



Study on Quality and Safety Control of Agricultural Product with Geographical Indication of Farmers' Cooperatives

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Abstract. Quality and safety is the source of maintaining the value of all commodities. Compared with general products, the quality and safety control of geographical indication products is more complicated and involves different interest groups, while farmers' cooperatives, which are related to the production of geographical indication products, play an important role in the quality and safety control of geographical indication products. On the basis of previous study results, this paper constructs the quality and safety control index system of geographical indication products of farmers' cooperatives, calculates the comprehensive evaluation value, and constructs the impact index system from three aspects: the basic characteristics of farmers' cooperation, the basic characteristics of farmers' cooperative directors and the characteristics of external environment; and then, based on the survey data on 56 farmers' cooperatives involved in the production of geographical indication products in Anhui Province, it makes an empirical analysis by using the OLS regression model. The results show that the quality and safety control level of geographical indication products of farmers' cooperatives is generally high, which is influenced by factors such as the establishment time of farmers' cooperatives, the number of existing members, the types of cooperatives and the trust degree of cooperative directors by members. Based on this, the author makes corresponding suggestions.

Keywords: Farmers' Cooperatives · Quality and Safety Control · Geographical Indication Products

1 Introduction

Implementing the strategy of rural revitalization is a major decision-making arrangement made by the 19th National Congress of the Communist Party of China, among which the implementation of the strategy of developing agriculture by quality is an important part of the strategy of rural revitalization. In the strategy of developing agriculture by quality, it clearly puts forward: "Implementing the action of revitalizing villages and

strengthening counties by industry, cultivating agricultural products brands, protecting geographical indication agricultural products, and creating a new pattern of development of one product for one village and one industry for one county". Meanwhile, in the strategy of rural revitalization, it is mentioned that with a view to promoting the organic connection between small farmers and modern agriculture development, diversified alliance and cooperation should be developed to enhance the organization degree of small farmers. Since the mid-1980s, farmers' specialized organizations began to appear in various places, and especially since the implementation of the Law on Farmers' Specialized Cooperatives of the People's Republic of China in 2007, farmers' cooperatives have become a study hotspot in academic circles, with fruitful results. The study perspective has gradually shifted from general theoretical study on the nature and function of cooperatives to empirical study on the governance structure and operational performance of cooperatives in China, and the study methods have gradually shifted from qualitative study methods based on theoretical analysis to quantitative study methods such as questionnaire survey, factor analysis and regression analysis, which have significant guiding significance for the development of farmers' cooperatives in China. Some achievements have also been made in the study of geographical indications and farmers' cooperatives. WANG and LIU (2008) judged from the perspective of industrial development that the main body of geographical indication protection mainly involves leading enterprises, farmers, professional cooperative organizations and the government [9]. YANG and ZHOU (2016) believed that it is necessary to vigorously develop agricultural production cooperation organizations and form market organizations that can ensure the quality of geographical indication agricultural products [10]. As the right of geographical indications is a collective exclusive right, cooperatives are responsible from application to maintenance, and its important role cannot be ignored [7]. ZHANG (2012) thought that tea specialized cooperatives are also an important force in cultivating tea geographical indication brands [11]. WANG (2016) thought it is required to provide an open platform for the protection of geographical indications of vegetables, which should give full play to the role of specialized cooperatives and improve brand competitiveness [8]. ZHAO and MIAO (2011) learned from the experience of the European Union, considering that China's farmers' specialized cooperatives are not simply the main body of applying for registration of geographical indications, but more importantly should be the main body of quality supervision of geographical indication products to participate in the protection of geographical indications [12]. LIU (2010) studied to show that whether to join farmers' cooperative organizations and other factors will significantly affect the quality control behaviors of geographical indication farmers. Geographical indications are a kind of quality marks, but they will not directly lead to the improvement of producers' quality control [5]. Most of the local farmers' cooperatives have the right to produce and operate geographical indication agricultural products, which have high standards and relatively perfect supporting services in management and technology, and ensure the product quality of geographical indication agricultural products to a certain extent [6]. LI and CHEN (2013) started with the guiding role on farmers from the perspective of member heterogeneity of farmers' specialized cooperatives, built a dual multi-task principal-agent model including local government and farmers' specialized cooperatives, and designed an incentive mechanism to improve the quality uniformity

of primary geographical indication agricultural products [4]. HE and HUANG (2017) believed that agricultural cooperatives play an important role in regulating farmers' irregular production behaviors and ensuring the quality of agricultural products at the source in terms of the source control of geographical indication agricultural products [2].

