

Study on Constructing Food Safety Hierarchical Management Index System: Taking S City in Jilin Province as an Example

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Abstract: In order to carry out the spirit of the "four strictest" important instructions on food safety, strict prevention and control of food safety risks, this paper takes the background of food safety hierarchical management policy, based on the OECD regulatory quality indicator system, and constructs the "two responsibilities" comprehensive indicator system of food safety according to the local conditions. This paper takes the background of food safety hierarchical management policy and constructs the "two responsibilities" comprehensive index system of food safety based on the OECD regulatory quality index system. In addition, the system is based on the questionnaire design, issued to the supervisors and practitioners of the two groups. The use of SPSSAU, regression analysis method to analyze the implementation of the policy under the two perspectives of the status quo, put forward more targeted regulatory countermeasures.

Keywords: Food Safety; Hierarchical Management; Indicator System; Regression Analysis; Empirical Analysis

1. Overview

In recent years, under the joint governance of all parties, China's food safety problems have been greatly improved, but there are still some food safety problems^[1]. 2022 September 22, the introduction of food safety "two responsibilities" working mechanism for food safety hierarchical management of territorial management responsibility and corporate responsibility (hereinafter referred to as the "two responsibilities") to make new provisions. The "two responsibilities") to make new provisions. Further establish and improve the food safety responsibility system, improve the main body of food safety responsibility system,

is conducive to timely prevention and resolution of risks and hazards, and guard the bottom line of food safety^[2]. In this context, the construction of food safety "two responsibilities" indicator system, the system as a framework to explore the current status of policy implementation, to guard and build a solid food safety defense has a positive effect.

2. Ideas for Constructing the Indicator System

The indicator system is the basic element that reflects the overall state of things. It is a structured framework composed of a series of clearly defined indicators and measurements. Its significance lies in having a basic understanding of things, scientifically extracting and summarizing the basic elements that constitute things, and quantifying or qualitativeizing them, in order to achieve a deepening, concreteness, and clarity of understanding of things, and at the same time, exert Provide guidance and evaluation functions^[3,4].

2.1 Basic Principles

(1) Systematic principle: There is a certain logical relationship between each indicator item, which should not only reflect the comprehensive level of food safety under the "two responsibilities" policy from different perspectives, but also accurately reflect all aspects of food safety hierarchical management The internal connections between each indicator item together form an organic unity, forming a unified evaluation system^[5].

(2) Comprehensive and balanced principle: When constructing a multi-layered comprehensive indicator system, it should reflect the hierarchy and logic between indicator items at different levels. The indicators at each level should be able to fully reflect the indicators at the upper level and be

able to cover food safety supervision. All aspects of work^[6].

(3) The principle of concise and scientific nature: The indicator system should be constructed based on the principle of scientific nature, which can objectively and truly reflect the characteristics and status of food safety supervision work, and the data should be easy to obtain and the calculation method should be simple and easy to understand^[7].

(4) Principle of continuous improvement: The indicator system should be a dynamic system that requires continuous evaluation and improvement^[8]. The food safety "two responsibilities" indicator system should be able to provide timely feedback and information to help market supervision continue to improve and learn.

2.2 Selection of Indicator System

The food safety "two responsibilities" comprehensive indicator system generally adopts the structural indicators (such as Table 1) of the OECD regulatory quality system^[9] to construct the food safety "two responsibilities" comprehensive supervision indicator system. Because the four-dimensional first-level indicators (regulatory policies, regulatory agencies, regulatory tools, and regulatory processes) in the OECD regulatory quality system are highly abstract and typical, they are

not related to the concepts and elements of the "two responsibilities" policy of market regulation and food safety. The theory is consistent. Therefore, the indicator system is adjusted based on the basic principles of indicator system construction and current national conditions and policies.

