STUDY ON EVALUATION METHOD FOR CHINESE AGRICULTURAL INFORMATIZATION

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Abstract：According to China's current situation in agricultural informatization development and the functions of the Ministry of Agriculture, and on a basis of the connotation of "agricultural informatization", this paper initially establishes a quantitative agricultural informatization evaluation index system which could reflect the actual level of every province's agricultural informatization. The index system consists of 12 indexes selected from 3 aspects, which are agricultural informatization foundational support level, agricultural production and operation informatization level, as well as agricultural management and service informatization level. At the same time, on the basis of summarizing the accomplishments of other researchers, a set of calculation methods/algorithms are proposed in the paper to evaluate the agricultural informatization level.

Key words：Agricultural informatization; Index system; Evaluation method

1 INTRODUCTION

Informalization is the general trend of current world economic and social development. The rapid development and overall permeation of information technology will provide agriculture production and rural social and economic development of our country with the new development opportunities. So it is a very important act to vigorously promote agricultural informalization, make full use of information technology to transform traditional agriculture for developing modern agriculture, train new peasants and accelerate the construction of new socialist countryside. Especially, it has strategic significance on promoting agriculture productivity great-leap-forward development in our country (The Ministry of Agriculture, Apr.,2010).

In recent years, the Central Committee of the Party and the State Council put high values on the work of agricultural informalization, put forward series of policies, carried out a number of engineering projects. Driven by these engineering projects, the agricultural informalization infrastructure construction has been speeding up continuously, the agricultural informalization application level has kept improving, the construction of agricultural informalization has been enhanced obviously (Li.,Oct.,2009).

Agricultural informatization is a systematic engineering project, it requires large amount of investment and long construction period (Yin.,Apr.,2004). If there is no scientific agricultural informatization evaluation system to guide it, it will inevitably cause a great waste of resources. Therefore, establishing a scientific agricultural informatization evaluation system to make quantitative analysis of the level of agricultural informatization has far-reaching strategic

significance and important practical significance (Chen.,Oct.,2007). It will help each province not only know explicitly the stage of their agricultural informatization level, but also improve the management and decision-making level of their agricultural informatization level.

Based on the above facts, this article will establish a quantitative evaluation index system that could reflect the actual agricultural informatization level of each province in China with the principles of integrity, operability, orientation and cohesion, according to China's current situation of agricultural informatization development and the specific functions of the Ministry of Agriculture.

2 THE CONCEPT AND CONNOTATION OF AGRICULTURAL INFORMATIZATION

2.1 The Concept of Agricultural Informatization

Agricultural informatization is a component of informatization, "2006-2020 National Informatization Developmental Strategy" has given the following definition to the informatization: informatization is a historic process that can make full use of information technology, develop and utilize information resources, promote information exchange and knowledge sharing, improve the quality of economic growth, promote economic and social development and transformation. Agricultural informatization put more emphasis on information technology applied to agriculture. Based on this judgment and the function scope of the Ministry of Agriculture, this research makes the following definition for agricultural informatization: agricultural informatization is the degree and process of the making full development and use of various information technology equipments and information resources to apply modern information technology to all aspects of agricultural production and operation, and agricultural management by promoting the construction of information infrastructural facilities such as rural broadcasting and television network, telecommunication network and computer network.

2.2 The Main Content of Agricultural Informatization

Embarking from the definition of Agricultural Informatization and the current situation, the articles believes that the core content of Agricultural Informatization should include three closely interrelated aspects: agricultural informatization foundational support, agricultural production and operation informatization, agricultural management and service informatization.

2.2.1 Agricultural Informatization Foundational Support

Agricultural informatization foundational support is a very important foundation for Agricultural Informatization. Agricultural informatization foundational support mainly include three basic network systems, they are broadcasting and television network, telecommunication network, and computer network, which covers radio, television, telephone, mobile phone, computer and other information terminals. Meanwhile, agricultural informatization foundational support also includes the degree of attention each province pay to informalization. It is specifically embodied in investment on Agricultural Informatization.

2.2.2 Agricultural Production and Operation Informatization

Agricultural production and operation informatization is among the important terms proposed

in Third Plenary Session of the Seventeenth Central Committee of the Chinese Communist Party, which mainly contains crop farming informatization, animal husbandry informatization, fishery informatization and agricultural products electronic transaction.

2.2.3 Agricultural management and service informatization

Agricultural management and service informatization needs to be realized by information technology. It mainly contains the agricultural E-government management level,proportion of agricultural informatization administrators in agriculture department,coverage of administrative village information service station,and proportion of rural information staff in agricultural population.

3 ESTABLISHMENT OF AGRICULTURAI INFORMATIZATION EVALUATION INDEX SYSTEM

3.1 Principles of Index System Design

The design of agricultural informatization evaluation index system is based on the following four principles.Integrity principle: The agricultural informatization evaluation index system covers 2 aspects, it could reflect not only the agricultural informatization foundational support level, but also the agricultural informatization application level.Operability principle: The design of the index system is based on current agricultural informatization development realities in China, values the index data availability. The data could be obtained from Statistics Bureau of every province or provided by marketing division of agriculture department of each province.Orientation principle: combined with the trends of agricultural informatization, some indexes are forward-looking ,which can guide each province's development.Cohesion principle: The agricultural informatization evaluation index system is upward linked up with the national informatization evaluation index system and downward reflecting the agricultural informatization development characteristics.

3.2 Composition of Index System

China's agricultural informatization evaluation index system refers to the national informatization evaluation index system, meanwhile it closely combined with China's current development situation of agricultural informatization and the function scope of the Ministry of Agriculture. The index system is aimed at reflecting the actual situations and characteristics of China's agricultural informatization, and also promoting the agricultural informatization schedule gradually. Initial assumption of the index system contains the agricultural informatization foundational support level, the agricultural production and operation level, and the agricultural management and service level, it total, it is 12 specific indicators in 3 aspects, as shown in table 1.

