Empirical Research on the Developmental Status of Farmer Cooperatives' Function

LI Yan-rong, GAO Jian-zhong*

College of Economics and Management, Northwest A&F University, Yangling 712100, China

Abstract In the paper, members in farmer cooperatives are selected as investigation subjects. By using fuzzy synthetic evaluation methods, functions of farmer cooperatives, which include six functions as follows: providing technology and information, marketing, processing and transportation, standardized services, and credit services and rights protection, are analyzed. The quantitative analysis is conducted on the developmental status of the functions of farmer cooperatives. The evaluation results are taken as evidence to anticipate the problems in the development of farmer cooperatives and then countermeasures are put forward, including intensifying the construction of actual functions of farmer cooperatives; contracting diversified credit and loan services; improving comprehensive strength of farmer cooperatives and taking the path of combining professional and comprehensive developmental paths. This study improves our knowledge on the development of farmer cooperatives and provides new insights to solve the problems that arise following the development.

Key words Farmer cooperatives, Fuzzy synthetic evaluation method, Developmental status, China

Since the implementation of the *Farmer Cooperatives Law of People's Republic of China* in 2007, the number of Chinese farmer cooperatives has been increased, but with the developmental quality, the scale of farmer cooperatives is small, especially their imperfect functions have far lagged behind the needs of reality. The scholars who have researched the functions of farmer cooperatives, the major method is normative analysis, but the empirical research is few[1-3]. Today, there is even no people can research the development status of the functions. In view of this, on the basis of the spot survey of farmers of Weinan in Shaanxi Province, the paper researches the members' satisfactory degree on the developmental status of the functions of cooperatives by selecting the members of farmer cooperatives. The research is of great real significance to revealing the development status of farmer cooperatives' functions; mastering the developmental direction of the development of Chinese farmer cooperatives; and making policies and measurements for supporting the construction of farmer cooperatives.

1 The establishment of fuzzy synthetic evaluation model

Fuzzy synthetic evaluation model is used when the relations among many businesses are fuzzy and the differences of businesses are not evident, so it is hard to classify them. For this reason, we should evaluate the single factor, and then conduct fuzzy synthetic evaluation of all factors to avoid any miss of statistical information and loss in the half way, which is conducive to solving the deviation of objective reality caused by the certain evaluation of "yes" or "no"[4]. Fuzzy synthetic evaluation model is a way widely used in the application of fuzzy mathematics. Some businesses are determined by multiple factors, so when encountering this kind of problems, each factor should be evaluated. On the basis of giving independent judgment of each factor, how to consider all the factors and then make a conclusion, that is the problem of comprehensive evaluation.

The judgment and basic method of fuzzy synthetic evaluation model[5] is: First, evaluation object is P, establishing the factor collection of evaluation object $U=\{u_1, u_2, \cdots, u_n\}$, evaluation collection $V=\{v_1, v_2, \cdots, v_n\}$. According to the relations among each factor U, U is divided into k, supposing the i subset $U_i=\{u_{i1}, u_{i2}, \cdots, u_{in}\}$, $i=1, 2, \cdots, k$, that is U_i contains n_i factors, then $\bigcup_{i=1}^{k} U_i = U$ and $\sum_{i=1}^{k} n_i = n$.

Second, the first level evaluation. Synthetically evaluating the each U_i by using the first level model, then $\underset{\sim}{B}_i = \underset{\sim}{W}_i \otimes \underset{\sim}{R}_i, i = 1,2,\cdots,N$.

Third, multi-level synthetic evaluation model. Taking each U_i as a factor, B_i as the its single factor evaluation, the $N \times m$ stage evaluation matrix can be constructed as well. Supposing $U=\{u_1, u_2, \cdots, u_k\}$, $\underset{\sim}{W}=(w_1, w_2, \cdots, w_k)$, and then the second level judgment results can be obtained: $\underset{\sim}{B} = \underset{\sim}{W} \otimes \underset{\sim}{R}$.

Fourth, calculating synthetic evaluation. $P_k = \underset{\sim}{B}_k \cdot V^T$ and then using the synthetic evaluation standard to obtain the evaluation grade.

