

The performance of Agricultural science and technology transformation Fund of different Technical Fields¹

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Abstract: Based on perfecting the performance evaluation index system of Agricultural scientific and technological achievements transformation Fund. In this paper, we evaluated the performance of Agricultural scientific and technological achievements transformation Fund in different technical fields during the "11th five-year plan" using comprehensive evaluation method. Results shows: Though highest the composite performance index of the planting industry in the ten different technical fields, lowest the average composite performance index of transformation Fund, compared with the composite performance index in 2006, the index of Plant protection industry and Agricultural resources efficient use have been improved, however, lowest-ranked in during the "11th five-year plan".

Introduction

Agricultural science and Agricultural technology is the important support of agriculture and the rapid development of rural economic, and give a major push to the realization of historic leap from the food and clothing to the well-off of the rural overall in China, Although fruitful in agriculture scientific and technological fruits Along with the increase in agricultural scientific and technological, however, the transformation of agricultural scientific research achievements to productive forces hindered because of a serious shortage of resource allocation of transformation long-term, and become the main limiting factors of agricultural productivity of rapid development of agricultural science and technology, different periods of agriculture, rural development, fields of technology of agricultural scientific and technological achievements transformation are supported, since set up of the agricultural scientific and technological achievements transformation fund in 2001,

Along with the increase in agricultural science and technology, how to realize the effective management, improve the operational efficiency of the transformation of funds and expand transformation efficiency are concerns for profit related and scholars, especially the management entities, The research about the fund of the agricultural scientific and technological achievements transformation focused on the policy formulation at present, including the transformation efficiency of funds(Tan Hua, Ni Jia, 2010; MA Wen-guang, ZOU Yi-xing, 2012), the capital management mechanism(Tan Hua, Ni Jia, 2010; MA Wen-guang, ZOU Yi-xing, 2012) operating model of the funds(Yin Xi-guo, Li Lei, 2009; Tan Hua, Wang Kai-yi, 2010) and the evaluation index system of funds performance(DAI Yuan-kun, WANG Qing-ping, 2013) have been thoroughly researched, And some feasible suggestions were proposed. However, these researches are centered on the funds itself, and Economic, social and environmental benefits of the transformation funds have not been investigated.

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Agricultural scientific and technological achievements includes different Technical Fields, different Technical Fields are supported by transformation funds during the development period of the agriculture in china. For example, technological achievements in Farming and processing, agricultural equipment were transformed first during in 2006-2007, Food production, development of modern agriculture and related industries were Developed priority in2009, however, in 2009, Rural informationization, biological breeding, food and agricultural products processing have become a priority with the investment of the transformation funds in 2010 according to the guidance of rural science and technology work in "11th five-year plan".

Based on the researches above, taking the data of projects approved by the Project supervision companies organized by the rural technology development center in China in 2006-2010, evaluating the agricultural scientific and technological achievements transformation fund performance of different technical fields in china using the comprehensive evaluation method, after building and perfecting the performance evaluation index system.

Establishment of the evaluation index system and data processing

Establishment of the evaluation index system

We adjusted the evaluation index system for primary using expert consultation, according to the evaluation goal of the agricultural scientific and technological achievements transformation fund performance, and the characteristics of Agricultural scientific and technological achievements transformation and influence factors, 4 broad categories, 9 subcategories, 27 individual indicators were composed the evaluation index system, just as discribed in table 1.

Table 1. Evaluation index system and the weight of performance of agricultural scientific and technological achievements transformation fund in China

