Suitability Evaluation on the Information Service System of " Agricultural Science and Technology 110" in Sichuan Province, China

HU Yu-fu[1,2], DENG Liang-ji[1,2]*

1. College of Economics and Management, Sichuan Agricultural University, Ya'an 625014, China; 2. College of Resources and Environment, Sichuan Agricultural University, Ya'an 625014, China

Abstract Method of fuzzy comprehensive evaluation is used to carry out suitability evaluation on the information service system of " Agricultural Science and Technology 110" in Sichuan Province, China. Analytic hierarchy process (AHP) and expert consultation method are used to determine the evaluation index system and index weight. Suitability effect of the information service system of " Agricultural Science and Technology 110" is taken as the target layer. The five indices at criterion layer are the organizational mode of agricultural information service, the support system of agricultural information resources, the agricultural information transfer system, the capital source of agricultural information service, and the support system of agricultural information service. And the index layer includes the talent team of agent service, the interaction between the subject and object, the accuracy of agricultural information, the convenience of agricultural information transfer, the adequacy of fund, the efficiency in the use of fund, the status of information infrastructure and so on. Evaluation result shows that the information service system of " Agricultural Science and Technology 110" in Sichuan Province is suitable for the rural economic development at present. The major factors restricting the information service system are the lack of continuity, the weak infrastructure of agricultural information infrastructure, and the relatively low education level of agricultural producers. Therefore, we should further explore and improve the operation mechanism of agricultural information service, expand the capital source of agricultural information service, strengthen the construction of agricultural infrastructure, and ensure the continuous operation of information service system.

Key words Agricultural Science and Technology 110, Agricultural information, Service system, Fuzzy comprehensive evaluation, Sichuan Province, China

Agricultural informationization is a necessary requirement for the modernization of agriculture, an important way for the transformation of traditional agriculture, and a necessary condition to enhance the competitiveness of agricultural products. Improving the agricultural information service system gives a firm protection to the agricultural informationization. Construction of agricultural information service system can promote the sustainable, stable and coordinated development of agricultural informationization, having great significance in improving the farmers' quality, enhancing the income of farmers, and promoting the construction of new socialist countryside. At the same time, how to construct a sustainable and efficient agricultural information service system is still a topic receiving the attention of scholars at home and abroad[1-11]. In recent years, forms of grass-root information service system are diversified. At present, there are many evaluations on the agricultural informationization level and agricultural information resources. And few are about the suitability analysis of agricultural information service system[12-17]. Information service system of " Agricultural Science and Technology 110" in Sichuan Province, China is a kind of typical new model of agricultural information service during the implementation of agricultural informationization in Sichuan Province. Fuzzy comprehensive evaluation method is used to carry out quantitative evaluation and analysis on the suitability of the information service system of " Agricultural Science and Technology 110" in Sichuan Province, which provides a scientific basis for the further improvement of the agricultural information service system.

1 Status of information service system of " Agricultural Science and Technology 110" in Sichuan Province, China

Sichuan provincial party committee and provincial government have attached great importance to the work of agricultural informationization. And establishing the rural information service system becomes one of the three major systems (information, market and scientific technology) during the " Eleventh Five - Year" period. Application of agricultural information technology is one of the important measures and means to increase the income of farmers and to accelerate industrial restructuring. Against this background, agricultural informationization construction in Sichuan Province has made great progress. And the information service system of " Agricultural Science and Technology 110" in Sichuan Province is a typical new model of agricultural information service during the implementation of agricultural informationization in Sichuan Province. This service system adopts the service mode of " government + university

Received: July 27, 2010 Accepted: September 20, 2010
Supported by the State Spark Program of China (2005EA810087).
* Corresponding author. E-mail: hyf03h@yahoo.com.cn

+ research institution + company + farmer" according to the situation of distributed agricultural information resources and difficult information application in villages and peasant households. Through resource consolidation and technology integration, a resource support system is established based on Agricultural Resources Database, Agricultural Knowledge Base, Agricultural Experts System, and Agricultural Experts Database. Information transmission system uses the internet, phone, SMS, TV and other modern information technologies as the information transmission means; while the demonstration organization system relies on the " Agricultural Science and Technology 110" command centers and rural service points at four layers of province, city, county and village. So far, this information service system has established 13 demonstration points in Sichuan Province, offering service for the farmers, agricultural technology personnel, government manager, and owners in agricultural development in the whole Sichuan. The service covers the field of agriculture, forestry, aquaculture, fertilization, environment, animal husbandry, agricultural economy, storage and processing of agricultural products, and so on.

