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SCISSORS DIFFERENCE AND ITS IMPACTS ON ECONOMIC VALUE OF CULTIVATED LAND IN CHINA

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ABSTRACT: The problem of price scissors difference between industrial products and agricultural products is one of the important problems in China. It impacts not only the living standard improvement of farmers but also the economic value of cultivated land, furthermore results in the direct and indirect loss of cultivated land resources. China's cultivated land area has decreased dramatically in recent years. An important reason for the decrease is the relatively low cost of cultivated land occupancy, which results from the distortion of economic value of cultivated land due to the existence of scissors difference. This study firstly analyzed the dynamic change of scissors difference and calculated the absolute and relative magnitude of scissors difference from 1997 to 2002, then computed the economic value of cultivated land before and after scissors difference adjustment in 2002, and finally discussed the inverted scissors difference. Results suggest that the scissors difference has a remarkable impact on the economic value of cultivated land, and the adjustment of scissors difference even inverted scissors difference to the economic value of cultivated land is indispensable.

KEY WORDS: cultivated land; economic value; scissors difference; scissors difference adjustment; P.R.China

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1 INTRODUCTION

As we all know, China is a country with vast population and scarce land per capita (YANG and LI, 2000). "Treasuring land very much, utilizing land rationally and protecting the cultivated land conscientiously" is fundamental state policy of China. At the same time, the cultivated land protection is also the base of carrying out the sustainable development strategy. However, because of the drive of economic interest, cultivated land area of China has decreased dramatically in recent years. According to the monitoring data of the Ministry of Land and Resources, nearly 1.33×10^6 ha (0.19×10^6 ha per year) of cultivated land were converted into built-up area from 1997 to 2002 (Ministry of Land and Resources, 1998–2003) (Fig.1). How to compute cultivated land value accurately and heighten the threshold of non-agriculture use of cultivated land is indispensable.

Recently, many researchers have paid more attention to the composition and calculation methods of cultivated land value in China (LIU, 2000; HUO and CAI, 2003; HAO and REN, 2004; YU and CAI, 2004). The composition of cultivated land value is confirmed by and large, which includes at least three aspects, economic value, ecologic value and social value. As to the calculation methods of different parts of cultivated land value, there are different viewpoints, but among these, less attention has been paid to the impact of price scissors difference between industrial products and agricultural products (scissors difference for short in this paper) on the economic value of cultivated land.

The scissors difference policy has been implemented since the founding of P.R.China in 1949, which means assembling rural wealth to support urban development, i.e. agriculture support industry. Under this policy, China's urban development was rapid, but the situation in the countryside is not optimistic now (JIANG and WU, 2003). The existence of scissors difference leads to the result that despite grain output increase farmers income can not increase, which suppresses the farmers' enthusiasm for agricultural production, therefore, a large amount of cultivated land were managed extensively

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and even were abandoned. The more important thing is that the existence of scissors difference causes the decrease of cultivated land quantity directly because it has twisted cultivated land income, then twisted the economic value of cultivated land further. The economic value of cultivated land before scissors difference adjustment (SDA) is far lower than its true value. Thus, the adjustment of scissors difference to the economic value of cultivated land is indispensable.

Bearing this context in mind, this paper analyzes the status quo of scissors difference firstly, and then computes the scissors difference and the economic value of cultivated land under the effect of scissors difference, so as to elevate the comparative advantage of agriculture and protect the cultivated land resources effectively.

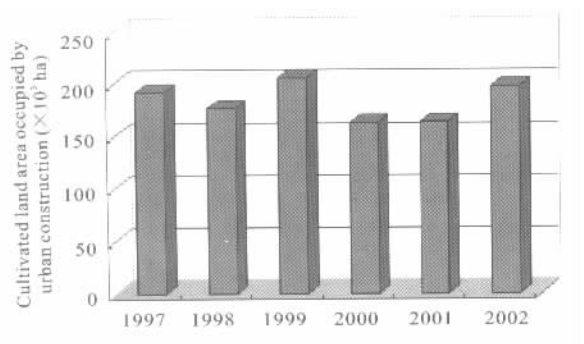


Fig.1 Cultivated land area occupied by urban construction from 1997 to 2002

2 DATA

The original data source regarding cultivated land area in this paper is from the 1996 National Land Survey, which provided the most systematic, comprehensive and coherent quantification measurement of China's land (FENG *et al*., 2005). Most provinces and counties use the 1996 National Land Survey results as their published statistical data (National Bureau of Statistics of China, 1997). The survey's accuracy and reliability are widely accepted.