first-level index [↙]	second-level index [↙] (The weight of the first-level index) [↙]	third-level index [↙] (The weight of the second-level index) [↙]	Weight of the third-level index [↙]
Input of project 0.15 [↙]	Objective of project 0.2 [↙]	contents of objectives 1.0 [↙]	0.03 [↙]
	decision of project 0.3 [↙]	Decision-making process 1.0 [↙]	0.045 [↙]
	allocation of funds 0.5 [↙]	regulatory compliance of the funds 1.0 [↙]	0.075 [↙]
process of project 0.10 [↙]	available of funds 0.5 [↙]	available rates of funds 1.0 [↙]	0.05 [↙]
	organization and implementation 0.5 [↙]	management system 1.0 [↙]	0.05 [↙]
Output of the project 0.35 [↙]	Output 1.0 [↙]	Number of new varieties development 0.1 [↙]	0.035 [↙]
		Number of testing demonstration zone Establishment 0.1 [↙]	0.035 [↙]
		Number of new technology Promotion 0.09 [↙]	0.0315 [↙]
		Number of new procedure Promotion 0.09 [↙]	0.0315 [↙]
		Number of new equipment Promotion 0.09 [↙]	0.0315 [↙]
		Number of new material Promotion 0.09 [↙]	0.0315 [↙]
		Number of pilot line Set up 0.08 [↙]	0.028 [↙]
		Number of production line Set up 0.08 [↙]	0.028 [↙]
		Number of Patent authorized 0.07 [↙]	0.0245 [↙]
		number of software copyright registration 0.07 [↙]	0.0245 [↙]
		number of Published papers and reports 0.07 [↙]	0.0245 [↙]
		number of Published works 0.07 [↙]	0.0245 [↙]
		revenues from Product sales(Million) 0.3 [↙]	0.048 [↙]
Effect of project 0.4 [↙]	economic benefit 0.4 [↙]	revenues from technologies (Million)0.2 [↙]	0.032 [↙]
		consolidated net earning (Million)0.25 [↙]	0.04 [↙]
		Total amount of pay (Million) 0.25 [↙]	0.04 [↙]
		adding jobs0.25 [↙]	0.04 [↙]
	social benefit 0.4 [↙]	number of farmers Drive 0.4 [↙]	0.064 [↙]
		number of the talents training during the run time0.15 [↙]	0.024 [↙]
		number of training courses during the run time 0.2 [↙]	0.032 [↙]
	ecological benefits 0.2 [↙]	Impact on the utilization of natural resources rationally 0.5 [↙]	0.04 [↙]
		Improvement of the agricultural ecological environment and ecological benefits 0.5 [↙]	0.04 [↙]

Data processing

We divided the qualitative indexes into five grades and scored as follows: superior (90,100), good(70,90), middle(70,60), low(60,40), bad(0,40), including the contents of objectives,

decision-making process, regulatory compliance of the funds, management system, impact on the utilization of natural resources rationally and improvement of the agricultural ecological environment and ecological benefits. Then the standard score can be got using Comprehensive Evaluation based on the questionnaire on management of the fund and so on. Finally, the data of all of the quantitative indexes were standardization processing using extreme:

$$\hat{X}_i = \frac{X_i - X_{\min}}{X_{\max} - X_{\min}} \times 100$$

Weights of the indexes

The premise of the Comprehensive Evaluation, weights of the indexes indicate the influence of each index on population, so the weights of the indexes must be scientific and reasonable. In this paper, both of the Delphi method and Hierarchical weighted are employed to avoid the influence of subjective factors of Subjective values method and instability of the objective method, just like the Data processing, the weights are achieved by questionnaire on about 30 Senior Experts, and relative deviation was employed to test the accuracy of expert's empowerment,

$$\delta_{ik} = \frac{m_{ik} - m_i}{\max |m_{ik} - m_i|}$$

Where $i=1,2,\dots$, and k represents the number of the Experts, so $k=1,2,\dots,30$, we denoted the weight of the indexes given by the number k expert at i times m_{ik} , so $m_i = \frac{1}{k} \sum_{k=1}^{30} m_{ik}$ is the average of the weights given at i times all of the experts, After four times empowerment by the experts, and the accuracy of empowerment:

$$S_4 = \sqrt{\frac{1}{30} \sum_{i=1}^4 (m_{ik} - m_i)^2} = 92.42\%$$

so final weight of the indexes are the average of weights given at 4 times all of the experts.

