Research on Evaluation of Intensive Use

of Agricultural Landunder the New Countryside Construction

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Abstract

This paper is on the basis of the former evaluation system of intensive use of agricultural land, unifying the actual situation of new countryside construction in our country, to analysis the intensive use degree of every province's agricultural land in our country using the method of principal and factor analysis. The research, melting into the agricultural industry target in the former evaluation system of intensive use of agricultural land, connecting the land product with the market price, establishes the new evaluation system of intensive use of agricultural land, which purpose is increase the value of the land product and increase the income of the farmers. Based on the data of every province in 2005, the article founds that the investment factor of land production, the additional income factor of farmers and the financial payout for supporting agriculture play the comparatively major role in the intensive use of the agricultural land. And the article also puts forward several advises.

Keywords: New countryside construction, The Intensive use degree of agricultural land, The Method of principal and factor analysis

1. Introduction

On May 4,2005,General Secretary Hu Jintao in his letter to the rural youth of Xinjiang province put forward to construct new socialist countryside.And on June 4th of the same year, Premier Wen Jiabao raised to "construct new countryside and change the backward appearance of some villages" in his inspection of rural tax reform in Gao Town in Hebei Province. Leading comrades of the central authorities require the Ministry of Construction to earnestly strengthen the construction of villages and towns and building of new socialist countryside. Construction of new countryside should be based on development of the first industry---agriculture, on increase in peasants' income and on solution of the "three agricultures" problem. Although China is rich in aggregate of land resources, yet it has a large population, it needs to feed over 20% of the world population by less than 10% of the world cultivated land and the area of its per-capita cultivated land is less than half of the world level.According to the investigation result of national land use change carried out by the Ministry of Land and Resources in 2005, by October 31,2005, the area of China cultivated land is 122.0827 million hm^2, its per capita arable land area is only 0.093 hm^2, less than 40 % of average level of world, equal to 1/8 of U.S.A and 1/2 of India. Moreover, China's cultivated land is distributed mainly in hilly, mountainous and plateau areas, and the cultivated land distributed in plains and basins only occupies 30.73 % of the total cultivated land. To build new countryside, increase the peasants' income and solve the problem of "three agricultures" on the basis of the existing cultivated land, it is necessary to change the original extensive farming way of land, to invest more labor, fund and technology in less land, to raise land production rate and to use less agricultural land to produce more agricultural products, therefore, intensive use of agricultural land has become an objective requirement for development of social economy.

Now, the Party Central Committee puts forward to build new countryside and to increase the peasants' income, this raises new requirements for agricultural land intensive use. Agricultural land intensive utilization requires less investment but more output, more output does not mean more earning of the peasants, and sometimes more output may bring less earning of peasants. Therefore, to increase more benefit, intensive use of agricultural land, while stressing less investment but more output, should adjust the varieties of planting in accordance with change of the market. Industrialization of agriculture is a fundamental change of traditional agricultural farming system under the conditions of market and an effective means to raise intensive use of agricultural land. At present, the core of agricultural industrialization is, around a certain leading industry or some relevant key products, to connect and combine all links of preproduction, mid-production and postproduction into a new industrial system to realize integration of planting, breeding and processing; production, supply and sale; and trade, industry and farming. Therefore, industrialized framing

is a double-directional continuation and extension of agricultural chains, an optimized combination of elements and a united farming system of economic, ecological and social benefits.

In this thesis, the author, under the prerequisites of new countryside construction, puts the conditions of agricultural industrialization into the evaluation system of agricultural land intensive use, adopts the principal component analytic method to analyze the agricultural land intensive use of 30 provinces, cities, autonomous regions and municipalities under the Central Government in 2005 and in accordance with the factor scores, conducts sequencing of agricultural land intensive use of each province, city, autonomous region and municipality under the Central Government.

2. Establishment of Index System of Agricultural land Intensive Use under the Condition of New Countryside Construction

Traditional Index System of Agricultural land Intensive Use

Intensive land farming is relative to extensive farming. The concept of intensive land farming first came from such economists as Ricardo (David Ricardo) in their land lease theory of study on agricultural land use. It is a farming way to centrally invest more production means and labor in a certain area of land and to use advanced technology and management method to seek high profits from smaller area of land. It can be divided into several types, such as fund intensive type, labor intensive type, technology intensive type, etc.