2 The establishment of function index system of farmer cooperative

2.1 Establishing the index system of farmer cooperatives' functions Through consulting experts and reviewing the former literatures. Functions from six aspects in terms of production and living of farmer cooperatives are defined, including

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* Corresponding author. E-mail: gaojianzhong@yahoo.com.cn

providing technology and information, marketing, processing and transportation, standard service, credit service and right protection. Under the six functions, there are many sub-indicators, which can be seen on Table 1[6-7].

Table 1 Indicator system of functions of farmer cooperatives

Target layer	First grade index (U_i)	Second grade index (U_{ij})
Functions of farmer cooperatives	Providing technology and information (U_1)	Providing specialized technological information(U_{11})
		Training scale(U_{12})
		Training frequency(U_{13})
	Marketing (U_2)	Marketing capability(U_{21})
		Marketing price (U_{22})
	Processing and transportation(U_3)	Product storage(U_{31})
		Deep processing of products(U_{32})
		Unified transportation(U_{33})
	Standard service(U_4)	Purchasing productive materials(U_{41})
		Unified brand(U_{42})
	Credit service (U_5)	Total sum of money collected(U_{51})
		Providing guaranteed loan(U_{52})
		Providing capital(U_{53})
	Rights and interests protection(U_6)	Solving disputes(U_{61})
		Providing the minimum purchasing price(U_{62})
		Improving market position(U_{63})

2.2 Determining the indicator weight by using analytic hierarchy In the paper, 20 experts including 7 doctoral supervisors, 8 associate professors and 5 management people in farmer cooperatives are selected. According to the scoring method of the judgment matrix put forward by Satty[5]. Score the first level indicators and second level indicators in pairs, and then seven judgment matrixes can be obtained, thus, the weight of each indicator and its testing result can be obtained by using analytic hierarchy(Table 2).

Table 2 The weight of each index and the test results by using the analytic hierarchy

Target layer	First grade index			Second grade index		
	Name	Weight	*CR*	Name	Weight	*CR*
Functions of farmers' cooperatives	Providing technology and information (U_1)	0.193 7	0.061 6	Providing specialized technology and information(U_{11})	0.698 4	0.008 8
				Training scale(U_{12})	0.194 2	
				Training frequency (U_{13})	0.107 5	
	marketing(U_2)	0.483 0		Marketing capability(U_{21})	0.864 2	0
				Marketing price(U_{22})	0.135 8	
	Processing and transportation(U_3)	0.127 6		Products storage(U_{31})	0.270 7	0.050 8
				Deep processing of products(U_{32})	0.648 0	
				Unified transportation(U_{33})	0.081 4	
	Standardized service (U_4)	0.087 3		Unified purchasing materials(U_{41})	0.714 1	0
				Unified brand(U_{42})	0.285 9	
	Credit service(U_5)	0.072 3		Total sum of money collected(U_{51})	0.666 3	0.052 3
				Providing guarantee loan(U_{52})	0.252 4	
				Providing capital(U_{53})	0.081 2	
	Rights and interest protection(U_6)	0.036 0		Solving disputes(U_{61})	0.089 9	0.036 3
				Providing the minimum purchasing price(U_{62})	0.207 8	
				Improving market position(U_{63})	0.702 3	

It can be seen from Table 2 that, *CR* is lower than 0.1, so, the analysis concerning whether the judgment matrix can pass the consistency test.

3 Empirical analysis

3.1 Members' evaluation on the developmental status of the functions of cooperatives

3.1.1 Establishing the scoring standard and evaluation quantitative classification standard. According to the general evaluation results, the evaluation collection is $V=\{1,2,3,4\}$, with quantifying the subjective estimation of semantic scale, and giving each of them the value of 1.0, 0.8, 0.6 and 0.4 respectively. The observed quantity is the standard of four grades semantic. The evaluation quantitative standard designed can be seen on Table 3.