The education fees data are from *The Statistical Bulletin of National Education Funds Implementation* (Ministry of Education of the People's Republic of China£< 2002). The living expenses data are adjusted by consumer price indices based on 2050 yuan per capita①. The consumer price indices data and other data come from *Statistical Yearbook of China* (National Bureau of Statistics of China, 1998–2003) and *China Rural Statistical Yearbook* (Investigation Groups in Rural Social Economy of National Bureau of Statistics of China, 2003).

3 METHODS

3.1 Comparable Labor Force Method

The essential of scissors difference is the balance that the price of agricultural products is lower than their value and the price of industrial products is higher than their value. It reflects the unequal exchange between agriculture and industry (HAN, 1993; FU, 1999; JIANG and WU, 2003). The researches about scissors difference computing methods were conducted mainly in the last decade of the 20th century (LI, 1993; ZHANG, 1993; FU, 1999). The comparable labor force method based on Marx's labor value theory is adopted frequently (YAN and GONG, 1987; HAN, 1993; TIAN, 1995). In this paper we will also adopt this method to compute the scissors difference from 1997 to 2002 in China.

The value computation of industrial products and agricultural products is the key of this method. Here, the concrete industrial and agricultural laborers were turned into the comparable labors without any difference in the quality. According to the comparable labor force of industry department and agriculture department, the total value of each department is acquired. Hereinto, the computing of reduction coefficient between industrial laborers and agricultural laborers is the difficulty of this method.

There are many differences between industrial labor force and agricultural labor force. It is impossible to think over all aspects. In this paper, we think over the three main facets: 1) Complicated degree of labor. Here, we consider that the reproduction expenditure of labor decides the complicated degree of labor, and the reproduction expenditure includes education fees and living expenses. 2) Surplus labors existing in agriculture department. We will deduct the surplus labor force from the whole number of agricultural labor force. 3) Half and assistant labor force of statistical agricultural labor force. We converted half and assistant labor force to normal labor force (YAN and GONG, 1987).

The premise of scissors difference computing is that: 1) Gross domestic product (GDP) is the basal data. 2) Products of primary industry are considered as the agricultural products, and products of secondary and tertiary industries are considered as the industrial products (the generalized industrial products); 3) GDPs of industry department and agriculture department are considered as their own gross price, and the value created by

① This data is from Rural Development Research Center of State Council (about the origin of this data see YAN and GONG, 1987).

industrial and agricultural labor force is considered as their own gross value (JIE, 1997).

Based on the calculation method and the premise of scissors difference computing, the computing procedure of scissors difference is listed in Table 1.

3.2 Reduction Coefficient of Industrial and Agricultural Products

The computing of net income is an important part to evaluate the economic value of cultivated land. However, the estimation value of total income is lower than its actual value and the estimation value of total cost is higher than its actual value because of the existence of the scissors difference. This results in the relatively low comparative advantage of agriculture and affects the accuracy of valuation results. Therefore, when we evaluate the economic value of cultivated land, the net income of cultivated land should be adjusted by scissors difference.