(1) Comprehensive analysis: First, according to my country's actual situation, in the first-level indicator items of the OECD regulatory quality system, additional regulatory effectiveness indicators are added based on the current food safety level. Secondly, the second-level indicators in the OECD system of the Organization for Economic Co-operation and Development will continue to be used under the first-level indicators. According to the development status of my country's market supervision field, the "parliamentary supervision of regulatory policies" and "judicial agencies' supervision of regulatory policies" in "regulatory agencies" will be deleted. "Role of supervision" and "Supervision through RIA evaluation" in "Supervision tools". In order to explore the overall status of food safety under the "two responsibilities" policy, a first-level indicator of "supervision effectiveness" and a corresponding second-level indicator of "food quality level" are added. Level indicator items.

Table 1. OECD Regulatory Quality System

First level indicator	Secondary indicators
regulatory policy	Clarify regulatory policy formulation
	Integration between regulatory policies
	Grade
Regulatory Authority	Supervisory quality skills training
	Capacity of the Regulatory Agency's Team
	Parliamentary oversight of regulatory policy
	The role of the judiciary in regulatory policy
	inter-regulatory coordination mechanism
regulatory tools	regulatory principles
	Selection of regulatory policy tools
	Assessing regulatory policy quality through RIA
	Business licenses and permits
	Control total regulatory burden
	Regulatory Review and Assessment
regulatory process	Planning regulatory activities
	regulatory communications
	Transparency and public consultation

(2) Decomposition and classification of indicator items: In accordance with the market supervision system of the "two

responsibilities" mechanism for food safety, the selection of third-level indicator items is based on policy documents ("Opinions" and

"Regulations") and relevant business needs, and based on the second-level indicator items For the content of the first-level indicator items, the selected third-level indicator items will be decomposed one by one corresponding to the second-level indicator items. Until each indicator can be realized and described with specific intuitive indicators to form more

complete and detailed indicators. Finally, conduct extensive consultation and actual verification of the indicator system, and adjust, optimize and improve it to enhance its operability^[10]. The construction of a comprehensive indicator system for food safety "two responsibilities" is shown in Table 2-3.

Table 2. Comprehensive Indicator System of “Two Responsibilities” for Food Safety

First level indicator	Secondary indicators	Level three indicators
regulatory policy Regulatory Authority	Clarify regulatory policies	Improve the food safety responsibility system (enterprise main responsibility, territorial management responsibility)
		Improve the working mechanism of "daily management and control, weekly inspection, and monthly dispatch"
		Improve food safety management system and employee health management system
		Establish and improve systems for incoming goods inspection, production and operation process control, and factory inspection.
	Integration between regulatory policies	Guaranteeing supervision responsibilities and integrating work such as optimizing the business environment
		The connection mechanism between the “two responsibilities” and regulatory responsibilities and industry management responsibilities
		Integration of inspection work and promotion of food safety liability insurance
	Grade	Strengthen data infrastructure construction (territorial management platform data entry rate, "Three Single Books" upload rate, etc.)
		Properly deploy food safety directors and food safety officers (for large and medium-sized catering enterprises and school canteens)
		Completion rate of supervision for entities obtaining food production and operation licenses in production and operation
Regulatory Authority	Regulatory agency team capabilities	Quality level of food safety supervisory personnel
		The extent to which food safety supervisors enforce the law in accordance with laws and regulations
	Supervisory skills training and promotion	Level of staffing and construction of food safety supervision personnel
		Knowledge about food safety laws and regulations
		Education and training for food-related employees
	coordination mechanism	Daily work assessment of food safety supervision professionals
		Public food safety knowledge Popular science propaganda Situation
		Internal functional coordination (internal division of powers, task allocation, etc.)
	Coordination with external agencies (production and business units and other agencies)	
	Food safety collaborative governance effectiveness (timely sharing of information and resources among departments)	

Table 3. Comprehensive Indicator System of “Two Responsibilities” for Food Safety