Comprehensive evaluation

The Comprehensive value of the agricultural scientific and technological achievements transformation fund performance can be achieved after weighted the standard score of every index:

$$C_{ft} = \sum_i^{21} \hat{X}_{ift} \cdot W_i, \quad C_t = \sum_i^{21} \hat{X}_{it} \cdot W_i$$

C_t represents the evaluation value of agricultural scientific and technological achievements transformation fund performance in China in t (2006-2010) year, and we denoted the evaluation value of agricultural scientific and technological achievements transformation fund performance in f technologies field in t (2006-2010) year C_{ft} , \hat{X}_{ift} and W_i represents the standardized value and weight of index i respectively. Considering all the projects have been approved, The final performance evaluation value are given as follows:

$$C'_{ft} = 0.4C_{dt} + 60, \quad C'_t = 0.4C_t + 60$$

Comprehensive evaluation value calculation

The agricultural transformation of scientific and technological achievements approved in different technologies fields during "11th five-year plan" period are given in table2, and comprehensive value of agricultural scientific and technological achievements transformation fund performance in different technical fields are given in table3.

Table 2. Distribution of the agricultural scientific and technological achievements transformation in different technical fields during "11th five-year plan" period

technical fields	Number of projects	ratio	number of funds	ratio
Planting industry	504	36.26%	30595	36.07%
Agriculture Production Industry	233	16.76%	14805	17.45%
Animal husbandry	134	9.64%	6320	7.45%
Forestry	106	7.63%	7700	9.08%
Biotechnology products	65	4.68%	3850	4.54%
Agricultural equipment	92	6.62%	5750	6.78%
Aquaculture	91	6.55%	5905	6.96%
Agricultural information technology	38	2.73%	2240	2.64%
Plant protection	27	1.94%	1790	2.11%
High efficiency use of Agricultural resources	100	7.19%	5865	6.91%

Table 3. The comprehensive value of agricultural scientific and technological achievements transformation fund performance in different technical fields (2006-2010).

technical fields	2006	2007	2008	2009	2010	Average	Performance index of Unit funds
Planting industry	92.24	88.56	90.05	91.14	90.53	90.50	0.0030
Agriculture Production Industry	82.19	75.91	80.12	80.08	81.78	80.02	0.0054
Animal husbandry	80.36	72.89	69.40	75.89	76.54	75.02	0.0119
Forestry	77.06	73.52	71.36	71.40	71.55	72.98	0.0095
Biotechnology products	74.41	75.31	70.28	71.29	72.00	72.66	0.0189
Agricultural equipment	74.28	76.31	70.79	70.79	73.94	73.22	0.0127
Aquaculture	74.02	72.00	68.94	68.85	71.54	71.07	0.0120
Agricultural information technology	71.46	75.02	68.62	73.03	71.39	71.90	0.0321
Plant protection	71.19	71.43	70.10	71.81	73.84	71.67	0.0400
High efficiency use of Agricultural resources	70.90	69.04	71.45	73.63	73.31	71.67	0.0122

Conclusion

Based on the evaluation of the performance of agricultural scientific and technological achievements transformation fund in different technical fields, the result shows:

First, due to the planting industry development is the important content of agricultural economic development, the agricultural scientific and technological achievements transformation fund project also highlights the "steady food supply, increased stamina". The investment of agricultural scientific and technological achievements transformation fund in the field of planting technology than other fields. From perspective of the comprehensive index of agriculture scientific and technological achievements transformation fund performance during 2006-2010, higherest of the comprehensive index of transformation fund performance of Planting technology, and the mean Comprehensive performance index is 90.50 for five years, followed by agricultural products processing technical field, and the mean Comprehensive performance index is 80.02 for five years, though the

Comprehensive performance indexes of animal husbandry, forestry, agriculture equipment are in the top , still lower than the average indexes of all technical fields.

Second, From perspective of change of the comprehensive index of agriculture scientific and technological achievements transformation fund performance during 2006-2010, though lowest ranked of the plant protection and high efficiency use of Agricultural resources, however, the comprehensive indexes in the two fields rised 3.40% and 3.73% respectively campared with 2006. and the indexes in other fields decreased in 2006-2010.

Finally, Combined with the distribution of agricultural scientific and technological achievements transformation fund projects approved during the "11th five-year plan" in different technical fields. Highestest of the performance index of Unit funds in plant protection, and then is the performance index of Unit funds in Agricultural information technology, just as discribed above, higherest of the performance index of agricultural scientific and technological achievements transformation fund in planting technology, but the performance index of Unit funds is lowest, Only 0.0030.

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