Table 1 Computing procedure for scissors difference

Procedure	Expression
Gross industrial output value	(1)
Gross agricultural output value	(2)
Number of industrial labor force	(3)
Reduction coefficient of comparable labor force	(4)
Number of labor force converting from industry to agriculture	(5)=(3)×(4)
Number of agricultural labor force	(6)
Total number of comparable labor force	(7)=(5)+(6)
New value generated by industrial department	(8)={[(1)+(2)]/(7)}×(5)
New value generated by agricultural department	(9)={[(1)+(2)]/(7)}×(6)
Quantity that the price of industrial products is higher than their value	(10)=(1)−(8)
Quantity that the price of agricultural products is lower than their value	(11)=(9)−(2)
Absolute magnitude of scissors difference	(12)=(10)+(11)
Range that the price of agricultural products is lower than their value	(13)=(11)/(9)
Range that the price of industrial products is higher than their value	(14)=(10)/(8)
Relative magnitude of scissors difference	(15)=(13)+(14)

The reduction coefficients of total income (agricultural products) and total cost (industrial products) of cultivated land, denoted as $RC(ap)$ and $RC(ip)$ in this paper, can be acquired based on the computing of scissors difference. The reduction coefficients can be calculated by using following equation:

$$RC(ap)=1-(13)$$
$$RC(ip)=1+(14)$$

where (13), (14) refers to the range that the price of industrial products is higher than their value and the range that the price of agricultural products is lower than their value respectively.

3.3 Income Capitalization Approach

The income capitalization approach is one of the basic land-price appraisal methods, which is acknowledged internationally. The economic value of cultivated land is mainly decided by the net income of cultivated land and the rate of income capitalization. The net income of cultivated land has confirmed. Now, the remaining task is to evaluate the rate of income capitalization.

There are many kinds of methods to evaluate the rate of income capitalization. Generally, we adopt the method of adding the risk-adjusting ratio to the safe interest rate to evaluate the rate of income capitalization, and one-year fixed deposit interest rate of the bank is regarded as the safe interest rate in practice (YANG and YIN, 1999; ZHU and CUI, 2001). However, the change of bank rate of China is frequent in recent years, it is not suitable to regard bank rate as safe interest rate. On the other hand, the estimation of the risk-adjusting ratio is also complicated. Here, we adopt 5% as the rate of income capitalization according to international and domestic correlative experiences (U.S.A. adopts 4.0% traditionally, Germany 5.5%, Britain 5.0%) (ZHU and CUI, 2001).

4 RERULTS AND ANALYSIS

4.1 Reduction Coefficient Between Industrial Labor Force and Agricultural Labor Force

According to the three aspects being considered, the conversion ratio of complicated degree between industrial labor force and agricultural labor force is 1.43:1. The general conversion ratio between normal labor force and surplus labor force is 2.11:1 (the half and assistant rural labor force has been inverted), and the reduction coefficient between industrial labors and agricultural labors is 3.0:1 accordingly.

4.2 Scissors Difference and Its Change Trend

Based on the computing procedure of scissors difference shown in Table 1, and on the assumption that the reduction coefficient between industrial and agricultural labors from 1997 to 2002 is invariable (3.0:1), the results of scissors difference from 1997 to 2002 are shown in Fig. 2. The relative magnitude of scissors difference increased by 24.98% between 1997 and 2002, and the absolute magnitude of scissors difference was tripled from 869.80×10^9 yuan in 1997 to 2016.07×10^9 yuan in 2002. This shows that the scissors difference problems must be paid more attention to.

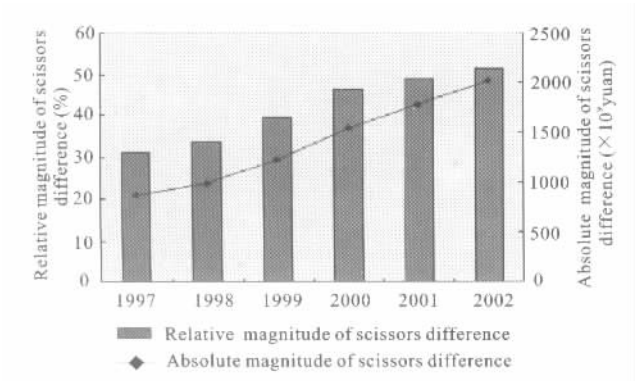


Fig. 2 Relative and absolute magnitudes of scissors difference from 1997 to 2002 in China

4.3 Economic Value of Cultivated Land Before and After SDA

Taking 2002 year as an example, the economic value of cultivated land is computed. According to the computing equation of $RC(ap)$ and $RC(ip)$, the values of $RC(ap)$ and $RC(ip)$ are 0.615 and 1.128 respectively. The results of net income before and after SDA are listed in Table 2.