First level indicator	Secondary indicators	Level three indicators
regulatory tools	regulatory principles	Implementation of the provisions of the food safety responsibility system for leading cadres
		Implement the main responsibilities of each food production and business unit
		Implement the principles of supervision of the entire chain of food production, circulation, processing and sales

	regulatory policy tools	Improve the information disclosure mechanism (disclose food safety information to the public in a timely manner)
		Implement the construction of a food safety territorial management platform
		Improve food safety traceability system
	Business licenses and permits	Market entities must apply for a license before entering the market.
		Supervision and inspection of licensing and filing matters for food operators
		Improve food business licensing and registration management information platform
	Control total regulatory burden	Improve the hierarchical and hierarchical guarantee mechanism
		Strengthen smart supervision methods ("Bright Kitchen and Bright Stove" system)
		Improve the food safety market credit system
regulatory process	Normalized prevention and control(Regulatory activities)	Keep production and business premises clean and tidy and personnel hygienic
		Clean up spoiled or expired food promptly
		Clean and disinfect tableware and drinking utensils as required
	Transparency and public consultation	Smooth channels for reporting food complaints
		Handling of food case complaints and reports
	regulatory communications	Disclosure and transparency of food case handling results
		Supervision and inspection intensity
		Strength of administrative penalties (strength of combating food safety violations)
Supervision effectiveness	food quality level	Food safety supervision level
		Food safety and quality sampling pass rate (edible agricultural products, grain, meat products, etc.)
		Food safety inspection coverage
		Comprehensive level of food safety

3. Questionnaire Survey

In order to explore the implementation of the "two responsibilities" policy on food safety and the current satisfaction level of food safety from the perspective of both supervisors and practitioners, a questionnaire survey was conducted.

3.1 Questionnaire Design

The design of the satisfaction questionnaire on the current status of food safety supervision in S City is based on the "two responsibilities" index system of food safety.

Engage in relevant experience and problems encountered at work Towards. It is divided into two questionnaires: supervisor questionnaire and practitioner questionnaire. The content is mainly personal to regulators and practitioners in City S. Basic information and their understanding of current policies in the field of food safety and themselves. The survey on the awareness of regulators and practitioners on the current status of food

safety policies refers to the Likert scale, which is divided into "very satisfied", "relatively satisfied", "average", "dissatisfied" and "very dissatisfied".

3.2 Sample Size and Distribution Process

The questionnaire data comes from S City, Jilin Province. There are 5,214 food business entities and 423 guarantee cadres in the city. The supervisor questionnaires were distributed by selecting the guarantee cadres from 21 towns (streets) in S City. At the same time, each guarantee cadre was During the supervision work, employees were randomly selected and distributed questionnaires to investigate the food safety situation in the region. A total of 210 questionnaires for guarantee cadres and 2,607 employee questionnaires were distributed. Excluding questionnaires that took too short a time to answer and those with single answers, a total of 198 supervisor questionnaires and 2,417 practitioner questionnaires were obtained. The validity rate of the supervisor questionnaire

was 94.3%, and the validity rate of the practitioner questionnaire was 92.7%.

4. Sample Analysis

Descriptive statistical classification and regression analysis were carried out on the samples of supervisors and practitioners to explore the implementation status of the hierarchical management system from the perspective of both.

4.1 Basic Information about the Survey Objects

(1) Supervisory personnel

This time, a total sample size of 198

supervisors was obtained. Females accounted for 48.88% of the respondents, and males accounted for 51.12%; 40.67% were under 30 years old, and 34.61% were between 30 and 39 years old, indicating that law enforcement officers are becoming younger; the proportion of those with university (including junior college) and postgraduate degrees reached 77.26%, indicating that the quality level of law enforcement personnel is high; the proportion of law enforcement personnel within three years of working reached 64.04%, indicating that the overall working time of law enforcement personnel is shorter and less work experience (see Table 4).