For the implication and formula of agricultural land intensive use, scholars from different countries have their different understandings. Scholars from Japan define land intension from the angle of land output, its formula is:

$$\text{Land intension=land farming area/pure farm production} \qquad (1)$$

Formula (1) means the needed farming area of land of unit production, the less the land intensity is, the more intensive the land use is; contrary, the more the land intensity is, the more extensive the land use is.

Scholar Tadur.Blinkeman from Germany defines land intension from the angle of land investment. He calls labor and fund invested in unit land as land intension.

$$I=(A+K+Z^2)/F \qquad (2)$$

In this formula, I—land intensive use, the bigger the I is, the bigger the land intensive use is, the smaller the I is, the bigger the land extensive use is; A—salary and expenses; K—capital consumption; Z—interest needed to pay farming capital; F—area of use land.

The types of the above two formulas are different, but the actual implication is the same. Because the law of reasonable use of land is that less investment results in less output and more investment brings more output. Japanese scholars regard more output of unit area as intension while German scholar more investment in unit area as intension, their conclusions are the same.

Land Intensive Use Index System under New Countryside Construction

According to the content of land intension, land intensive use can be divided into labor intension, technology intension and fund intension. Three intensions have different focuses in investment content, but they are mutually related, especially the two latter ones, sometimes they cannot be distinguished. Because application of new technology normally accompanies increase of investment fund—technology itself has value, and at the same time technical investment must take material investment as carrying body. Therefore, we can discuss together technology intension and fund intension, naming fund and technology intension.

Determination of Labor Intension Evaluation Index

Labor intension means the value of labor invested in unit-area of agricultural land within certain time (generally taking year as unit, its formula is:

$$\text{Labor intension=invested labor salary and expenses/area of agricultural land} \qquad (3)$$

$$\text{Invested labor salary and expenses=labor force invested in agricultural land*annual average salary of the district} \qquad (4)$$

In formula 4, the number of labor invested in agricultural land is determined by the labor number of the first industry in the rural area, and the average annual salary of the district can be replaced by the per capita salary of the peasants of the district.

Determination of Fund and Technology Intension Evaluation Index

Fund and technology intension means the total value of fund and technology invested in unit-area of agricultural land within a certain time (generally taking year as unit, its formula is:

$$\text{Fund and technology intension=total value of invested fund and technology and/area of agricultural land.} \qquad (5)$$

Of which, in most previous researches, the invested capital only calculating the peasants' own investment and not calculating financial investment of the country. Because this thesis has considered the factor of agricultural industrialization and financial support fund to agricultural industrialization which have obvious promoting function and can raising the peasant's income. Therefore it considers financial support fund. Capital invested by peasants themselves means mainly such expenses for purchasing seeds, fruit saplings and simple agricultural tools. Invested technical value mainly includes funds for purchasing chemical fertilizers, pesticides, plastic films, etc, and farm production tools for raising work efficiency. In practice, it is difficult for peasants to distinguish the above expenses. Therefore, this thesis calls all the expenses for purchasing pesticides, chemical fertilizers, seeds and plastic films as expenses of agricultural expenses. Annual expenses for purchasing agricultural production machinery can be expressed by the current year un-purchased production fixed assets. Financial farm supporting expenses include expenses in agricultural, forestry, animal husbandry and fishery industries, fund of land use are all expressed with financial supporting agricultural expenses on unit-area of agricultural land.

Index of Agricultural Industrialization Level

Here we use the scale of agricultural industrialization to indicate agricultural industrialization level, and total output value index of agricultural industrialization to express scale of agricultural industrialization. In this thesis, the index of the total output value of agricultural industrialization means the proportion of the total output value of agricultural industrial chains of the township enterprises in the total output value of agricultural industry and all township processing industries which use agricultural products as materials. At present, solution of China's "three agricultural" problem mainly relies on head township enterprises to lead other enterprises and take the road of agricultural industrialization. According to the implication of agricultural industrialization, the total output value of agricultural industrialization chain in this thesis is expressed by the total output value of other related township enterprises except industrial and building industries, and the total output value of agricultural by-product processing enterprises is expressed by the total output value of township agricultural product processing enterprises. Its calculating formula is:

Total output value index of agricultural industrialization=total output value of industrial chains of agricultural industrialization/ (total output value of all agricultural +agricultural product processing enterprises) (6).

Index of farm product processing industry of the district means the proportion of farm product processing industry in the total output value of the agriculture, its calculating formula is:

Index of processing enterprises=total output value of farm product processing industry of the district/ (total output value of farm product processing industry +total output value of agriculture) (7).