In China, more than 90% of the geographical indication products belong to or are related to agricultural products, and geographical indication has become an important means to protect and develop local high-quality and characteristic agricultural products. However, small farmers are still the main bodies in the production and management of geographical indication products in China, but they have natural defects in the quality and safety control of geographical indication products. As farmers' cooperatives are related to geographical indication products, through the form of "geographical indication + cooperatives + farmers" or "geographical indication + companies + cooperatives + farmers", they lead scattered farmers to form a scale and integrate small farmers into the agricultural product industry chain, which has unique advantages in realizing the quality and safety control of geographical indication products. Farmers' cooperatives can control the quality and safety of geographical indication products through unified fertilization and pest control, which can effectively improve the quality and safety levels of geographical indication products. Then, how do farmers' cooperatives control the quality and safety of geographical indication products during the industrial development of geographical indication products? And affected by what factors? The answers to these questions are the key to understand how to rely on farmers' cooperatives to promote the quality and safety control of geographical indication products.

2 Data and Study Methods

2.1 Source of Data

The survey area selected in this study is Anhui Province, which is a big agricultural province rich in characteristic products and having many geographical indication product brands. From January to July 2021, the author organized college students to distribute survey questions to farmers' cooperatives involved in the production of geographical indication products such as Huangshan Maofeng and Taiping Houkui in the combination of online and offline methods, and recovered 56 valid questionnaires. Taking the data of 56 farmers' cooperatives as the sample data of this study, this paper makes an empirical study on the overall situations of quality and safety control of geographical indication products of farmers' cooperatives.

2.2 Description of Variables

2.2.1 Explained Variables

There are many indexes to measure the quality control of geographical indication products of farmers' cooperatives. Based on the research achievements of GUO (2020) [1], this paper selects five variables, namely whether farmers' cooperatives have organized safety production knowledge trainings before production, whether fertilization is unified,

whether pest control is unified, whether they participate in the quality traceability system of agricultural products and whether pay attention to the quality and safety of agricultural products, to measure the quality and safety control behaviors of geographical indication products of farmers' cooperatives. Farmers' cooperatives have organized safety production knowledge trainings before production so that producers of geographical indication products have certain quality and safety production knowledge, which can improve the quality of geographical indication products to a certain extent and ensure the safety of geographical indication products. Besides, chemical fertilizer use and pest control are key indicators related to environment and quality and safety in the production process of geographical indication products. Farmers' cooperatives organize unified fertilization and pest control according to the actual situations in the production of geographical indication products, which can effectively control the quality of geographical indication products to a certain extent. In addition, whether farmers' cooperatives participate in the quality traceability system of agricultural products will promote the quality and safety of geographical indication products. Moreover, the higher the awareness of farmers' cooperatives on the importance of the quality and safety of geographical indication products, the higher their enthusiasm for controlling the quality and safety of geographical indication products, thus improving the quality and safety of geographical indication products. However, whether a single link or a specific production behavior of farmers' cooperatives complies with safety production norms in the production process of geographical indication products does not fully represent the safety production behaviors of farmers' cooperatives in the production process of geographical indication products. Therefore, this paper discusses the overall situations of the quality and safety control of geographical indication products of farmers' cooperatives by taking each dimension plus the final average as the explained variables.

2.2.2 Explaining Variables

Based on the research achievements of GUO (2020) [1] and LI, ZHOU, YAN (2015) [3], in this paper, the factors that may affect the quality and safety control of geographical indication products of farmers' cooperatives are divided into three aspects: (1) The basic information about farmers' cooperatives, including cooperative operation time, cooperative scale, whether it is a model cooperative, whether it has its own brand, cooperative type, cooperative registered capital, the proportion of the first investor to the total share capital, the proportion of the top five investors in the cooperative, the difference degree of shares held by other cooperative members except the first few investors, and the system of members entering and leaving a cooperative. (2) The characteristics of directors of farmers' cooperatives. The decision of farmers' cooperatives is made through the collection of several people or the joint discussion of the directors of cooperatives. Therefore, the education level and the years of engagement in agricultural production of directors of farmers' cooperatives may also have an impact on the collective decision-making choices of cooperatives. In this paper, it selects the following factors to express, i.e. age, gender, education level, years of serving as director, years of agricultural work, other work experience besides farming, what specialties the director has in management, sales and breeding, the trust degree of cooperative members to the director, etc. (3) External environmental factors, which are expressed by the evaluation of farmers' cooperatives

on the relevant technical guidance and supportive policies provided by the government and the economic development level of the involved township or street. For specific variables and their meanings, please see Table 1.