Table 3 Quantitative grading standard of evaluation

Evaluation value	Evaluation on the status quo	Grades
$x_i \geqslant 0.85$	Excellent	E_1
$0.7 \leqslant x_i < 0.85$	Fine	E_2
$0.6 \leqslant x_i < 0.7$	Qualified	E_3
$x_i < 0.6$	Bad	E_4

3.1.2 Score results of the developmental status of cooperatives' functions. According to the standard established in Table 3, the

members scoring cooperatives' functions according to the actual interests of them since they have attended cooperatives; the developmental status of each function of cooperatives and the contribution degree of self income increase. Taking 55 samples with relatively well developed as examples, such as Weinan of Shannxi Province, Xingtai of Hebei Province, Weihai of Shandong Province and Chengdu of Sichuan Province, in each cooperative, 5 members are selected to answer the questionnaires, 600 questionnaires were released, and finally, 590 were obtained with 578 valid.

In the valid questionnaires, members' score on each questionnaire is concluded in Table 4.

Table 4 Proportion of the grades given by the members in farmers' cooperatives

First grade index (U_i)	Weight(W_i)	Second grade index (U_{ij})	Weight(W_{ij})	Proportion of the evaluation results//%			
				Excellent (1.0)	Favorable (0.8)	Fine (0.6)	Bad (0.4)
Providing technology and information (U_1)	0.193 7	Providing specialized technology and information (U_{11})	0.698 4	32.8	57.2	7.4	2.6
		Training scale(U_{12})	0.194 2	22.1	57.2	18.5	2.2
		Training frequency(U_{13})	0.107 5	17.4	58.9	20.6	3.2
Marketing (U_2)	0.483 0	Marketing capability(U_{21})	0.864 2	30.6	56.1	7.7	5.5
		Marketing price(U_{22})	0.135 8	21.0	64.6	9.2	5.2
Processing and transportation(U_3)	0.127 6	Product storage(U_{31})	0.270 7	2.2	12.5	9.6	75.6
		Deep processing of products(U_{32})	0.648 0	2.6	8.1	14.4	74.9
		Unified transportation(U_{33})	0.081 4	6.3	11.8	14.4	67.5
Standardized service (U_4)	0.087 3	Unified purchasing production means (U_{41})	0.714 1	10.3	23.6	12.5	53.5
		Unified brand(U_{42})	0.285 9	24.4	25.5	18.8	31.4
Credit service (U_5)	0.072 3	Total sum of money collected(U_{51})	0.666 3	6.3	27.7	18.8	47.2
		Providing guarantee loan(U_{52})	0.252 4	3.0	22.5	18.5	56.1
		Providing capital(U_{53})	0.081 2	3.0	15.9	24.1	57.0
Rights protection(U_6)	0.036 0	Resolving disputes(U_{61})	0.089 9	8.5	14.4	11.3	65.8
		Providing minimum purchasing price (U_{62})	0.207 8	6.3	20.6	25.8	47.2
		Providing market position (U_{63})	0.702 3	5.7	15.9	21.5	56.9

3.2 Grading evaluation on cooperatives' functions by using fuzzy synthetic evaluation

3.2.1 Comprehensive evaluation on cooperatives' functions According to the operation steps of fuzzy evaluation, the evaluation matrix of individual factor of 4×3 orders of U_1 can be obtained from Table 4

$$\underset{\sim}{R_i}=\begin{bmatrix}0.328 & 0.572 & 0.074 & 0.026\\ 0.221 & 0.572 & 0.185 & 0.022\\ 0.174 & 0.589 & 0.206 & 0.032\end{bmatrix},$$

by using the first level model to synthetically evaluate U_1, its synthetic evaluation vector is calculated.

U_1 provides the evaluation vector of technology and information:

$$B_1=W_1\otimes R_1=(0.698\,4,\ 0.194\,2,\ 0.107\,5)$$

$$\begin{bmatrix}0.328 & 0.572 & 0.074 & 0.026\\ 0.221 & 0.572 & 0.185 & 0.022\\ 0.174 & 0.589 & 0.206 & 0.032\end{bmatrix}=(0.291,0.574,0.109,0.026)$$

In the similar manner, the evaluation vectors from U_2 to U_6 can be figured out.