2 Suitability evaluation on the information service system of "Agricultural Science and Technology 110" in Sichuan Province

Comprehensive Evaluation Method is to organically combine the qualitative evaluation method and quantitative evaluation method together, which has the advantages of both qualitative method and quantitative method, so as to achieve a comprehensive and complete evaluation. Comprehensive evaluation of agricultural information service system should accurately grasp its contents, find out the main factors affecting the construction correctly, construct scientific and reasonable evaluation index system, and provide the scientific basis for the further construction of agricultural information organizational system.

2.1 Evaluation method Analytic hierarchy process (AHP) and expert consultation method are used to determine the evaluation index system and index weight. Evaluation result is obtained by the Fuzzy Comprehensive Evaluation. Fuzzy Comprehensive Evaluation is a method based on fuzzy mathematics, using the principle of the composition of fuzzy relations to quantify the factors and to carry out comprehensive evaluation[18-20].

The operating procedure of model is as follows:

(1) Set up factor set $U=\{u_1, u_2, \cdots, u_n\}$.

(2) Set up evaluation set $V=\{v_1, v_2, \cdots, v_m\}$.

(3) Establish single factor fuzzy evaluation matrix R:

$$R=\begin{Bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{Bmatrix}, \quad (1)$$

where r_{ij} is the subordination of factor u_i in U to grade v_j in V, that is, the subordination of the object being evaluated as grade v_j from factor u_i.

(4) Determine the fuzzy evaluation vector weight $W=\{W_1, W_2, \cdots, W_n\}$, where W is the subordination of factors in U to the adaptation effect of grass-root agricultural information service mode. It is determined by the starting point of fuzzy evaluation. Factors emphasized during evaluation have the same determination function of index weight in other comprehensive evaluation methods.

(5) Comprehensive evaluation. W and R are synthesized to obtain Y:

$$Y=W\times R=(W_1, W_2, \cdots, W_n)\begin{Bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{Bmatrix}$$

$$=(y_1, y_2, \cdots, y_m) \quad (2)$$

Equation (2) means that the fuzzy relation W between evaluation factor and the adaptation effect of grass-root agricultural information service mode has formed a new fuzzy relation y between the evaluation grade and the adaptation effect of grass – root agricultural information service mode through fuzzy transformation matrix R. Assuming that $y_k(k=1,2,\cdots, m)$ is the maximum among all the factors in matrix Y, the grade of this service mode is v_k.

2.2 Evaluation process and result

2.2.1 Establishment of evaluation index system. Comprehensive evaluation on the agricultural information service system should firstly establish a scientific, objective and impartial evaluation index system. Thus, based on the working practice of Sichuan agricultural information service system and the research result of index system in related fields, overall framework of comprehensive evaluation index system of " Agricultural Science and Technology 110" information service system in Sichuan Province is established by consulting the relevant experts in agricultural information services[3, 5, 21]. Table 1 reports that the five first-grade indices are the organizational mode of agricultural information service, the support system of agricultural information resources, the agricultural information transfer system, the capital source of agricultural information service, and the support system of agricultural information service. And then, the corresponding second grade indices are selected.

2.2.2 Determination of evaluation index weight. In the evaluation index system, relative importance degrees of the indices at lower layers to a certain index at upper layer are different. In other words, influence degree of a certain index is greater than other indices. Therefore, weight coefficient of evaluation index should be determined. In order to ensure the objectivity, impartiality and scientific nature of weight coefficient, Delphi expert consultation method and analytic hierarchy process are used to establish judgment matrix and to determine the weight coefficient according to the order of importance. Index weights are as follows:

$A=(B_1, B_2, B_3, B_4, B_5)$
$=(0.207, 0.328, 0.196, 0.140, 0.129)$;
$B_1=(C_1, C_2, C_3)$
$=(0.268, 0.497, 0.235)$;
$B_2=(C_4, C_5, C_6, C_7, C_8)$

$=(0.080,0.318,0.318,0.173,0.111)$;

$B_3=(C_9, C_{10}, C_{11}, C_{12}, C_{13})=(0.174,0.377,0.245,0.121,0.083)$;

$B_4=(C_{14}, C_{15}, C_{16})=(0.415,0.401,0.184)$;

$B_5=(C_{17}, C_{18}, C_{19}, C_{20})=(0.413,0.269,0.178,0.14)$.

