Comprehensive Evaluation on Demonstration Farmers' Specialized Cooperatives on the Basis of AHP Model

SUN Mei-yu∗ , **LUO Jie-han**, **DUAN Yue-yong**, **WANG Yong**

China Commerce Institute，Beijing 100101

Abstract　On the basis of AHP method，this paper establishes comprehensive evaluation model of demonstration farmers' specialized cooperatives，uses the Delphi method and AHP software to assign scientific and objective weight to 7 criteria in criteria layer and 27 indices in index layer，and evaluate the overall level of 153 farmers' specialized cooperatives whose main business is fruits and vegetables in Region R. The results show that the overall operation level of farmers' specialized cooperatives is common；democratic and financial management is open；the information-based level and social sensation are not insufficient；the marking results of questionnaire is basically scientific and objective. This paper discusses the new way to evaluate operation level of farmers' specialized cooperatives，and puts forward relevant countermeasures and suggestions as follows：promote the information-based level of demonstration cooperatives；strengthen the service capacity of demonstration cooperatives；use means of science and technology to promote product quality；amplify social sensation of farmers' specialized cooperatives.

Key words　AHP，Demonstration，Farmers' cooperatives，Comprehensive evaluation，China

　　With China's rapid economic development and the changing modes of production，the contradictions between small agriculture of myriad households and ever-changing market have become increasingly prominent. How to solve the problems of low organizational level of farmers and higher output not accompanied by a higher income，has become a topic of concern to the government and society[1]. In recent years，the farmers' specialized cooperatives in China develop rapidly，which play a more and more important role in dissemination of information，popularization of practical technology，unified arrangements for production and sales，and improvement of quality and safety of agricultural products. The farmers' specialized cooperatives in China have gradually become the new force of standardized agricultural production and industrialized operation. The outline of the Twelfth Five-year Plan issued by China in March 2011 pointed out that we will accelerate the development of modern agriculture，support farmers' specialized cooperative organizations and supply and marketing cooperatives，and provide various forms of production and management services. Development of farmers' specialized cooperatives has become an effective way to increase farmers' income and promote the level of organization. In order to promote the operating level of farmers' specialized cooperatives，the " Eleventh Five-year Plan" Key Scientific and Technological Support Program (Key Technology Research and Demonstration of Village Economic Industrialization Service) has researched and developed support system of

agricultural production and circulation support system，and conducted demonstration and application. We use AHP evaluation method，and scientifically select the typical farmers' specialized cooperatives with significance of demonstration for demonstration and promotion，so as to promote the operating level of farmers' specialized cooperatives in China and increase output and incomes for farmers.

1　Establishment of AHP evaluation model

　　As there are many farmers' specialized cooperatives in demonstration area，and manifold modes of operation，business scope and organizational forms，so the situation involved is more complex，and the quantitative evaluation is difficult. In order to scientifically，comprehensively and objectively select the farmers' specialized cooperatives in line with the demonstration needs of this subject，to achieve a good demonstration and promotion effect，the research group uses Delphi method and AHP method to establish comprehensive evaluation model of demonstration farmers'specialized cooperatives，according to *Demonstration Farmers' Specialized Cooperatives Establishment Standard* (Trial) issued by Ministry of Agriculture in China，in conjunction with the specific requirements of " village economic industrialization service system application and demonstration.

1.1　Establishment of evaluation index system　To apply AHP to analysis of problems，we should first make the problems orderly and hierarchical，to construct a model of hierarchical analysis structure. Constructing a good hierarchical structure is extremely important for solution to the problem，and also determines the effectiveness of the model results.

　　To achieve a reasonable comprehensive evaluation on demonstration farmers' specialized cooperatives，the hierarchical model is divided into three layers. The first layer is the ob-

jective layer A, namely the comprehensive evaluation and selection on demonstration farmers' specialized cooperatives; the second layer is criteria layer B_k, namely the criteria conditions of demonstration cooperatives, a total of k criteria from B_1 to B_k; the third layer is index layer B_{kj}, that is, the indices participating in evaluation are $B_{11} - B_{kj}$.

In accordance with analysis structure of AHP, this research selects evaluation indices and designs survey questionnaires, in line with demonstration needs. The evaluation indices include qualitative indices and quantitative indices. Qualitative indices are divided into 6 scoring points, namely excellent, good, common, qualified, poor, and very poor. The survey objects score in the corresponding point according to the actual situation. According to specific ratio of business indices, quantitative index can be converted into the score of this index under the same rate. The research group selects 7 criteria and 27 indices according to related factors design of comprehensive evaluation on demonstration cooperatives (Table 1)[2].

