The economic support index evaluation study on the pig breeding scale of the six provinces in central China

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Abstract. Shanxi province, Anhui province, Jiangxi province, Henan province, Hubei province and Hunan province are located in the central part of China. They are playing an essential role in China's economic and social development. In this article, we use analytic hierarchy process(AHP), on the basis of the statistical yearbook data of 2016, conduct an appraisal research about the economic support index of the pig breeding scale in the six provinces of central China. The evaluation shows that Hubei tops all of the provinces on the economic support index, followed by Hunan, Anhui, Henan, Jiangxi. The lowest index is in Shanxi province. It indicates the economic conditions in Hubei province is the most capable for it to support the pig breeding scale, Shanxi province is the opposite.

1. Introduction
In October, 2013, the State Council promulgated Livestock and poultry pollution control regulations. The regulations have been implemented formally since January 1, 2014. Not only does it show the seriousness of scale breeding pollution problem, but also indicates the Party Central Committee and the State Council put a new premium on this problem. It is largely due to the development of the large scale and intensification of pig industry. Just because of this, the pig breeding scale create the large amount of dung which can not be processed. As a result, it pollutes the rural environment and waters around livestock farm. Thus, we take the six provinces in central China as the research subjects, making a study on economic support index of pig breeding scale of them.

2. Index selection and calculation
Referring to the existing literature, we select per capita GDP, Industrial enterprises research and experimental development expenditure to GDP ratio and the total output of pork as indexes to evaluate the economic support index of the pig breeding scale of six provinces in central China. Based on statistical yearbook data in 2016. It can draw the corresponding standardized value of the three evaluation indexes, marked as Z1, Z2, Z3. As it shown in table 1.

Table 1. The calculation and standardization of economic support index of the pig breeding scale in six provinces

Province	The dimensionless processing value of per capita GDP Z1	The dimensionless processing value of industrial enterprises research and experimental development expenditure to GDP ratio Z2	The dimensionless processing value of the total output of pork Z3
Shanxi	0.69	0.54	0.13
Anhui	0.71	1.00	0.2
Jiangxi	0.72	0.60	0.54
Henan	0.77	0.68	1.00
Hubei	1.00	0.94	0.71
Hunan	0.84	0.83	0.96

Then we further draw descriptive analysis of social economic support index in table 2.

Table 2. Descriptive statistics

	N	Minimum	Maximum	Mean	Standard deviation
Z1	6	0.69	1.00	0.7883	0.11686
Z2	6	0.54	1.00	0.7650	0.18716
Z3	6	0.13	1.00	0.6483	0.32084
Effective N （list state）	6				

Table 2 details the descriptive statistics of economic support index. Combined with table 1, we can find that the standard deviation of per capita GDP is small, it shows the sample's dispersion degree is low. After comprehensive analysis, the conclusion is that the highest per capita GDP is in Hubei province, the lowest is in Jiangxi province. In addition, Shanxi, Anhui, Jiangxi and Henan are under mean value. The maximum value of industrial enterprises research and experimental development expenditure to GDP ratio index belongs to Anhui province, the minimum value belongs to Shanxi province, Shanxi, Jiangxi, Henan are under mean value. The standard deviation of the total output of pork is large, this proof the sample's dispersion degree is high, the maximum value is in Henan, the minimum value is in Shanxi. Moreover, the maximum is seven times the minimum. It is a large gap between the two provinces. Thereinto, Shanxi, Anhui and Jiangxi are under average level.

3. The economic support index evaluation of pig breeding scale of six provinces in central China

On the basis of the analysis about the evaluation of the economic support index of the pig breeding scale of six provinces in central China, the factor variance contribution rate is shown in table 3.

Table 3. Factor variance contribution rate

component	Initial eigenvalue			Quadratic sum loaded			Rotate quadratic sum loaded		
	Total	Variance %	Add up %	Total	Variance %	Add up %	Total	Variance %	Add up %
1	1.915	63.847	63.847	1.915	63.847	63.847	1.402	46.745	46.745
2	0.629	20.965	84.812	0.629	20.965	84.812	1.142	38.067	84.812
3	0.456	15.188	100.000						

As we can see from the table 3, the factor variance are very high, it shows that the factor is a good description of these three indexes. Based on the analysis of table 3, we can figure out that the variance

contribution rate of factor 1 has reached 63.847%, and its eigenvalue is 1.915. The variance contribution rate of factor 2 is 20.965%, and its eigenvalue is 0.629. These two factors account for 84.812% of variance (over 80%). So the first two main ingredients are taken as the first and second principal components. Then, the component matrix is shown in table 4 below.

Table 4. Component matrix

	Component	
	1	2
Z1	0.843	-0.090
Z2	0.791	-0.494
Z3	0.760	0.614

As shown in table 4, the first component has the maximum load on the variables Z1 and Z2. The correlation coefficients are 0.843 and 0.791. The second component has the maximum in Z3, and the correlation coefficient is 0.614. Thus, we can conclude that the variables Z1 and Z2 are mainly explained by the first main component, and Z3 is mainly explained by the second main component. After rotating the three factors, results are shown in table 5.

Table 5. Rotational component matrix

	Component	
	1	2
Z2	0.926	0.116
Z1	0.711	0.463
Z3	0.202	0.956

The result is shown in table 5 after the rotation. Component 1 has the maximum payloads of 0.711 and 0.926 in the variables Z1 and Z2. Component 2 has maximum load of 0.956 on Z3. The component 1 be named as F1, component 2 can be named as F2. Then we get component score coefficient matrix as follows.

Table 6. Component score coefficient matrix

	Component	
	1	2
Z1	0.431	0.168
Z2	0.817	-0.348
Z3	-0.308	1.007

We can obtain factor expressions from the table above:

$$F1= 0.431* Z1+0.817* Z2-0.308* Z3$$
$$F2= 0.168* Z1-0.348* Z2+1.007* Z3$$

The two factor variance contribution rate (63.847%, 20.965%) were normalized to (75.28%, 24.72%). Regarding the variance contribution rate as a weight, the economic support index of pig breeding scale is

$$Y=75.28\%* F1+24.72\%* F2$$

Consequently, the factor score and economic support index can be reached as table 7.

Table 7. The socio-economic support index

Province	F1	F2	Y
Shanxi	0.69853	0.05891	0.54042
Anhui	0.95361	0.32513	0.79825
Jiangxi	0.63420	0.4294	0.59013
Henan	0.57943	0.89972	0.65861
Hubei	0.98030	0.2585	0.87538
Hunan	0.7147	0.81900	0.76289

As shown in table 7, Hubei province has the highest economic index, followed by Hunan, Anhui, Henan, Jiangxi. The lowest one is Shanxi province. It indicates that the economic conditions of Hubei province is most beneficial to pig breeding scale among these six provinces in China, while Shanxi's economic support is weakest.

4. Conclusion

Be accompanied by large scale and intensification, the pig breeding scale has produced a lot of fecal waste and is highly concentrated. Due to the lack of place to digest and save, it causes great pollution to the rural environment and waters of livestock farms. In this paper, based on the statistical yearbook data of 2016, the economic support index of pig breeding scale in six provinces in central China was studied by AHP (Analytic hierarchy process). The assessment results show that the economic support index of Hubei province is the highest , followed by Hunan, Anhui, Henan and Jiangxi. The lowest one is Shanxi province.

Acknowledgment

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