Table 1 Evaluation index system of "Agricultural Science and Technology 110" in Sichuan Province, China

Target layer	Criterion layer	Index layer
Suitability effect on the information service system of "Agricultural Science and Technology 110" in Sichuan Province(A)	Organizational mode of agricultural information service(B_1)	Talent team of agent service(C_1)
		Interaction between the subject and object(C_2)
		Object's ability to receive information(C_3)
	Support system of agricultural information resources(B_2)	Comprehensiveness of agricultural information(C_4)
		Accuracy of agricultural information(C_5)
		Practicability of agricultural information(C_6)
		Pertinence of agricultural information(C_7)
		Expansibility of agricultural information renewal(C_8)
	Agricultural information transfer system(B_3)	Promptness of agricultural information transfer(C_9)
		Economy of agricultural information transfer(C_{10})
		Convenience of agricultural information transfer(C_{11})
		Capacity of agricultural information(C_{12})
		Feedback of agricultural information(C_{13})
	Capital source of agricultural information service(B_4)	Adequacy of fund (C_{14})
		Continuity of fund (C_{15})
		Efficiency in the use of fund(C_{16})
	Support system of agricultural information service(B_5)	Status of information infrastructure(C_{17})
		Organizational guarantee of information service(C_{18})
		Policy and system security of information service(C_{19})
		Legal assurance of information service(C_{20})

Among all the indices affecting the suitability effect of agricultural information service mode, weight of the support system of agricultural information resources is the maximum (0.328), according to the result of weight, followed by the organizational mode of agricultural information service (0.207), the agricultural information transfer system (0.196), the capital source of agricultural information service (0.140), and the support system of agricultural information service (0.129). At the index layer, weights of both the accuracy and practicability of information resources have reach 0.104, followed by the interaction between the subject and object (0.103). Besides, the economy of agricultural information transfer, the adequacy of fund, and the continuity of fund all have relatively high weights. Therefore, when establishing or selecting the service mode, practical and accurate content of service should be firstly ensured. Then, we should actively find out the needs of the object, answer the questions proposed by the object, improve the interaction between the subject and object, ensure the adequate and sustained fund of agricultural information service system, and establish an agricultural information transfer system with high efficiency and low cost.

2.2.3 Establishment of fuzzy evaluation matrix. The evaluation index set already known is $U=\{u_1, u_2, \cdots, u_n\}$; the evaluation grade set is $V=\{$very good v_1, good v_2, general v_3, poor v_4, very poor $v_5\}$. Questionnaire for the suitability effect of information service is designed according to the index system established. Investigation object is the peasant masses who receive the agricultural information service, the people who offer agricultural information service, and the experts. A total of 250 questionnaires are sent out and 223 valid questionnaires are retrieved. Degree of membership R is obtained through the statistics of questionnaires. Hence, we have

$$R_1=\begin{Bmatrix}0.48 & 0.26 & 0.25 & 0.01 & 0.00\\ 0.34 & 0.36 & 0.23 & 0.07 & 0.00\\ 0.15 & 0.31 & 0.38 & 0.15 & 0.01\end{Bmatrix};$$

$$R_2=\begin{Bmatrix}0.51 & 0.28 & 0.15 & 0.06 & 0.00\\ 0.74 & 0.16 & 0.09 & 0.01 & 0.00\\ 0.34 & 0.56 & 0.06 & 0.04 & 0.00\\ 0.50 & 0.36 & 0.13 & 0.01 & 0.00\\ 0.35 & 0.46 & 0.16 & 0.02 & 0.01\end{Bmatrix};$$

$$R_3=\begin{Bmatrix}0.44 & 0.32 & 0.17 & 0.05 & 0.02\\ 0.68 & 0.16 & 0.09 & 0.05 & 0.02\\ 0.77 & 0.16 & 0.05 & 0.02 & 0.00\\ 0.40 & 0.45 & 0.11 & 0.04 & 0.00\\ 0.38 & 0.36 & 0.15 & 0.08 & 0.03\end{Bmatrix};$$

$$R_4=\begin{Bmatrix}0.18 & 0.22 & 0.29 & 0.25 & 0.06\\ 0.15 & 0.21 & 0.24 & 0.26 & 0.14\\ 0.41 & 0.32 & 0.21 & 0.06 & 0.00\end{Bmatrix};$$

$$R_5=\begin{Bmatrix}0.12 & 0.18 & 0.25 & 0.30 & 0.15\\ 0.56 & 0.52 & 0.16 & 0.05 & 0.02\\ 0.65 & 0.28 & 0.06 & 0.01 & 0.00\\ 0.49 & 0.35 & 0.15 & 0.01 & 0.00\end{Bmatrix}.$$