Table 1 Specific indices of comprehensive evaluation of demonstration farmers' specialized cooperatives

Objective layer	Criteria layer B_k	Index layer B_{kj}
Comprehensive evaluation A of rural economic program demonstration farmers' specialized cooperatives	Democratic management degree B_1	Complete registration formalities B_{11}
		Voting transparency B_{12}
		Degree of holding regular meetings of members and regulating voting rights B_{13}
		Sound system of social services supervision B_{14}
	Financial management degree B_2	Transparency of contribution assessment of members' financial affairs and accounts, transparency of records B_{21}
		The robustness of accounting B_{22}
		Regulation degree of distributable earnings B_{23}
		Robustness of financial openness system B_{24}
	Information-based level B_3	Robustness of computer, communication equipments and so on B_{31}
		Use of communication and broadband network B_{32}
		Resolution of information-based promotion B_{33}
		Information-based level of personnel B_{34}
	Operation scale B_4	The dominant level of industries operated in whole county B_{41}
		Having production means (or land area) B_{42}
		Comparison between sales volume(or yield)and the average level of the city B_{43}
		Comparison between members of cooperatives and the average level of the city B_{44}
	Service capacity B_5	The unified purchase rate and distribution rate of main means of production B_{51}
		The ratio of trade volume of members to trade volume of cooperatives B_{52}
		The ratio of farmers to members of cooperatives B_{53}
		Stability of sales channel building B_{54}
	Product quality B_6	In line with the planting provision of Food Safety Law, realizing traceability of product quality B_{61}
		Having quality authentication system of non-pollution, green and organic products B_{62}
		Registered brand and package design B_{63}
		Having their own planting standards, processes, *etc.* B_{64}
	Social sensation B_7	Social reputation and publicity B_{71}
		Income increase of members in cooperatives B_{72}
		Ill record or punishment B_{73}

1.2 Determination of index weight As for the complex decision-making problems, their judgement matrix is formed after a number of experts fill in a form of consulting. The establishment of judgement matrix is also based on scale table by using 1 −9 scale method proposed by Saaty. And we in accordance with the meaning of the scale method, we adopt Delphi-expert scoring method, to construct the judgement matrix[3].

Taking the judgement matrix A-B_k of criteria layer B_k to objective layer A as an example, by sending out form of consulting to the experts, we conduct pairwise comparison on index elements, and the final assignment of integrated result is as follows[4]:

By using software, we calculate and obtain a result as follows: $CR = 0.0750$, $\lambda_{max} = 7.5936$, $CI = 0.0989$, $RI = 1.32$. λ_{max} is the largest eigenvalue of the matrix; CI is the consistency index of matrix; RI is the average random consistency index

with the same order; CR is the random consistency ratio, $CR = CI/RI$; when $CR < 0.10$, we can hold that the judgement matrix has satisfactory of consistency. After the test, it is in line with consistency.

Table 2 Judgment matrix of criteria layer B_k to objective layer A

A	B_1	B_2	B_3	B_4	B_5	B_6	B_7
B_1	1	1/3	1/5	1/5	1/5	1/5	1/3
B_2		1	1/3	1/3	1/3	1/3	1
B_3			1	1	1/3	1/3	1
B_4				1	3	1/3	3
B_5					1	1/3	3
B_6						1	3
B_7							1

$WB_k = (3.36\%, 7.21\%, 12.39\%, 19.86\%, 16.97\%, 31.79\%, 8.42\%)$.

The weight results of criteria layer can be seen in Table 3.

Similarly, we construct the judgement matrix of index layer B_{kj} to criteria layer B_k, and conduct calculation and test. Through calculation and consistency test, we finally obtain the weight result of each index layer as follows:

$WB_{1j} = (22.28\%, 9.79\%, 29.33\%, 38.60\%)$
$WB_{2j} = (51.26\%, 15.04\%, 7.65\%, 26.05\%)$
$WB_{3j} = (19.33\%, 6.87\%, 54.47\%, 19.33\%)$
$WB_{4j} = (55.37\%, 12.59\%, 24.77\%, 7.27\%)$
$WB_{5j} = (54.03\%, 12.28\%, 6.24\%, 27.45\%)$
$WB_{6j} = (45.19\%, 36.57\%, 12.43\%, 5.81\%)$
$WB_{7j} = (25.83\%, 63.70\%, 10.47\%)$

Table 3 Criteria layer weight of comprehensive evaluation of demonstration farmers' specialized cooperatives

Objective layer	Criteria layer	Weight//%
Comprehensive evaluation of demonstration farmers' specialized cooperatives	Democratic management degree B_1	3.36
	Financial management degree B_2	7.21
	Information-based level B_3	12.39
	Operation scale B_4	19.86
	Service ability B_5	16.97
	Product quality B_6	31.79
	Social sensation B_7	8.42

2　Analysis of evaluation result

According to the needs of the subject, the research group selects 153 farmers' specialized cooperatives which operate vegetables and fruits in region R, to give questionnaire and score. In the farmers' specialized cooperatives participating in questionnaire, the production-oriented farmers' specialized cooperatives account for 20.92%; circulation-oriented farmers' specialized cooperatives account for 54.90%; production-circulation-oriented farmers' specialized cooperatives account for 24.18%; cooperatives operating vegetables account for 58.16%; cooperatives operating fruits account for 34.64%; cooperatives operating melons account for 7.19%.