Table 4. Basic Information of Questionnaire Survey

Supervisory staff questionnaire			Practitioner Questionnaire		
project	Options	Proportion	project	Options	Proportion
gender	female	48.88%	gender	female	45.9%
	male	51.12%		male	54.1%
age	Under 30 years old	40.67%	age	18 to 29 years old	20.44%
	30 to 39 years old	34.61%		30 to 39 years old	31.86%
	40 to 49 years old	16.85%		40 to 49 years old	27.85%
	Over 50 years old	7.87%		Over 50 years old	19.13%
Educational qualifications	Junior high school and below	5.73%	Educational qualifications	Junior high school and below	22.86%
	High school (including technical secondary school)	17.01%		High school (including technical secondary school)	37.95%
	University (including college and undergraduate)	66.02%		University (including college and undergraduate)	34.9%
	Graduate students and above	11.24%		Graduate students and above	4.29%
Years of experience in supervisory work	Less than 1 year	7.50%	Years engaged in food work	Less than 1 year	18.79%
	2-3 years	18.76%		2-3 years	25.67%
	4-6 years	33.06%		4-6 years	31.32%
	7-10 years	38.43%		7-10 years	17.66%
	More than 11 years	2.25%		More than 11 years	6.56%

(2) Practitioners

A total of 2,607 valid questionnaires were collected from practitioners. Among them, 45.9% were female and 54.1% were male; 4-6 years accounted for the highest proportion, accounting for 31.32%, followed by 2-3 years, accounting for 25.67%; 30-39 years accounted for the highest proportion, 31.86%; high school (Those with higher education (including technical secondary school) and above accounted for 37.95%, followed by universities (including college and undergraduate) accounting for 34.9%, indicating that the quality level of employees

in catering service units is relatively high (see Table 4).

4.2 Food Safety Status Satisfaction Analysis

(1) The satisfaction score of supervisors on the current implementation status of the “two responsibilities” for food safety is 4.6. Among them, for the first level. The satisfaction scores for indicator regulatory policies, regulatory agencies, regulatory tools, regulatory processes, and regulatory effectiveness are 4.58, 4.66, 4.52, 4.56, and 4.73 respectively. Supervisors’ opinions on “supervision” The lowest satisfaction score for "Regulatory

Policy Tools" in "Tools" is 4.43, and its corresponding third-level indicators "implementation of food safety territorial management platform construction" and "food safety traceability system" are satisfactory. The degree of satisfaction is low. 10.67% and 8.43% of people respectively expressed dissatisfaction. This shows that the construction of local platforms needs to be improved, and the implementation effect of the food safety traceability system is not ideal; the scores for the three third-level indicators in "supervision effectiveness" are all high, indicating that the supervision Management personnel are relatively satisfied with the effectiveness of the implementation of the "two responsibilities" for food safety in S City.

(2) The employee satisfaction score for the current implementation status of the "two responsibilities" for food safety is 4.2. The satisfaction scores of the first-level indicator items in the employee satisfaction questionnaire are 4.28, 4.17, 4.14, 4.28, and 4.23 respectively. Similarly, employees have the lowest satisfaction score for "supervision tools". Among them, the third-level indicator item "finding the food safety information they need on the government affairs disclosure website" has the lowest satisfaction score, indicating that the S city government service disclosure system and the corresponding The information sharing mechanism needs to be further improved, or practitioners do not know how to correctly find the information they need; the satisfaction scores for "Regulatory Policy" and "Regulatory Process" are relatively high, and their corresponding three-level indicators The items "'Daily control, weekly inspection, monthly dispatch' working mechanism" and "Cleaning and disinfection of tableware and drinking utensils" have higher self-evaluations.

4.3 Validity and Reliability Analysis

Use spaaau to test the reliability and validity of the two questionnaires. (As shown in Table 5) It can be seen that the reliability coefficient value of the supervisory personnel questionnaire is 0.987, which is greater than 0.9. In addition, the KMO value is 0.973, and the significance of Bartlett's sphericity test is 0.000, which is less than 1. %, the data can effectively extract information; similarly, the amount of information from the practitioner

questionnaire research items can also be effectively extracted.