2.2.4 Single factor fuzzy evaluation. Comprehensive evaluation result of $B_i=(i=1, 2, 3, 4)$ is obtained by compositional operation and square method of general matrix:

$Y_1=B_1\times R_1=(0.332\,9, 0.321\,5, 0.270\,6, 0.072\,7, 0.002\,4)$;

$Y_2=B_2\times R_2=(0.509\,6, 0.364\,7, 0.100\,0, 0.024\,7, 0.001\,1)$;

$Y_3=B_3\times R_3=(0.601\,5, 0.239\,5, 0.101\,5, 0.043\,9, 0.013\,5)$;

$Y_4=B_4\times R_4=(0.210\,3, 0.234\,4, 0.255\,2, 0.219\,1, 0.081\,0)$;

$Y_5=B_5\times R_5=(0.384\,5, 0.229\,7, 0.178\,0, 0.140\,5, 0.067\,3)$.

Hence, the comprehensive evaluation matrix of subsets in B is:

$$R=\begin{Bmatrix}Y_1\\Y_2\\Y_3\\Y_4\\Y_5\end{Bmatrix}=\begin{Bmatrix}0.332\,9 & 0.321\,5 & 0.270\,6 & 0.072\,7 & 0.002\,4\\0.509\,6 & 0.364\,7 & 0.100\,0 & 0.024\,7 & 0.001\,1\\0.601\,5 & 0.239\,5 & 0.101\,5 & 0.043\,9 & 0.013\,5\\0.210\,3 & 0.234\,4 & 0.255\,2 & 0.219\,1 & 0.081\,0\\0.384\,5 & 0.229\,7 & 0.178\,0 & 0.140\,5 & 0.067\,3\end{Bmatrix}.$$

2.2.5 Result of fuzzy comprehensive evaluation. According to the matrix obtained, result of fuzzy comprehensive evaluation is obtained by using equation (2):

$$Y=A\times R=(0.433\,0,\ 0.295\,6,\ 0.167\,4,\ 0.080\,5,\ 0.023\,5).$$

2.3 Analysis of the evaluation result According to the result of single factor evaluation, "very good" and "good" have relatively high probability in the evaluation results matrix of organizational service mode, which are 0.332 9 and 0.321 5, respectively. Probability of "general" is also relatively high, which is 0.270 6. This indicates that the service mode of information service system of "Agricultural Science and Technology 110" in Sichuan Province basically adapts to the local development, but still needs further improvement. According to the evaluation result of the agricultural information transfer system and the support system of agricultural information resources, "very good" and "good" have relatively high probability in the evaluation matrix, indicating that the support system of agricultural information resources has a great amount of agricultural information, abundant content, and high quality. It is narrowly targeted and can meet the needs of the majority of farmers. The economical and practical agricultural information transfer system has effectively solved the problems in information transfer. In the evaluation result matrix of capital source, probabilities of "very good", "good", "general" and "poor" are 0.210 3, 0.234 4, 0.255 2 and 0.219 1, respectively. In other words, comprehensive evaluation result belongs to the grade of "general", indicating that capital is a main factor restricting the development of information service system of "Agricultural Science and Technology 110". In the evaluation result of support system, "very good" has the maximum probability (0.384 5), followed by "good" and "general", which are 0.229 7 and 0.178 0, respectively. This indicates that support system of information service system of "Agricultural Science and Technology 110" is basically reliable in Sichuan Province, but still needs further improvement, especially in the construction of agricultural infrastructure.

According to the fuzzy comprehensive evaluation results of information service system suitability of "Agricultural Science and Technology 110" in Sichuan Province, probabilities of "very good" and "good" are 0.433 0 and 0.295 6, respectively, followed by "general", which is 0.167 4. This indicates that the information service system is suitable, is accepted by the majority of local farmers, and can basically meet the needs of farmers. According to he comprehensive evaluation result, probabilities of "very good" and "good" are both below 0.5 and the sum of the two is less than 0.75, indicating that the information service system of "Agricultural Science and Technology 110" still needs further improvement in Sichuan Province. At present, capital source of information service system is insufficient. The major factors restricting the information service system are the lack of continuity, the weak infrastructure of agricultural information infrastructure, and the relatively low education level of agricultural producers.

