Table 2. Source data of survey on research objects

	Grape park		Modern agricultural demonstration park		Professional strawberry cooperative	
	Before circulation	After circulation	Before circulation	After circulation	Before circulation	After circulation
Annual average cultivation time (month) per unit land	9	12	9	12	9	12
Output (Yuan) per unit land	600	2000	800	10000	750	6500
Labor force input (person) per unit land	4	10	5	15	5	9
Owned fund input value (Yuan) per unit land	400	16400	500	24000	300	4000
Available external capital value (Yuan) per unit land after circulation	/	1600	/	96000	/	1000
Total capital input (Yuan) per unit land	/	18000	/	120000	/	5000
Farmers' per capita net income (Yuan/month)	500	2000	450	1600	400	1500
Ratio of farmers' agricultural income to the total income	0.8	0.2	0.9	0.2	0.75	0.3
Land circulation area for realization of scale operation (Mu)	/	3500	/	500	/	200
Total land circulation area (Mu)	/	5000	/	500	/	1000
Mechanical utilization value (Yuan) per unit land	100	450	120	500	150	300
Scientific input value (Yuan) per unit land	600	8000	700	6000	500	2500

Table 3. Statistical table of index value

	Grape planting park	Modern agricultural demonstration park	Professional strawberry cooperative
Index of rate of utilization per unit land	33	33	33
Index of rate of output per unit land	233	1150	767
Index of labor force input rate per unit land	150	200	80
Index of owned fund input per unit land	4000	4700	1233
Index of external capital attraction per unit land	9	8	2
Index of farmers' per capita net income variation	300	256	275
Index of realization of farmers' per capita net income target	300	240	225
Index of ratio of farmers' agricultural income to the total income	75	78	60
Index of realization of scale operation	70	100	20
Index of mechanical utilization rate per unit	350	317	100
Index of scientific input variation per unit land	1233	757	400

Table 4. Economic performance evaluation result of land circulation

Level of target	Parks	Total score	Level of index	Score
Economic performance evaluation of land circulation	Grape planting park	242.56	Index of rural economic development	415.03
			Index of improved farmers' living	57.99
			Index of agricultural industrial development	171.77
	Modern agricultural demonstration park	310.29	Index of rural economic development	609.97
			Index of improved farmers' living	49.69
			Index of agricultural industrial development	119.07
	Professional strawberry cooperative	79.00	Index of rural economic development	114.55
			Index of improved farmers' living	49.69
			Index of agricultural industrial development	54.52