Table 5. KMO and Bartlett's Test

Supervisor Questionnaire			Practitioner Questionnaire		
KMO value		0.973	KMO value		0.967
Bartlett's test of sphericity	Approximate chi-square	7726.122	Bartlett's test of sphericity	Approximate chi-square	7254.540
	df	861		df	820
	pvalue	0.000		pvalue	0.000

4.4 Regression Analysis

Regression analysis of the supervisory personnel questionnaire (as shown in Table 6) shows that: the supervision process, supervision tools, supervision agencies, and supervision policies are used as independent variables, and supervision effectiveness is used as the dependent variable for linear regression analysis. The model formula is: supervision effectiveness = 0.047 + 0.586*Regulatory process + 0.066*Regulatory tools + 0.133*Regulatory institutions + 0.199*Regulatory policies, the model R-square value is 0.823.

Specific analysis shows:

The regression coefficient value of the supervision process is 0.586 (t=5.379, p=0.000<0.01), which means that the supervision process will have a significant positive impact on supervision effectiveness.

The regression coefficient value of regulatory tools is 0.066 (t=0.502, p=0.616>0.05), which means that regulatory tools do not have an impact on regulatory effectiveness.

The regression coefficient value of regulatory agencies is 0.133 (t=1.156, p=0.249>0.05), which means that regulatory agencies do not have an impact on regulatory effectiveness.

The regression coefficient value of regulatory policy is 0.199 (t=2.009, p=0.046<0.05), which means that regulatory policy will have a significant positive impact on regulatory effectiveness.

The summary analysis shows that: the regulatory process and regulatory policies will have a significant positive impact on regulatory effectiveness. However, regulatory tools and regulatory agencies will not have an impact on regulatory effectiveness.

In the same way, the summary analysis of the

practitioner questionnaire is: the supervision process will have a significant positive impact on the effectiveness of supervision. However, regulatory tools, regulatory agencies, and regulatory policies will not affect regulatory effectiveness.

Table 6. Linear Regression Analysis Results

	Regression coefficients	95% CI	Collinearity Diagnosis	
			VIF	Tolerance
constant	0.047 (0.583)	-0.110 ~ 0.204	-	-
regulatory process	0.586** (5.379)	0.373 ~ 0.800	10.312	0.097
regulatory tools	0.066 (0.502)	-0.190 ~ 0.322	14.828	0.067
Regulatory Authority	0.133 (1.156)	-0.092~ 0.357	12.199	0.082
regulatory policy	0.199* (2.009)	0.005 ~ 0.393	8.397	0.119
sample size	178			
R2	0.823			
Adjust R2	0.819			
F value	F(4,173)=201.357,p=0.000			
Note: dependent variable = regulatory effectiveness				
D-W value = 1.996				
*p<0.05 **p<0.01 The brackets are tvalue				

5. Result Analysis

According to the satisfaction scores of each index item and the results of regression analysis, the result analysis is summarized as follows:

(1) The supervision process from both perspectives will have a positive impact on supervision effectiveness.

The focus of the supervision process is on the procedures and related relationship issues in the implementation of supervision. Through the analysis of the results, both supervisors and practitioners agree that the supervision process will have a positive impact on supervision effectiveness. The better the supervision process is implemented, the higher the supervision effectiveness. Both are highly satisfied with the secondary indicator "normalized prevention and control (supervisory activities)". Among them, the third-level indicator among the second-level indicators "food production and business premises clean and disinfect tableware and

drinking utensils as required" are both considered to be important factors affecting the effectiveness of supervision.

(2) From the perspective of regulators, regulatory policies will have a positive impact on regulatory effectiveness.