Taking each U_i as a factor, B_i as its individual factor evaluation, a 6×4 evaluation matrix can be composed, which is as $\underset{\sim}{R}$:

$$\underset{\sim}{R}=\begin{bmatrix}B_1\\ B_2\\ B_3\\ B_4\\ B_5\\ B_6\end{bmatrix}=\begin{bmatrix}0.291 & 0.574 & 0.109 & 0.026\\ 0.293 & 0.572 & 0.079 & 0.055\\ 0.028 & 0.096 & 0.131 & 0.745\\ 0.143 & 0.241 & 0.143 & 0.472\\ 0.052 & 0.254 & 0.192 & 0.503\\ 0.061 & 0.167 & 0.215 & 0.557\end{bmatrix}$$

3.2.2 Multi-level synthetic evaluation on cooperatives' functions. Through the former analytic hierarchy process, the weight distribution of the first level of the indicator system has been obtained.

$$\underset{\sim}{W}=(w_1,\ w_2,\ w_3,\ w_4,\ w_5,\ w_6)=(0.194,0.483,0.128,0.087,0.072,0.036)$$

The second evaluation results of U can be obtained:

$$\underset{\sim}{B}=\underset{\sim}{W}\otimes\underset{\sim}{R}=(0.194,0.483,0.128\ 0.087,0.072,0.036)$$

$$\begin{bmatrix}0.291 & 0.574 & 0.109 & 0.026\\ 0.293 & 0.572 & 0.079 & 0.055\\ 0.028 & 0.096 & 0.131 & 0.745\\ 0.143 & 0.241 & 0.143 & 0.472\\ 0.052 & 0.254 & 0.192 & 0.503\\ 0.061 & 0.167 & 0.215 & 0.557\end{bmatrix}=(0.220,0.445,0.110,0.224)$$

3.2.3 Calculating the synthetic evaluation value of each first level indicator. Providing technology and information: $V_1=(1.0,0.8,0.6,0.4)\times(0.291,0.574,0.109,0.026)^T=0.826$

Marketing: $V_2=(1.0,0.8,0.6,0.4)\times(0.293,0.572,0.079,0.055)^T=0.821$

Processing and transportation: $V_3=(1.0,0.8,0.6,0.4)\times(0.028,0.096,0.131,0.745)^T=0.481$

Standardized service: $V_4=(1.0,0.8,0.6,0.4)\times(0.143,0.241,0.143,0.472)^T=0.611$

Credit service: $V_4=(1.0,0.8,0.6,0.4)\times(0.052,0.254,0.192,0.503)^T=0.571$

Rights and interests protection: $V_4=(1.0,0.8,0.6,0.4)\times(0.061,0.167,0.215,0.557)^T=0.546$

3.2.4 Calculating the general synthetic evaluation value. $V=(1.0,0.8,0.6,0.4)\times(0.220,0.445,0.110,0.224)^T=0.732$

3.3 Results of empirical analysis It can be seen the "synthetic evaluation value of each first level indicator" of cooperatives' functions, members have high evaluation on the two functions in terms of providing technology & information and marketing. The synthetic score of the two items is 0.826 and 0.821, belonging to "fine" stage, which indicates that farmer cooperatives do well in providing technology& information and marketing. Members' evaluation on the three indicators in terms of processing and transportation, credit service and rights and interests protection, the score of the three items is 0.481, 0.571 and 0.546, belonging to "bad" stage, which indicates that the functions of cooperatives on processing and transportation, credit service and rights and interest protection are limited. The functions of cooperatives still have improvement space. Members' evaluation on standardized service is mediocre, the synthetic evaluation score is 0.611, belonging to "general" level.

In addition, in the context of the developmental status of farmer cooperatives, the general comprehensive score of each index is 0.732, the evaluation level is "fine". The results tell that members of farmer cooperatives have high satisfactory degree on participating cooperatives.

It needs pointing out that when selecting survey samples, only large scale farmer cooperatives with favorable development and stable income are selected. The small farmer cooperatives with unregulated operation and small scale are excluded, which inevitably makes the whole score more optimistic than the reality.