Based on the above data and the confirmed rate of income capitalization (5%), the economic values of cultivated land before and after SDA are shown in Fig. 3.

When the computing results are compared (Fig. 3), the following results can be observed. Firstly, the economic value of cultivated land before SDA accounted for about 49% of that after SDA on the country average level, therefore, the impact of scissors difference on cultivated land value must be paid more attention to. Secondly, the economic value of cultivated land after SDA increase 177.3×10^3 yuan/ha on country average level. In developed metropolises and provinces such as Beijing, Shanghai, Fujian, etc., the absolute increase magnitude of the economic value of cultivated land is more than 400×10^3 yuan/ha. However, in poor developed provinces such as Qinghai, Tibet, Shaanxi and so on, the absolute increase magnitude of the economic value of cultivated land is only 40.0×10^3–90.0×10^3 yuan/ha. This indicates that the impact of scissors difference on the economic value of cultivated land is interrelated with the provincial (regional) economic development degree. Anyway, the economic value of cultivated land after SDA heighten the threshold of land requisition compensation so as to protect cultivated land resources and the farmers' profit to a certain extent.

Because cultivated land is so scarce and the problem of agriculture, countryside and farmers is so serious, it is indispensable to calculate the economic value of cultivated land accurately.

4.4 Back Feeding Policy and Inverted Scissors Difference

The No.1 document of central government in 2005 has put forward the question that "industry back feeding agriculture, city supporting the countryside", which reflects great change in developmental strategy and policy of China, namely from "agriculture supporting industry" to "industry back feeding agriculture". The government has adopted some methods to compensate agriculture, for example, the direct subsidy policy for grain. The quantification of scissors difference is helpful for government to confirm rational compensation standard. In fact, the net income from cultivated land after SDA is the true income the farmers should obtain. The genuine "industry back feeding agriculture" policy should be carried out based on the SDA, namely inverted scissors difference. Here, the net income per hectare adjusted by inverted scissors difference is computed tentatively.

According to the thinking of SDA, on the assumption that the absolute magnitude of scissors difference is constant (2016.07×10^9 yuan) in 2002, the reduction coefficient of total income and total cost are 1.294 and 0.444 respectively. The economic value of cultivated land after inverted scissors difference adjustment (ISDA) is shown in Fig. 4.

When the scenarios are compared with the economic value per hectare before and after SDA, the following general patterns can be observed.

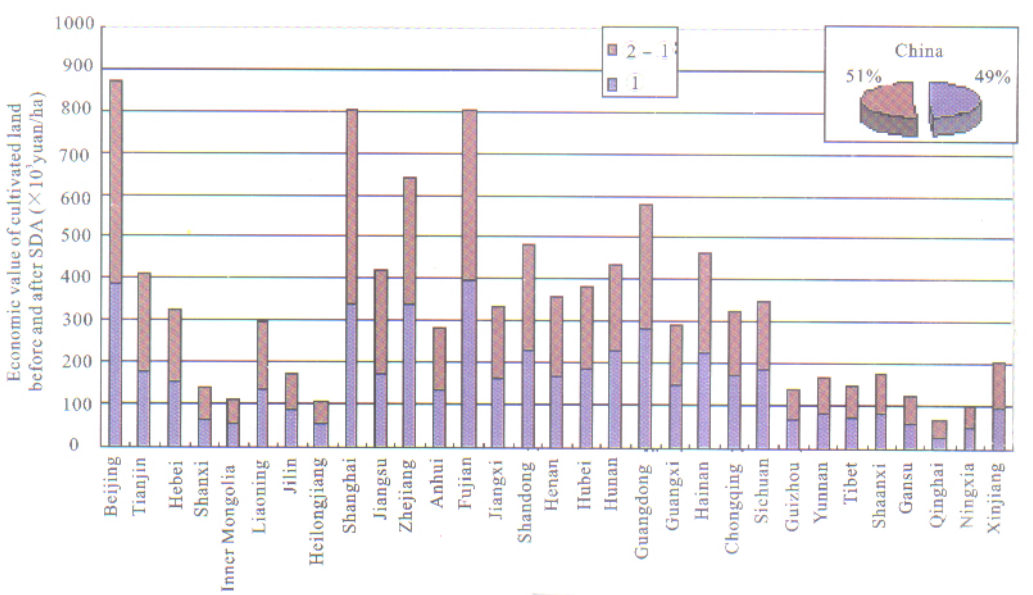
Firstly, the economic value of cultivated land before SDA accounts for about 32% of the economic value of cultivated land after ISDA on the country average level; the economic value of cultivated land after SDA accounts for about 66% of the economic value of cultivated land after ISDA on the country average level.