Table 1. Variable Settings and Notes

	Variable Type	Variable Name	Variable Notes	Variable Description	
				Mean	Variance
Explained variables	Quality and safety control of geographical indication products of cooperative	Safety production knowledge training of cooperative before production (1)	1 = Never organized 2 = Ever organized, but not many 3 = Organized many times 4 = Organized regularly	2.89	0.461
		Unified fertilization of cooperative (2)	1 = Never unified 2 = Ever unified, but not much 3 = Unified many times 4 = Completely unified	2.64	0.888
		Unified pest control of cooperative (3)	1 = Never unified 2 = Ever unified, but not much 3 = Unified many times 4 = Completely unified	2.79	0.899
		Quality traceability system of agricultural products of cooperative (4)	1 = Never participated 2 = Ever participated, but now quit 3 = Always participated	2.36	0.597
		Attention of cooperative to the quality and safety of agricultural products (5)	1 = Never paid attention 2 = Paying attention, but not much 3 = Paying more attention 4 = Paying high attention	3.64	.416
		Comprehensive average score of quality and safety control of geographical indication products of farmers' cooperative	$\frac{(1)+(2)+(3)+(4)+(5)}{5}$	2.8643	0.249

(continued)

Table 1. (continued)

	Variable Type	Variable Name	Variable Notes	Variable Description	
				Mean	Variance
Explaining variables	Basic characteristics of cooperative	Operating time of cooperative U11	Years of cooperative operation by 2020 (unit: year)	8.55	7.815
		Scale of cooperative U12	Existing number of cooperative members (unit: person)	116.55	1561.815
		Whether the cooperative a model one U13	1 = Yes; 0 = No	0.46	0.253
		Whether the cooperative owns its own brand U14	1 = Yes; 0 = No	0.61	0.243
		Type of cooperative U15	1 = Led by a village economic organization, government agriculture-related department or leading enterprise; 0 = Led by a large producer	0.55	0.252
		Registered capital of cooperative U16	1 = \leq RMB100,000; 2 = RMB100,000–200,000 (including RMB200,000, the same below); 3 = RMB200,000–500,000; 4 = RMB500,000–1 million; > RMB1 million = 5	4.34	1.610
		Proportion of the first investor to the total share capital U17	(Unit: %)	332.4464	585.924
		Proportion of the top five investors in the cooperative U18	1 = \leq 20%; 2 = 20%–40% (including 40%, the same below); 3 = 40%–60%; 4 = 60%–80%; > 80% = 5	4.43	0.286

(continued)

Table 1. (continued)

Variable Type	Variable Name	Variable Notes	Variable Description	
			Mean	Variance
	Difference degree of shares held by other cooperative members except the first few investors U19	1 = Very low; 2 = Relatively low; 3 = General; 4 = Relatively high	2.43	0.686
	System of entering and leaving a cooperative U110	1 = Inflexible; 0 = Flexible	0.93	.286
Basic characteristics of cooperative directors	Director age U21	Actual age (unit: year)	48.54	66.471
	Director gender U22	1 = Male; 0 = Female	0.89	0.097
	Years of serving as director U23	Actual duration (unit: year)	6.29	4.135
	Educational level of director U24	1 = University and above; 2 = High school; 3 = Junior high school; 4 = Primary school and below	2.02	0.527
	Years of agricultural work of director U25	Actual duration (unit: year)	18.89	95.661
	Other work experience besides farming of director U26	1 = Yes; 0 = No	0.77	0.181
	Specialties in management, sales and breeding of director U27	1 = Yes; 0 = No	0.80	0.161

(continued)

Table 1. (continued)

	Variable Type	Variable Name	Variable Notes	Variable Description	
				Mean	Variance
		Trust degree of cooperative members to the director U28	1 = Very low; 2 = Relatively low; 3 = General; 4 = Relatively high; 5 = Very high	3.30	1.233
	Characteristics of external environment	Evaluation on the relevant technical guidance and supportive policies provided by the government U31	1 = Very poor; 2 = Relatively poor; 3 = General; 4 = Better; 5 = Very good	3.79	1.081
		Economic development level of the involved township or street U32	1 = Good; 0 = Bad	0.93	.068

3 Analysis of Empirical Results

Taking the comprehensive average score of quality and safety control of geographical indication products of farmers' cooperatives as an explained variable, SPSS17 was used to process the sample data, and OLS regression analysis was carried out. Specific model test and parameter estimation results are as shown in Table 2.

According to the parameter test results of the model, in terms of the basic characteristics of farmers' cooperatives, 4 variables, namely, establishment time, number of existing members, type of cooperative and system of entering and leaving a cooperative, have passed the significant test at the level of 5%, and whether a cooperative is a model one and whether a cooperative has its own brand have passed the significant test at the level of 5%, while other variables have no significant influence. The detailed explanation is as follows: the longer the establishment of a farmers' cooperative, the more inclined the members of a farmers' cooperative are to adopt cooperative strategies to promote the realization of collective actions and ensure a higher level of quality and safety control of geographical indication products. The number of existing members of a farmers' cooperative is significant at the level of 5%, and it is positively correlated, which shows that the increase in the number of members of a farmers' cooperative to a certain extent, so as to ensure reputation, thus obtaining product premium does not necessarily lead to a decline in the quality and safety control level of geographical indication products, but the impact is not very significant. That a farmers' cooperative is