Regulatory policy has a paramount place and role in such special and complex matters as regulation. reflecting the basis, goals, values, concepts, directions of regulatory activities, and related conflicts and relationships such as strategy. For this indicator item, ambiguity emerged between regulators and practitioners. Regulators believe that regulatory policies have a positive impact on regulatory effectiveness, while practitioners believe that regulatory policies do not have an impact on regulatory effectiveness. Combining their satisfaction scores for "regulatory agencies", the greater ambiguity is found in the second-level indicator "integration between regulatory policies", which corresponds to the third-level indicator "the responsibility of underwriting and supervising is beneficial to optimizing the business environment". There is a large difference in the satisfaction scores for the third-level indicator, "The responsibility of supervision is conducive to the optimization of the business environment".

(3) From a dual perspective, neither regulatory agencies nor regulatory tools will have an impact on regulatory effectiveness.

For both indicators, it was considered that there would be no impact on the effectiveness of regulation. The regulator is the subject of regulatory implementation. Regulatory tools are the means, methods, approaches and even attitudes, techniques and strategies chosen, adopted and used by the regulatory body. Combined with the satisfaction scores of the questionnaire, the overall satisfaction scores of the practitioners are low for the regulators. Among them, there is a big difference in the satisfaction score of "the degree of enforcement of laws and regulations by supervisors" among the three-level indicators; for regulatory tools, the satisfaction scores show that they are mainly interested in "information disclosure mechanism", "publicizing information in the governmental affairs system", "publicizing information in the governmental affairs system" and "publicizing information in the governmental affairs system". For the regulatory tools, the

satisfaction scores are mainly lower for “information disclosure mechanism”, “government affairs system information disclosure” and “local platform construction”. Neither of the two perspectives has a good positive effect on the level of food safety.

6. Conclusion and Recommendations

According to the analysis results, the following suggestions are put forward for the food safety classification management policy of S City:

(1) Improve the information disclosure mechanism and increase exposure. The survey results show that both supervisors and practitioners believe that the current information disclosure mechanism and the level of random inspections of information disclosure need to be improved. Strengthen step by step. At the same time, more than 60% of the respondents believe that increasing the exposure of illegal companies and increasing penalties are important measures to improve food safety levels. Sampling inspection is an important means of post-event supervision of production enterprises and in-process supervision of distribution enterprises. The release of sampling inspection information can allow consumers to grasp the existence and severity of "substandard" food problems in a timely manner, and help consumers avoid risks. Regulatory authorities need to adapt to the new situation and new requirements of the Internet era, let the public know the results of food safety sampling inspections through a variety of methods at the first time, continuously improve the timeliness and breadth of information release, and continuously improve the timeliness and breadth of information release. Release positive information about strengthening supervision and severe punishment, increase the exposure of illegal enterprises, increase the cost of "illegal", and enhance the people's confidence in food safety.

(2) Improve the food safety traceability system and improve risk prediction. Establishing a food safety traceability system is an effective way to improve supervision efficiency. Through the food safety traceability system, we can quickly locate, trace back to the source of production, and find food production problem links. The government should speed up the construction of a food safety

traceability system, form information sharing, understand the reputation of food manufacturers or companies in real time at the terminal, and promote enterprises and individuals to standardize production, operation and sales. And use risk assessment to provide data support for government departments to make food safety decisions, so that possible hazards can be controlled within a controllable range.

(3) Strengthen food safety publicity methods and enhance subject awareness. The survey results show that employees' satisfaction scores with their understanding of laws and regulations are not high, and more than 50% of the respondents believe that the main reasons for current food safety problems are “weak food safety awareness” and “lack of food safety identification” ability”. Therefore, it is extremely necessary to publicize food safety to practitioners and consumers, strengthen consumers' understanding of the Food Safety Law and the Consumer Rights Protection Law and their awareness of rights protection, strengthen the grassroots rights protection network system, and give full play to the social The supervisory role of the power guides all parties to participate in management and forms a new pattern of social governance. Continue to enhance the awareness of corporate responsibility and establish a self-disciplined and standardized business philosophy for employees in food business units.

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