By retrieving and sorting questionnaires, we use the weight of model to criteria and index criteria, and obtain the comprehensive evaluation distribution of demonstration farmers' specialized cooperatives (Fig. 1) and criteria layer scoring distribution of demonstration farmers' specialized cooperatives (Fig. 2).

From Fig. 1, 2, we know that the farmers' specialized cooperatives in region R have the following characteristics.

2.1　The overall operation level of farmers' specialized cooperatives is common　The overall score of farmers' specialized cooperatives participating in evaluation concentrates mainly in 60 – 69, accounting for 47.06% of the objects; there are only 3 farmers' specialized cooperatives participating in evaluation with score above 90, accounting for 1.96% of the objects; there are 15 farmers' specialized cooperatives participating in evaluation with score below 40, accounting for 9.80% of the objects.

2.2　Democratic and financial management is open　In 7 criteria of comprehensive evaluation of demonstration farmers' specialized cooperatives, "democratic management degree" and "financial management degree" of cooperatives participat-
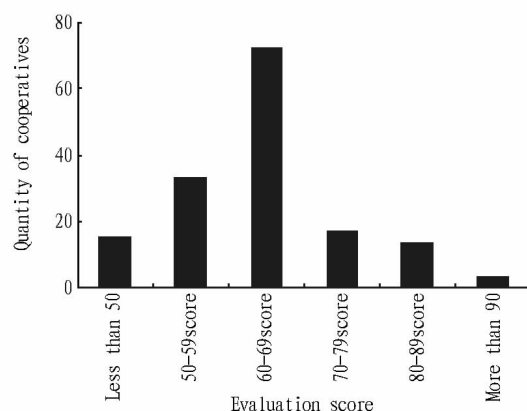

Fig. 1　The distribution of comprehensive evaluation of demonstration farmers' specialized cooperatives
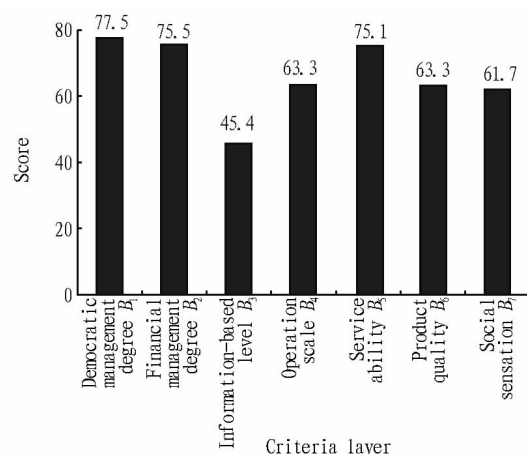

Fig. 2　The distribution of criteria layer score of demonstration farmers' specialized cooperatives

ing in the survey, are good, with scores over 75, indicating that farmers' specialized cooperatives do better in the registration, the election of director of cooperatives, holding cooperatives meeting, democratic elections, democratic supervision, providing accounting members, setting accounts for members of cooperatives, quantification of members' accumulation fund share, equitable distribution of benefits and so on.

2.3　The information-based level and social sensation are not insufficient　Information-based level is "short slab" in the criteria layer. The cooperatives have shortcomings in providing computer hardware and software, and especially hiring information-based talents. Although many cooperatives are equipped with computers and other hardware devices, but they can not surf the net, so it performs practically no function. The concept of "if you improve the quality and function of an essential product many consumers will buy it" is prevalent.

2.4　The marking results of questionnaire is basically scientific and objective　In this survey questionnaire, the average score of 153 cooperatives surveyed is 64.31 points. The farmers' specialized cooperatives which get passing score in comprehensive evaluation account for 68.63% of the survey objects. As for scoring of 7 criteria, apart from information-based level, others are basically qualified. Through field visit, discussions with government departments, and other means,

we inspect the specific situation of survey objects randomly, and verify the basic consistency of the actual situation with the results of comprehensive evaluation model of demonstration farmers' specialized cooperatives based on AHP. The design of this evaluation model is scientific and objective.

3　Countermeasures and suggestions

　　Through the careful examination and selection of the results of the evaluation, the research group regards the farmers' specialized cooperatives with score more than 60 points as objects of this demonstration. In order to improve the overall level of farmers' specialized cooperatives, we put forward the following countermeasures and proposals.