Table1 Agricultural Informatization Evaluation Index System

One-level index	Two-level index	No.	Unit	Data origin
Agricultural Informatization Foundational Support Level	Average number of computers per 100 families	1	PCS/100 families	Provincial statistics bureau
	Average number of mobiles per 100 persons	2	PCS/100 persons	Provincial statistics bureau
	Proportion of cabletele vision users	3	%	Provincial statistics bureau
	Government Investment proportion of the agricultural informatization	4	%	Provincial Agriculture Department Market Department or information ceter
Agricultural Production and Operation Informatization Application Level	Crop Farming Informatization Index	5	%	the same as above
	Animal Husbandry Informatization Index	6	%	the same as above
	Fishery Informatization Index	7	%	the same as above
	Agricultural Products e-commerce Transaction Proportion	8	%	the same as above
	E-Government Agriculture Management Level	9	%	the same as above
Agricultural Management and Service Informatization Application Level	Proportion of Agricultural Informatization Administrators in Agriculture Department	10	%	the same as above
	Coverage of Administrative Village Information Service Station	11	%	the same as above
	Proportion of Rural Information Staff in agricultural population	12	%	the same as above

4 THE CALCULATION METHOD OF AGRICULTURAL INFORMATIZATION INDEX SYSTEM

4.1 The Determination of Index Standard Value

Index standard value, also called target value every index needs to achieve, is a periodical target description for agricultural informatization development. The selection of the values refers to the current values of provinces that have got a good development in agricultural informatization. But the standard values are higher than the current values from those provinces. These necessary values for evaluation index system could be used to definite the direction of agricultural informatization development. According to related state statistics and the understanding of each province's agricultural informatization, we tentatively definite standard values for 12 indexes, as shown in table 2. After more accurate understanding on each province's agricultural

informatization index values, the standard index values could be adjusted appropriately.

4.2 Non-dimensional processing of the index values

Due to the differences among the units of each index, the evaluation results could not be compared and calculated directly. In order to solve the problem with different units that cannot be calculated comprehensively, we make date dimensionless, compare the actual value with the standard value and convert the actual values dimensionless in range from 0 to 100. Converted dimensionless values could be directly used to compare provincial agricultural informatization differences, and also could be used to calculate the final result of agricultural informationization evaluation with weighting values. The formula (1) is the index values non-dimensional formula.

$$T_i = \frac{R_i}{P_i} \times 100 \qquad (1)$$

In this formula，i =1，2···12，i is the number of the 12 indexes ;

T_i is the dimensionless value of the ith index;

R_i is the actual value of the ith index, got from the statistics;

P_i is the standard value of the ith index, determined by the discussion in above texts.

4.3 The calculation of the agricultural informatization evaluation result

The final agricultural information evaluation result comes out from weighting the 12 dimensionless values, it ranges from 0 to 100. The total agricultural information evaluation result is also called agricultural informatization index, used in horizontal and vertical comparison. It is useful to thoroughly understand each province's agricultural informatization development level and effectively develop each province's agricultural informatization work.

Formula（2）is to calculate the final agricultural informatization evaluation result, it comes out directly from weighting the 12 dimensionless values.

$$I = \sum_{i=1}^{12} T_i \cdot W_i \qquad (2)$$

In this formula，i =1，2···12，i is the number of 12 indexes;I is the agricultural informatization index;Ti is the dimensionless value of the ith index;Wi is weight of the ith index.

4.4 Demonstration of Calculation

In order to examine the accuracy of the above calculation method, this section takes A province as a example to demonstrate the process of agricultural informatization index calculation method (as shown in table 2).

Table 2：A province Agricultural Informatization Evaluation Index System Calculation Data Table

No.	Index Name	Weighting W_i	Unit	Standard Value P_i	Actual Value R_i	Dimensionless Value T_i
1	Rural Computer Ownership Numbers per 100 Families	15	PCS/100 Families	50	5	10.0
2	Rural Mobile Phone Ownership Numbers per 100 persons	9	PCS/100 Persons	70	35	50.0
3	Rural CATV Ownership Rate	6	%	100	60	60.0
4	Proportion of Agricultural Informatization Investment in Government Investment on Agriculture	5	%	100	60	60.0
5	Crop Farming Informatization Index	10	%	5	2	40.0
6	Animal Husbandry Informatization Index	10	%	10	5	50.0
7	Fishery Informatization Index	10	%	10	5	50.0
8	Agricultural Products Electronic Transaction Proportion	10	%	100	90	90.0
9	E-Government Agriculture Management Level	5	%	100%	80	80.0
10	Proportion of Agricultural Informatization Administrators in the Ministry of Agriculture	5	%	1	0.6	60.0
11	Information Service Station Coverage in Administrative Villages	10	%	100	75	75.0
12	Proportion of Rural Messengers in Agricultural Stuffs	5	%	0.1	0.06	60.0

The final evaluation result of A province agricultural informatization index is: I =52.50

5 CONCLUSIONS

Embarking from the connotation of Agricultural Informatization，this article presents an agricultural informatization level evaluation index system, which includes 3 one-level indexes and 12 two-level indexes. Meanwhile, this article proposes the agricultural informatization evaluation method in detail. The established agricultural informatization evaluation index system has strong operability and orientation, each index is measurable and quantitative with data from statistics bureau, and provincial agriculture department market department or information ceter of each province. The index of agricultural informatization obtained from calculating could definite every province's agricultural informatization development level clearly. And the standard value of each index can provide each province necessary reference data for the agricultural informatization construction.

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