4 Suggestions on developing farmer cooperatives functions

In view of the possible problems in the development process of farmer cooperatives, the following countermeasures are put forward[8].

4.1 Intensifying the physical function construction of farmer cooperatives Through empirical analysis, it is not so difficult to see that at present, the processing functions of farmer cooperatives need further improvement. Except for helping farmers to farmer the difficulties in selling their products, the entity processing function of them should be established to realize the added value of products to improve rural households' income. Developing the entity function construction of processing and realizing the deep processing of agricultural products are the fundamental way for Chinese farmer cooperatives to help farmers resolve the difficulties in selling their products and materialize the internalized interests of industrial chain.

4.2 Establishing the credit service functions of farmer cooperatives from multiple channels From the above empirical analysis, at present, the credit function of farmer cooperatives is weak but the further development of credit service is a choke point for the development of farmer cooperatives . In view of this, on the one hand, the preferential policies of government to farmers should be carried out; on the other hand, the subjective initiative of farmer cooperatives should be fully displayed and the financial association should be developed. The farmer cooperatives should implement the innovation items of capital mutual help to vigorously explore the effective fund collecting channel for the development of farmer cooperative organization.

4.3 Trying to improve the comprehensive power of farmer cooperatives to take the developmental path of combining specialized development and comprehensive development In the six functions of farmer cooperatives defined in the research, only the prior two items can reach the favorable state and the functions of the rest items are explicitly backward. Farmer cooperatives should not only display their economic functions in improving farmers' income, but also the non-economic social functions, for example, provide credit service and rights protections for farmers. The construction of Chinese farmer cooperatives can mirror the experiences of the construction of comprehensive cooperatives' functions to try to diversify the cooperatives' functions and completely change the relatively weak status in terms of processing and transportation of cooperatives, credit functions and rights and interests protection functions.

References

[1] SUN YF. Empirical research and inspiration of farmers' needs and wishes of our cooperation at the present stage[J]. Jiangsu Social Sciences, 2003(1): 11-14. (in Chinese).

[2] GE WG. Development of theory and practice of farmer specialized cooperative economic organizations[M]. Beijing: China Agriculture Press, 2008: 135-140. (in Chinese).

[3] CUI BY, LI XM. Empirical analysis of capital under the control of the function and operation of cooperatives[J]. Issues in Agricultural Economy, 2008(1): 102-106. (in Chinese).

[4] LIANG Q, SHI LM. Customer satisfaction of third-party logistics of utilizes fuzzy comprehensive analysis methods conservation development way[J]. China Market, 2007(49): 46-47. (in Chinese).

[5] MAO X. Based on AHP and fuzzy comprehensive evaluation method of safety evaluation of MIS[J]. Economic Research Guide, 2010 (25): 28-31. (in Chinese).

[6] LIU ZH. AHP in the hotel customers a comprehensive assessment of the application level[J]. China Business&Trade, 2009(7): 45-76. (in Chinese).

[7] WANG T. Based on farmers demand function construction of farmer cooperatives[J]. Rural Economy, 2009(11): 89-93. (in Chinese).

[8] GUO HD. "American New Generation Cooperatives" and inspiration to our country[J]. Management and Administration on Rural Cooperative, 2004(7): 204-207. (in Chinese).

[9] XIAO M. Discussion on ways of economic development in rural areas of Anhui Province based on cooperatives[J]. Asian Agricultural Research, 2009, 1(6):16-19, 28.

[10] DU WJ, REN DP. Security guarantee of agriculture industry based on the improvement of cooperative legal institution[J]. Journal of Anhui Agricultural Sciences, 2011, 39(18): 11242-11244. (in Chinese).

[11] LI GM. Differential marketing of agriculture products dominated by rural cooperative economic organizations[J]. Asian Agricultural Research, 2009, 1(6):20-23, 33.

[12] CHEN F, LIN SX, LIANG ZW, et al. Analysis of the process of winter potato industry in Zhongshan City from the point of peasant economic cooperative organization[J]. Journal of Anhui Agricultural Sciences, 2011, 39(19): 11795-11796, 11799. (in Chinese).