Secondly, on the condition that GDP is invariable, the ISDA heighten the threshold of non-agriculture use of cultivated land. The economic value of cultivated land

Table 2 Net income of cultivated land before and after SDA in China, 2002

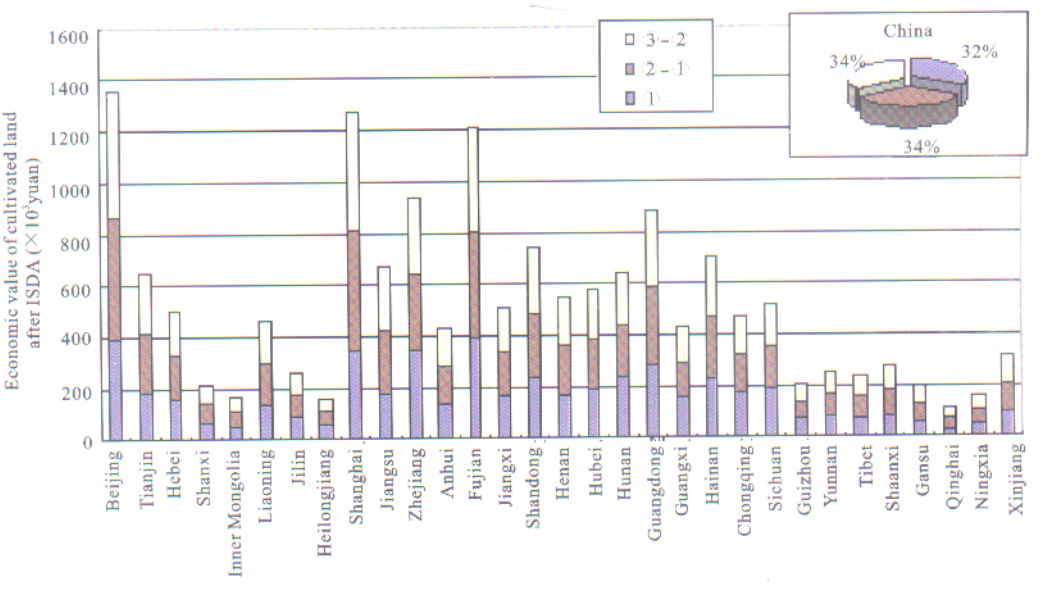
Province (region)	Cultivated land area I ($\times10^3$ha)	Output value of farming II ($\times10^8$yuan)	Cost of farming III ($\times10^9$yuan)	Net income per ha before SDA IV=(II−III)/I (yuan/ha)	Output value of farming after SDA V=II/0.615 ($\times10^8$yuan)	Cost of farming after SDA VI=III/1.128 ($\times10^9$yuan)	Net income per ha after SDA VII=(V−VI)/I (yuan/ha)
Beijing	249.20	8.85	3.98	19518.26	14.39	3.53	43559.70
Tianjin	475.30	8.19	3.92	8987.85	13.32	3.47	20711.99
Hebei	6487.50	83.31	32.60	7816.36	135.47	28.90	16425.94
Shanxi	4064.10	22.40	9.09	3275.70	36.42	8.06	6979.88
Inner Mongolia	7067.90	30.44	11.04	2743.78	49.49	9.79	5616.77
Liaoning	3974.00	47.69	20.88	6746.93	77.55	18.51	14856.27
Jilin	6123.20	39.21	12.40	4378.52	63.76	10.99	8617.05
Heilongjiang	12205.40	48.16	14.45	2762.17	78.31	12.81	5366.65
Shanghai	283.40	9.66	4.81	17111.93	15.71	4.26	40378.03
Jiangsu	4925.90	90.21	47.82	8605.58	146.69	42.40	21171.93
Zhejiang	2106.00	48.21	12.05	17167.36	78.38	10.68	32145.94
Anhui	5885.70	65.38	24.77	6901.39	106.32	21.96	14333.16
Fujian	1320.70	40.18	13.91	19897.41	65.34	12.33	40139.19
Jiangxi	2783.50	35.96	12.83	8309.98	58.48	11.38	16921.34
Shandong	7446.50	140.28	54.02	11584.40	228.10	47.89	24200.75
Henan	8679.80	123.83	49.94	8512.63	201.35	44.28	18096.59
Hubei	4572.30	66.88	23.32	9525.20	108.74	20.68	19260.36
Hunan	3891.00	60.97	15.57	11669.16	99.14	13.80	21932.90
Guangdong	3346.00	74.75	27.19	14213.67	121.54	24.10	29120.44
Guangxi	4390.80	46.32	12.52	7696.82	75.31	11.10	14623.68
Hainan	751.50	13.48	4.96	11345.11	21.92	4.40	23323.28
Chongqing	2187.90	24.89	5.49	8867.83	40.47	4.87	16274.53
Sichuan	5981.50	76.02	19.67	9420.26	123.61	17.44	17749.49
Guizhou	4717.10	24.92	8.66	3447.55	40.52	7.67	6962.61
Yunnan	6302.30	39.94	13.74	4156.61	64.94	12.18	8370.99
Tibet	370.80	2.19	0.83	3688.95	3.57	0.73	7646.20
Shaanxi	4368.90	31.10	12.70	4210.51	50.57	11.26	8996.56
Gansu	4912.60	24.96	9.85	3076.37	40.59	8.73	6484.80
Qinghai	705.30	2.07	1.06	1438.27	3.37	0.94	3444.89
Ningxia	1359.30	5.27	1.72	2616.42	8.57	1.52	5188.48
Xinjiang	4222.70	34.82	14.41	4834.10	56.62	12.78	10384.04
Total	125930.00	1370.55	500.19	6911.50	2228.54	443.43	14175.42