3 Conclusion and suggestion

Combining with the practical development of information service system of "Agricultural Science and Technology 110" in Sichuan Province, a evaluation index system of agricultural information service system consisting of 20 indices is established based on the investigation and the guiding ideology of operability, scientific nature, and the availability of data. Method of fuzzy comprehensive evaluation is used to carry out suitability evaluation on the information service system of "Agricultural Science and Technology 110" in Sichuan Province, China. Result shows that the information service system is suitable at present, is accepted by the majority of local farmers, and can basically meet the needs of farmers. The major factors restricting the information service system are the lack of continuity, the weak infrastructure of agricultural information infrastructure, and the relatively low education level of agricultural producers. Therefore, on the one hand, with the development of information service, we should further explore and improve the operation mechanism of agricultural information service, construct a multiple "win-win" mode of operation, expand the capital source of agricultural information service, and offer adequate and sustained funds for the agricultural information service. On the other hand, we should strengthen the construction of agricultural infrastructure and the agricultural information resources, offer training for agricultural producers during agricultural informationization, and improve their education level and scientific consciousness.

References

[1] ZHANG YX. Theory and practice of agricultural information [M]. Beijing: China Agriculture Press, 2005:12. (in Chinese).
[2] CAUDLE SL. Strategic information resources management: fundamental practice [J]. Government information quarterly, 1996, 13(1):83-97.
[3] LI YB. Research on service system development of China's agricultural information [M]. Beijing: China Economic Publishing House, 2006:12. (in Chinese).
[4] HOLLIFIELD CA, DONNERMEYER JF. Creating demand: influencing information technology diffusion in rural communities [J]. Government Information Quarterly, 2003, 20(2):135-150.
[5] LI DL. Exploration of zero kilometer: research on the construction of basic agricultural information service system [M]. Beijing: China Agriculture Press, 2007:5. (in Chinese).
[6] XIONG XY. Building an effective service model of agricultural information based on demand-led [J]. Rural Economy, 2008(4):111-113. (in Chinese).
[7] GLASS V, TALLUTO S, BABB C. Technological breakthroughs lower the cost of broadband service to isolated customers [J]. Government Information Quarterly, 2003, 20(2):121-133.
[8] SENEVIRATNE W. Local information upload strategy in building up rural community information pages on the Internet: an approach to attending the information needs of rural Sri Lanka [J]. The International Information &Library Review, 2004, 36(3):241-252.
[9] ARNOLD AM. Developing a national information policy-considerations for developing countries [J]. The International information& Library Review, 2004, 36(3):199-207.

(To page 24)

duction of production and marketing, as well as socialized services and enterprises-type of management[6].

2.4 Analysis on threat

2.4.1 The factor of thought pattern. In the Pearl River Delta, the secondary and tertiary industries develop relatively better, for example, in 2008, the output of the secondary industry and tertiary industry has achieved 1 496.46 billion yuan and 1 406.952 billion yuan respectively, but the primary industry only has 71.145 billion yuan. With the increase of job opportunities, the varied way of getting income and the increasing costs of labor forces, the idea of despising agriculture and abandoning agriculture is prevalent. In economics, opportunity cost refers to the benefits and profits of doing the other things but using the same resources, or the costs one should pay for choosing something or abandoning something. The rural labor forces have many choices for using land. Comparing with the secondary and tertiary industry, the opportunity costs of undertaking agricultural production for rural labors are relatively higher, so many farmers choose to abandon agricultural production.

2.4.2 The income gap between urban and rural residents. The further development of urbanization in the Pearl River Delta area causes many problems. For one thing, the development space of agriculture is reduced; for another thing, rural labors, materials and capitals flow to cities, which lead to the further widening of income gap. It can be from Table 3 that though the income of urban and rural residents keeps stable from 2006 to 2008, the income gap has been enlarged gradually.

3 Countermeasures and suggestions for developing urban agriculture in the Pearl River Delta

3.1 Making use of the market direction to urban agriculture The market can guide the restructuring of agricultural structure and the production of agricultural products with high quality, so it can be the platform for the trade of agricultural production in the international market, and then promote the healthy development of urban agriculture. Therefore, the construction of the market for agricultural products should be given priority to, and the market-oriented direction for the development of rural agriculture will be stimulated by it.