Table 2. Model Regression Results and Related Tests (Number of Samples = 56)

Variable Characteristics/Name Intercept	Non-standardized Coefficient		Standard Coefficient	t	Sig.
	B	Standard Error			
Basic characteristics of cooperative					
U11	.046	.021	.259	2.209	.034
U12	.004	.001	.284	2.481	.018
U13	.166	.088	.168	1.897	.066
U14	.172	.091	.170	1.896	.066
U15	.238	.098	.240	2.436	.020
U16	-.029	.044	-.074	-.654	.518
U17	.003	.002	.134	1.516	.138
U18	.083	.087	.089	.953	.347
U19	.096	.065	.160	1.478	.148
U110	.182	.084	.195	2.172	.037
Basic characteristics of cooperative director					
U21	-.004	.009	-.063	-.423	.675
U22	-.152	.178	-.095	-.851	.401
U23	-.042	.027	-.173	-1.565	.127
U24	.003	.081	.004	.032	.975
U25	.001	.006	.012	.105	.917
U26	.198	.107	.169	1.841	.074
U27	.055	.111	.044	.490	.627
U28	.140	.055	.312	2.573	.014
Characteristics of external environment					
U31	.080	.043	.167	1.872	.070
U32	.369	.234	.192	1.578	.124
Intercept term	.267	.564		.474	.638
R-squared		.826			

a model one and owns its own brand can encourage cooperatives to control the quality and safety of geographim and long-term operations. The variable of the system of entering and leaving a cooperative of a farmers' cooperative has passed the significant test at the level of 5%, but the regression coefficient is positive, that is to say, the less flexible the system of entering and leaving a cooperative, the higher the level of quality and safety control of geographical indication products. On the contrary, the flexible system of entering and leaving a cooperative has become a kind of "incentive" for members

not to participate in the quality and safety control of geographical indication products, which has aggravated the speculative behaviors of some cooperative members.

In terms of the characteristics of directors of farmers' cooperatives, other work experience besides farming of the directors has passed the significant test at the level of 10%, the reason for which may be that other work experience besides farming of directors of farmers' cooperatives may, to a certain extent, give the directors more opportunities to access more information and better understand the quality and safety control requirements of all parties, thus improving the quality control level of geographical indication products. As a kind of collective organization, the decision of farmers' cooperatives is made through the collection of several people or the joint discussion of the directors of the cooperatives. Therefore, the more members trust the directors, the more they are willing to turn the collective goals of the cooperatives into their individual goals, and the more consistent they are with the cooperatives in behavior and concept, thereby ensuring the high quality of geographical indication products.

In terms of characteristics of external environment, the relevant technical guidance and supportive policies of the government have passed the significant test at the level of 10% and the impact is positive, which shows that the relevant technical guidance and supportive policies of the government can promote farmers' cooperatives to strengthen the quality and safety control of geographical indication products to a certain extent.

4 Conclusions

Along with the continuous improvement of living standards, consumers pay more and more attention to the safety and quality of products. Therefore, geographical indication products are highly sought after by consumers. In China, most geographical indication products belong to or are related to agricultural products, and geographical indication has become an important means to protect and develop local high-quality and characteristic agricultural products. As one of the leaders in the production and operation of geographical indication products, farmers' cooperatives play an important role in the quality and safety control of geographical indication products. However, in reality, due to imperfect internal governance mechanism, high cost of quality supervision, etc., cooperatives are easy to fall into the "predicament of collective actions", which makes it difficult to achieve the goal of quality and safety control of geographical indication products. Therefore, it is very important to discuss how farmers' cooperatives control the quality and safety of geographical indication products and what factors affect them during the industrial development of geographical indication products.

Taking Anhui Province as an example, this paper makes an empirical study on the overall situations of quality and safety control of geographical indication products of farmers' cooperatives based on the survey data on 56 farmers' cooperatives involved in the production of geographical indication products such as Huangshan Maofeng and Taiping Houkui. The results show that the quality and safety control level of geographical indication products of farmers' cooperatives is generally high, which is influenced by factors such as the establishment time of farmers' cooperatives, the number of existing members, the types of cooperatives and the trust degree of cooperative directors by members. To this end, farmers' cooperatives should properly control the scale, give full

play to the economies of scale, constantly improve the internal governance mechanism, strengthen the access and exit management, and enhance the quality and safety control effect of geographical indication products. Meanwhile, farmers' cooperatives should take strengthening model cooperatives and brand building as the driving force, strengthen quality and safety control, and enhance reputation. And besides, the government should actively guide farmers' cooperatives to do a good job in product quality and safety, and offer financial and other policy support.

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