3. Analysis of Agricultural land Intensive Use under the Background of New Countryside Construction Method of Analysis

According to the above index system, we select the original index data of year 2005 of China's main provinces from the 2006 Statistic Yearbook and through screening and sorting get data in Table 1. Then we use statistical software SPSS to conduct principal component analysis and obtain characteristic value and contributive ratio of each factor and then, in accordance with the principle of accumulated contributive ratio bigger than 70 %, extract 2 common factors. To better explain the load of each factor, we, in accordance with the principle of biggest variance and on the basis of principal component analysis, conduct rotary analysis and finally decide the index variables of each common factor. The accumulated contributive ratio of the two common factors reaches 72.836 %, this indicates the extracted factors can better explain all variables.

Analysis of Data

Analysis of Extracted Factors

The load matrix of the two factors to index variables is showed in Table 2. From Table 1, we can see that the contributive ratio of explanation by factor 1 of agricultural land intensive utilization under the condition of new countryside construction is 50.872 %, its contribution is biggest; the contributive ratio of explanation by factor 2 of agricultural land intensive utilization under the condition of new countryside construction is 21.964 %, that is to say Factor 1 includes 50.872 % of information of index, while factor 2 includes 21.964 % of information of index. The contributive ratio of the two factors has already reached 72.836 %, they can basically represent the information of all indexes and can reflect the general situation of agricultural land intensive utilization under the condition of new countryside construction.

Insert Table 1 here

Analysis of Factor Load Matrix

Factor principal component analytic load matrix is showed in Table 2. Because principal component analysis of factor load cannot better explain the load of each factor, it is necessary to conduct orthogonal rotation on the basis of principal component analysis and get Table 3. From Table 3, we can see that indexes entered into factor 1 are labor integration

situation, average land production expenses, average land fixed assets expenses, etc. these are peasants' investments of chemical fertilizers, seeds, fruit saplings plastic films and farm tools in order to improve soil quality and raise output, so it can be named as factor of agricultural land production investment (f_1). Indexes entered into factor 2 are average land financial expenses, index number of total industrial output value, index number of total output value of agricultural product processing enterprises, etc. these are factors which can raise output and price of agricultural products and increase income of peasants, so it can be named as income-increasing factor of peasants (f_2). According to the farm land intensive utilization and the requirements of accumulated contribution, the quantity of principal component=7, accumulated contributive ratio is 72.83 %, the formula of general evaluation value is: F=0.50872 f_1 +0.21964 f_2

Insert Table 2 and Table 3 here

When further analyzing the influence of each index on factors,we find that in analysis of factors, the after-rotation factor load matrix can better explain the load situation of each factor, but cannot better explain the information quantity represented by index in the factor, therefore, we still use the (non-rotated) factor load of principal component analysis to analyze the influence, because when non-rotation, factor 1 has already represented the 50.872 information quantity of the original index, so focus on f_1 analysis. From Table 2, we can see that the influences of such indexes as labor intensive situation, average land production expenses, average land fixed assets expenses, average land financial expenses and agricultural product processing total output value index on f_1 are all above 0.5, this illustrates each factor has comparative influence on factor 1, of which, the influence coefficient of labor intensive situation, average land production expenses are above 0.80; the influence coefficient of agricultural product processing total output value index and average land fixed assets expenses are 0.70; and then the influence coefficient of average land financial expenses is 0.549, and the influence coefficient of Industrial total output value index is 0.133.

Scores of Factors

According to the analytic result of SPSS statistic software, the factor scores of each region are showed in Table 4.

Insert Table 4 here

According to the scores of factors in Table 4, a line graph can be made and Figure 1 can be got. This figure shows comprehensive scoring situation of agricultural land production investment factor, peasant income increasing factor and agricultural land intensive utilization factor.

Insert Figure 1 here

4. Conclusion

4.1 Agricultural land production investment factor still play key role in agricultural land intension

The variance contributive ratio of agricultural land production investment factor reaches 50.872%, that is to say that under the condition of new countryside construction, peasant labor intension situation, average land production expenses, average land fixed assets invested in land production and raising of peasants' income still play bigger role. Analysis indicates that raise of China's agricultural land output still in bigger extent relies on fine seeds and saplings, fine cultivation and peasant investment for purchasing production tools.Therefore improvement of the quality of seeds and saplings and raising of working efficiency of production tools has bigger influence on raising of agricultural land intension.

4.2 Under the background of new countryside construction,development and strengthening of farm product processing enterprises plays significant role in raising agricultural land intension and increasing peasants' income.