3.1　Promote the information-based level of demonstration cooperatives　To solve the problem of low information-based level of farmers' specialized cooperatives, in accordance with the actual situation of demonstration objects, the research group provides computer hardware and software for demonstration objects and improves network bandwidth environment. Rural network is instable; the broadband cost is high; the demonstration objects have strong mobility; there is a shortage of information-based talents. These problems are the important factors responsible for restricting information-based level of demonstration cooperatives. We can use mobile Internet access, information-based training and other means to solve these problems.

3.2　Strengthen the service capacity of demonstration cooperatives　The farmers' specialized cooperatives are farmers' economic cooperative organizations, which primarily should provide services for members of cooperatives. To enhance the service capacity of the demonstration objects, we should broaden and stabilize sales channels, promote the diversification of sales structure, enhance pricing right of products, actively carry out "connecting farmers and supermarkets", "connecting farmers and schools", "connecting farmers and enterprises" and other activities, encourage cooperatives to establish chain stores, direct sales points, shop, and marketing centre in cities, help solve farmers' problem of "difficult sales" and help farmers increase yield and income.

3.3　Use means of science and technology to promote product quality　We should actively learn and comply with the provisions of *Agricultural Product Quality Safety Law* and *Food Safety Law*; establish the production record system to record the whole process of production and achieve traceability of product quality; encourage the demonstration objects to create conditions to have access to pollution-free product certification, green food certification, organic agricultural product certification, and certification of geographical indication; encourage the demonstration objects to register trademark and achieve unified packaging, unified identity, and unified sales of the products of cooperatives; encourage the demonstration objects to formulate the standard of production, harvesting, processing, and circulation, and continue to implement and promote the standard, according to the specific circumstances of the cooperatives.

3.4　Amplify social sensation of farmers' specialized cooperatives　Through brand packaging, exhibition and forum, event planning, media recognition and other ways, we should expand publicizing degree of cooperatives. In the mean time, we should also actively use demonstration platform (or HC360. COM, NC. MOFCOM. GOV. CN *etc.*) to establish web site, to raise recognition and expand influence. We should spurn the traditional concept of "if you improve the quality and function of an essential product many consumers will buy it", and create good image of cooperatives, so as to rapidly promote the development pace and operation level of cooperatives.

References

[1]　HU DH. How to do with official criteria on direct link between farmers and supermarkets[M]. Beijing: China's Agricultural Science Press, 2010: 60. (in Chinese).

[2]　Department of Agriculture. Farmers' professional co-operatives demonstration club create standard trial implementation[Z]. Beijing: Department of Agriculture, 2010. (in Chinese).

[3]　DU D, PANG QH, WU Y. The modern comprehensive evaluation method and case selection[M]. Beijing: Tsinghua University Press, 2008: 15. (in Chinese).

[4]　WANG HM. Based on the AHP electric power industry market performance evaluation[J]. Statistics and Decision, 2009(9): 44 –46. (in Chinese).

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[5]　LV JL, GE C. Analysis on financing status of infrastructure in agricultural high-tech demonstration zone of Yangling City and application of PPP mode[J]. Asian Agricultural Research, 2009, 1(6):34 –37, 43.

[6]　WEN Y. Construction of Qinling ecological demonstration area[J]. Journal of Anhui Agricultural Sciences, 2011, 39 (23): 14278 – 14280, 14284. (in Chinese).

[5]　HE ZW. Present condition, problem, countermeasure on the development of Chinese rice industry[J]. Journal of Agrotechnical Economics, 2003(6): 41 –44. (in Chinese).

[6]　National Bureau Task Group. China wholesale food market development research report[M]. Beijing: Economic Management Press, 2004. (in Chinese).

[7]　LI JM. China's grain market development report[M]. Beijing: China Financial and Economic Publishing House, 2007. (in Chinese).

[8]　LUO Y. Market structure, risk decision – making and food security, economist[J]. Economist, 2010(1): 57 –66. (in Chinese).

[9]　NIE ZB. China's grain circulation system reform in 30 years: 1978 – 2008[M]. Beijing: Economic Management Press, 2009. (in Chinese).

[10]　National Statistics Bureau. China Commodity Trading Market Statistics Yearbook[M]. Beijing: China Statistical Publishing House, 2001. (in Chinese).

[11]　LI ZC, QIN MJ. China's grain circulation industry market structure form of the game theory[J]. Seeker, 2005(9): 8 –10. (in Chinese).

[12]　NIE ZB. Production and management table of Grain and oil processing industry in 2006[M]// China's grain market development report in 2007. Beijing: Economic Management Press, 2008. (in Chinese).

[13]　NIE ZB. China's grain market development report: 2005 – 2008 [M]. Beijing: Economic Management Press, 2008. (in Chinese).