3.2 Increasing investment in the agricultural infrastructure construction Although the Pearl River Delta is economically advanced area, its power in investing urban agriculture is limited, hence, the favorable policies issued by the government for constructing new village should be well made use of. The investment from Guangdong Province and the central government should be positively striven for, so as to perfect the agricultural infrastructure construction and improve the agricultural development level.

3.3 Realizing high-tech industrialization of urban agriculture Urban agriculture is high-tech agriculture, so it should cooperate with colleges and universities and scientific research institutions in the Pearl River Delta area and mutually develop the resources of urban agriculture. The personnel involved in urban agriculture should research and introduce the new species, equipments and technologies about urban agriculture to promote the transference, exemplification and promotion of the technological results, so as to elevate the high-tech industrialization of urban agriculture.

References

[1] ZHANG XH, YU YM. SWOT analysis of the urban agriculture development [J]. Chinese Countryside Well-off Technology, 2006(12): 15-19. (in Chinese).

[2] China Investment Guide. Overview of Pearl River Delta [EB/OL]. http://www.fdi.gov.cn/pub/FDI/zgjj/tzhj/jjtz/jjxqy/cjjzjsjzjj/t20060418_23043.htm. (in Chinese).

[3] Xinhuanet. The Pearl River Delta economic zone [EB/OL]. http://news.xinhuanet.com/ziliao/2009-07/13/content_11700336.htm. (in Chinese).

[4] HOU CS, LIU J, YANG XP, *et al*. Current status and developing direction of urban agriculture in Guangdong Province [J]. Guangdong Agricultural Sciences, 2009(7): 274-275. (in Chinese).

[5] WANG B. The development theory of Chinese urban agriculture [D]. Chengdu: Sichuan University, 2005: 19-57. (in Chinese).

[6] XIE ZM. The SWTO analysis for the agricultural recycle of economy in the area of the Pearl River Delta [J]. Guangdong Agricultural Sciences, 2010(1): 273-275. (in Chinese).

(From page 20)

[10] WOMACK R. Information intermediaries and optimal information distribution [J]. Library& Information Science, 2002, 24(2): 129-155.

[11] WANG C, LIANG J. Study of agricultural information service model in Sichuan [J]. Journal of Chengdu University of Information Technology, 2007, 22(S1): 143-146. (in Chinese).

[12] SUN SF, LUO CS. Analysis on problems of the construction of rural China's information service system [J]. World Agriculture, 2007(3): 13-15. (in Chinese).

[13] YANG XR, JIA SG, ZHAO YJ. Current status and evaluation on the construction of China agricultural information website [J]. Computer and Agriculture, 2003(9): 18-19. (in Chinese).

[14] ZHUANG CL, YANG P, LI DL, *et al*. Evaluation on capacity of basic agricultural information service [J]. Statistics and Decision, 2006(11): 54-55. (in Chinese).

[15] CHEN Z, CAO DL, LIANG BS, *et al*. A principal-component analytical method based on agricultural informationalization appraisement [J]. Journal of Henan Agricultural University, 2007, 41(5): 565-568. (in Chinese).

[16] HAN XS, PAN HF, WEN JH, *et al*. Evaluation and study on development of agriculture information service [J]. Journal of Agricultural Mechanization Research, 2007(10): 20-22. (in Chinese).

[17] YUAN BY. Agricultural information resource use efficiency appraisal on online [J]. Rural Economy, 2008(9): 111-112. (in Chinese).

[18] LIU L, CAO YP, WANG T, *et al*. Applying fuzzy mathematics [M]. Xi'an: Shaanxi Science and Technology Press, 2008: 2. (in Chinese).

[19] LI AG, ZHANG ZH, MENG Y, *et al*. Fuzzy mathematics and its application [M]. Beijing: Metallurgical Industry Press, 2005: 8. (in Chinese).

[20] FANG DQ, WU TJ. Synthetic evaluation model construction of agricultural Information resources based on fuzzy mathematics decision-making theory [J]. Journal of Anhui Agricultural Sciences, 2008, 36(29): 12979-12982. (in Chinese).

[21] XIN LY, SONG ZW, JIA BH, *et al*. Analysis on the construction of agricultural information evaluation index system in Tianjin [J]. Chinese Agricultural Science Bulletin, 2008, 24(8): 465-468. (in Chinese).