From Table 2, we can see that the influence coefficient of total output value index of farm product processing enterprises reaches 0.794, just following labor intensive situation and average land production expenses, this indicates township farm product processing enterprises play comparatively bigger role in increasing of peasant income.

4.3 Financial farm-supporting expenses play important supporting role in raising agricultural land intension

From Table 2, we can know that the influence coefficient of financial farm-supporting expense on factor 1 comes up to 0.549, this shows that the present financial farm-supporting expense has bigger influence on agricultural land intension.

4.4

In analysis of agricultural land intension scores of each province, Zhejiang, Anhui, Guangdong and Fujian get comparatively higher score in agricultural land intensive use, showing that the agricultural land intension of these four provinces is comparatively higher, while Zhejiang, Beijing, Shanghai, Guangdong, Jiangsu and Fujian have higher score of factor 1, indicating that these regions invest more in agricultural land production, namely investing higher labor intension, production expenses and fixed asset expenses. Viewing China's agricultural statistic data, we can know that because Tianjin and Shanghai belong to industrial cities, their township enterprise only have industrial enterprise and building enterprise total output value and output value of other industries is zero, so their score of factor 2 is lower. Zhejiang, Anhui, Liaoning and Hunan have higher scores of factor 2, indicating the level of agricultural industrialization

of these four provinces is higher.

5. Suggestions

In line with the above analyses and combination of the present China new contryside construction situation, the following suggestions are made:

First of all, it is necessary to increase agricultural land production investment and raise agricultural land output.

From the above conclusion, we can see that investment in agricultural land production exerts greater influence on agricultural land intension. Therefore, increasing investment in agricultural land production is needed. At present, among the agricultural land production investment, production investment and fixed asset investment, such as buying farm machines and tools still need to be paid by the peasants themselves, but most of the peasants won't be able to purchase these high-efficient farm machines and tolls due to their own economic conditions, this will in great extent restrict use efficiency of agricultural land. Moreover, raising of land output still needs relying on research and development of fine seeds and fruit saplings and needs support of agricultural science and technology, so, we should increase agricultural research investment to raise the per-mu output of the land.

Energetically support the development of head enterprises, especially development of head farm product processing enterprises

From the above analytic conclusion, we can know that head enterprises, especially head farm product processing enterprises have greater influence on raising the agricultural industrialization level, increasing the peasants' income and upgrading agricultural land intension. At the present time, China takes the road of agricultural industrialization and adopts the mode of head enterprises leading development of local industrialization. Development of head enterprises can increase numbers of agricultural orders, expand purchasing amount of agricultural products and gradually raise the price of agricultural products. At the same time head enterprises connect with market, which can guide peasants to grow products needed by markets, to upgrade land output value and indirectly raise per capita salary of the peasants, thus increasing the peasants' income. Therefore, local governments should greatly support the development of the head enterprises, especially development of head agricultural farm product processing enterprises.

Increase financial expenses to support agriculture and raise agricultural land intensive use

Since reform and opening to the outside world, due to the difference of diadactic structure between town and countryside, the proportion of financial farm supporting fund in gross national product has been comparatively small. In 2000, 2001, 2002, 2003, 2004 and 2005, the national financial expenses on agriculture is 7.8 %, 7.7 %, 7.2 %, 7.1 %, 8.3 %, 5.3 % respectively. National financial expense is very limited. Agricultural land fund is mainly invested by peasants themselves. From the result of analyses, we can see that increase of financial fund on agriculture has comparatively bigger influence in raising agricultural land intensive use, so under the background of new countryside construction, governments at different levels should gradually increase investment in agricultural land so as to raise agricultural land intensive use.

Each province should increases agricultural land intensive use in accordance with its actual conditions

It is known from the above scores of provincial factors that because agricultural land intensions of regions are different, the land production investment factors are different, and peasant income factors are different as well. Beijing, Zhejiang and Guangdong get higher scores of land production investment factors, but lower scores of peasant income increasing factors, and peasant income increasing factors of most regions are very low. Therefore, governments in all regions should energetically invest in land production and at the same time raise the peasants' income in accordance with their actual situation and guide the peasants to grow market products, raise product output and price so to raise the peasants' income while upgrading agricultural land intensive use.