Note: Hong Kong, Macao and Taiwan are not included in Table 2



① is the economic value of cultivated land before SDA; ② is the economic value of cultivated land after SDA; Hong Kong, Macao and Taiwan are not included

Fig. 3 Economic value of cultivated land before and after SDA



③ is the economic value of cultivated land after ISDA; the meanings of ① and ② are the same as in Fig.3; Hong Kong, Macao and Taiwan are not included

Fig.4 Economic value of cultivated land after SDA and ISDA

after ISDA increases by 177.0×10^3 yuan/ha again on the country average level.

5 CONCLUSIONS AND DISCUSSION

This study analyzed the dynamic tendency of scissors difference. The results show that the general change trend of scissors difference was enlarged from 1997 to 2002, and the relative magnitude of scissors difference increased by 24.98% between 1997 and 2002. The absolute magnitude of scissors difference increased from 869.80×10^9 yuan in 1997 to 2016.07×10^9 yuan in 2002.

At the same time, the impact of scissors difference on the economic value of cultivated land is evaluated in China in 2002. The results show that the economic value of cultivated land before SDA only accounts for about 49% of the economic value of cultivated land on the country average level. The scissors difference has enormous influence on the economic value of cultivated land. Therefore, the economic value of cultivated land can be evaluated more accurately via SDA.

Under the backdrop of agriculture subsidy policy, the inverted scissors difference and its impact on the economic value of cultivated land have also been analyzed. The results show that if the inverted scissors difference policy is carried out further, the economic value of cultivated land is heightened again. The farmers' profits and cultivated land resources would be both protected better simultaneously.

From the perspective of cultivated land protection, the findings of this research at least highlight an important countermeasure for cultivated land protection. Namely the back feeding policy of "industry supporting agriculture" should be carried out and strengthened so as to eliminate the scissors difference and implement the inverted scissors difference further. Fortunately, the central government has already paid great attention to this issue. However, the elimination of scissor difference includes many different aspects, such as the elevation of agricultural labor productivity, the price adjustment of industrial and agricultural products and the transfer of surplus labor force, etc. Therefore, the enforcement of back feeding policy (the elimination of scissors difference and the implementation of ISDA) should be integrated with other policies and economic reforms.

REFERENCES

FENG Zhi-ming, YANG Yan-zhao, ZHANG Yao-qi, 2005. Grain-for-green policy and its impacts on grain supply in west China [J]. *Land Use Policy*. (in press)

FU Chen, 1999. The review of the studies of scissors difference in the 1990s [J]. *Agricultural Economic Problems*, (12): 2–5. (in Chinese).

HAN Zhao-zhou, 1993. A computing method research of price scissors difference between industrial products and farm products [J]. *Statistics Research*, (1): 49–51. (in Chinese)

HAO Jin-min, REN Hao, 2004. Peasant rights' damage in land acquisition systems [J]. *Journal of Public Management*, 1(2): 25–31. (in Chinese)

HUO Ya-qin, CAI Yun-long, 2003. Assessment and restoration of the value of cultivated land resources: a case study of

Huining county, Gansu Province [J]. *Journal of Arid Land Resources and Environment*, 17(5): 81–85. (in Chinese)

Investigation Groups in Rural Social Economy of National Bureau of Statistics of China, 2003. China Rural Statistical Yearbook [R]. Beijing: China Statistics Press. (in Chinese)

JIANG Hai-bo, WU Yun-feng, 2003. Scissors difference problem under the market economy [J]. *Shanghai Statistics*, (7): 39–41. (in Chinese)

JIE Xin-hua, 1997. The computing and reduction of scissors difference [J]. *Journal of Shangrao Teachers College*, 20(4): 1–5. (in Chinese)

LI Zhu-xi, 1993. New experiment of scissors difference study method [J]. *Finance and Economics Research*, (9): 23–29. (in Chinese)

LIU Hui-fang, 2000. The composition and quantification of farm land value in China [J]. *China Land Science*, 14(3): 15–18. (in Chinese)

Ministry of Education of the Peoples Republic of China, 2002. The statistical bulletin of national education funds implementation in 2002 (China) [EB/OL]. (http://www.edu.cn/20031225/3096486.shtml), 2003,12,16/2005.5.9. (in Chinese)

Ministry of Land and Resources, P.R. China, 1998–2003. China Land and Resources Almanac [R]. Beijing: China Geology Press. (in Chinese)

National Bureau of Statistics of China, 1997–2003. China Statistical Yearbook [R]. Beijing: China Statistics Press. (in Chinese)

TIAN Fu, 1995. Overview of research on the scissors difference between agricultural products and industrial products [J]. *Price Theory and Practice*, (4): 40–42. (in Chinese)

YAN Rui-zhen, GONG Dao-guang, 1987. The price scissors difference problems between agricultural products and industrial products [R]. Beijing: Renmin University of China. (in Chinese)

YANG Hong, LI Xiu-bin., 2000. Cultivated land and food supply in China [J]. *Land Use Policy*, (17): 73–88.

YANG Qing-yuan, YIN Wen, 1999. A study of using income capitalization approach to the evaluation of agricultural land price [J]. *Journal of Southwest China Normal University (Natural Science)*, 24(1): 103–109. (in Chinese)

YU Feng-qing, CAI Yun-long, 2004. Re-establishing the value of cultivated land resource for subsidizing agriculture¡"a policy-making orientation resolve rural, agricultural and peasants' issues [J]. *China Land Science*, 18(1): 18–23. (in Chinese)

ZHANG Guang-wen, 1993. Analysis of scissors difference computing method [J]. *Price Monthly*, (5): 3–5. (in Chinese)

ZHU Ren-you, CUI Tai-ping, 2001. The problems and answers existing in the income capitalization approach in China [J]. *Commercial Research*, (2): 5–77. (in Chinese)