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Table 1. Extraction of Factors

Varia ble	Initial Factors			Extracted Factors			Rotary Extracted Factors		
	Characteri stic value	Contribu tive ratio(%)	Accumu lated contribu tive ratio(%)	Characteri stic value	Contribu tive ratio(%)	Accumu lated contribu tive ratio(%)	Characte ristic value	Contribu tive ratio(%)	Contribu tive ratio(%)
1	3.052	50.872	50.872	3.052	50.872	50.872	2.320	38.672	38.672
2	1.318	21.964	72.836	1.318	21.964	72.836	2.050	34.165	72.836
3	.800	13.336	86.172						
4	.489	8.146	94.318						
5	.280	4.664	98.983						
6	.061	1.017	100.000						

Table 2. Factor load matrix of principal component analysis

	Factors	
	1	2
Labor intensive situation	.949	-.131
Average land production expenses	.828	.408
Average land fixed assets expenses	.720	.360
Average land financial expenses	.549	.655
Industrial total output value index	.133	.712
Agricultural product processing total output value index	.794	-.262

Table 3. Rotary factor load matrix

	Factors	
	1	2
Labor intensive situation	.736	.516
Average land production expenses	.894	.228
Average land fixed assets expenses	.781	.193
Average land financial expenses	-.008	.855
Industrial total output value index	.564	.755
Agricultural product processing total output	.434	.715

Table 4. Factor Scores of Each Region

Region	Factor 1	Factor 2	Score	Region	Factor 1	Factor 2	Score
Beijing	1.40932	-1.65969	0.352415	Hubei	-0.36484	0.37697	-0.1028
Tianjin	0.24602	-1.90509	-0.29328	Hunan	0.4632	0.84153	0.420473
Hebei	-0.25325	0.60676	0.004435	Guangdong	1.54905	0.30254	0.854483
Shanxi	-0.90684	0.27444	-0.40105	Guangxi	-0.30107	0.46238	-0.0516
Inner	-0.77365	0.11356	-0.36863	Hainan	-0.9378	-0.54	-0.59568
Liaoning	0.27619	0.93618	0.346126	Sichuan	-0.3659	0.13393	-0.15672
Jilin	-0.74346	0.35934	-0.29929	Guizhou	-0.74576	0.14573	-0.34737
Heilongjiang	-0.97023	-0.13116	-0.52238	Yunnan	-0.77471	0.23769	-0.3419
Shanghai	1.43225	-3.72579	-0.08972	Xizang	-0.87325	-1.03423	-0.6714
Jiangsu	0.85444	0.13594	0.464529	Shanxi	-0.72886	0.15014	-0.33781
Zhejiang	2.87696	1.25029	1.738181	Gansu	-0.97163	0.09891	-0.47256
Anhui	1.39521	1.34933	1.006138	Qinghai	-0.89868	0.06285	-0.44337
Fujian	1.0911	0.56183	0.678465	Ningxia	-0.44213	-0.03085	-0.2317
Jiangxi	0.07259	0.34722	0.113191	Xinjiang	-1.06613	-0.6074	-0.67577
Shandong	0.54998	0.49392	0.38827				
Henan	-0.09812	0.39271	0.036339				
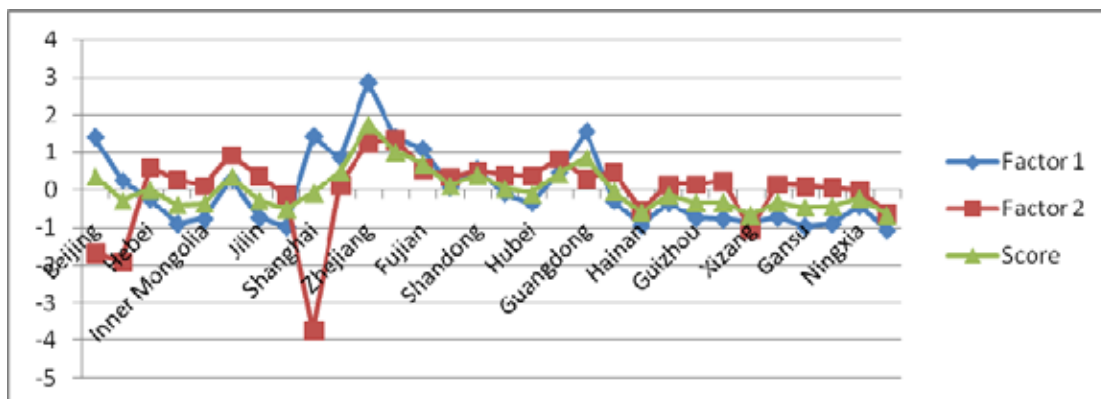
Figure 1. Analytic line graph of factor score