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Research Article

Effects and Appraisal of Grain Subsidy Policy Based on Statistical Analysis

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At present, the grain subsidies in China are mainly in forms of technical subsidies, like subsidies for superior seed varieties and general subsidies for agricultural production supplies and grain purchase prices. However, the purpose of the paper focuses on whether these subsidy policies can cause good effects and encourage farmers to grow grains and what impact these subsidy policies have on farmers' income. The paper takes a specific area as a research object and sorts the data using the statistical analysis put in the paper. Considering the current agricultural production conditions, the paper studies the content and structure of grain subsidy policy and the changes in grain growing acreage, farmers' income, and agricultural power machinery under the implementation of grain subsidy policy. In the end, the paper makes a research into the effect of implementing the grain subsidy policy, uses the statistical analysis to empirically analyze the impact the grain subsidy policy has on grain growing acreage, and draws a conclusion.

1. Introduction

It is a major decision-making issue facing the Chinese government to improve my country's agricultural subsidy policy under the WTO framework, improve the performance of agricultural subsidy policy, and improve the agricultural subsidy policy system, thereby ensuring national food security, increasing farmers' income, and promoting the comprehensive, stable, and sustainable development of my country's agriculture.

Agriculture is a fundamental production department in national economy for a nation of which other departments can exist and develop on the premise and a base of social development and human progress. Grain production is the base of agricultural production. Compared with other agricultural products, grain has become an important competitive capital among countries due to its special significance and function in national political economy [1]. China is the most populous country in the world, so the grain problem obviously matters a lot. However, such an important fundamental department is quite fragile in our national economy and still restricts the weak link of our national economic development. The grain production in our country still remains in a comparatively tight balanced state of supply and demand [2].

Grain, being not only the foundation of national economic development but also the source of life for a nation, is one of the important material goods of nation's economy and people's livelihood as well as national defense capabilities [3]. China, the most populous country on Earth, must guarantee the grain safety so as to allow the people to have meals and stay away from being hungry. Since the foundation, agricultural problem, agricultural development, agricultural production, and output value changes have attracted the government's and people's attention. Grain subsidy policy has mainly gone through three stages, that is, monopoly on the purchase and marketing, coexistence of three prices, and subsidies for producers. With the development of social economy, grain subsidy policy should be suitable for present economic development, and rational subsidy program should be made. The state chose Anhui and Jilin as pilot cities to implement the subsidy policy, and then other cities followed. A series of agricultural benefit policies including state's cancellation of agricultural tax and fee institution have positive influence on grain stable increment, comprehensive development of rural economy, and deep revolution in the villages.

With the development of social economy and the increasingly prominent industrial development, the growth of agricultural benefits has been in a relatively slow state. In addition, the problem of urban-rural development gap has become more and more prominent, and the impact of various factors such as unbalanced social and economic development has affected the country. The food security issues, agricultural development, and even harmony and stability of the entire society have brought certain impacts. How to adopt agricultural subsidy policies to ensure national food security, realize the benefits of food planting, and increase farmers' income from planting is an important issue that my country needs to solve at present. Food is the material basis on which people live. Only by ensuring and meeting the people's most basic food needs can a series of economic activities be better carried out.

Based on the actual development of agricultural production today, this paper analyzes the implementation content of the grain subsidy policy; the structure of the policy; and the changes in the grain sown area, farmers' income, and total power of agricultural machinery under the implementation of the grain subsidy policy. Researching and improving the analysis effect of grain subsidy policy is the main object.

2. Related Works

The nonagricultural employment of farmers has always been the focus of international academic circles. Literature [4] proposes to use a standard labor-leisure model to study the distribution of labor time for farm managers. Literature [5] studies the nonagricultural employment decision-making issues of rural households from two aspects: nonagricultural labor participation decision-making based on the individual level and nonagricultural labor time based on the family level. With the increase in subsidies, farmers' labor time allocation decisions have changed, and researchers have begun to pay attention to the impact of subsidy policies on farmers' labor time allocation decisions. Literature [6] theoretically studies the mechanism of the impact of subsidy policies on farmers' labor time decision-making and believes that subsidy policies can affect their labor time allocation decisions through three ways: increasing the marginal value of labor, increasing family wealth, and weakening farmers' income fluctuations. Literature [7] concludes through empirical research that the subsidy policy has a negative impact on farmers' nonagricultural labor and a positive impact on agricultural labor. In contrast, literature [8] believes that decoupling subsidies will prompt farmers to reduce agricultural working hours and increase nonagricultural employment time. Domestic research on nonagricultural employment issues of rural households mainly focuses on the discussion of factors that affect rural households' nonagricultural employment decision-making. Literature [9] studies the impact of individual characteristic variables of farmers, especially human capital variables, on farmers' participation in nonagricultural employment in poverty-stricken areas in the west. Literature [10] mainly examines the influence of factors such as the status of farm households' family management, the characteristics of the family's labor force, and the relationship between the family and the outside world on the allocation of farm households' labor time. Literature [11] takes farmers as the research object; selects dummy variables such as family characteristic variables, social environment, and geographical characteristics; studies the factors that affect farmers' nonagricultural employment decision-making; and concludes that family characteristic variables are the main factors affecting the allocation of nonagricultural labor time of farmers. Literature [12] explores the choice mode of nonagricultural employment for farmer couples through individual characteristic variables of farmer households and family characteristic variables. Literature [13] examines the gender differences in nonagricultural employment decision-making of farmers. Literature [14] incorporates rural infrastructure into the nonagricultural employment decision analysis system of farmers.

Whether the agricultural subsidy policy promotes or inhibits the production input of farmers, foreign scholars pay close attention to this issue, but the research conclusions are still controversial. Some scholars have discovered through research that subsidy policies can encourage farmers to increase their agricultural production input levels in a variety of ways. Literature [15] believes that the subsidy policy encourages farmers to increase production input by reducing farmers' risks. Literature [16] finds that subsidy policies can influence farmers' credit constraints and encourage farmers to increase their production input levels. Literature [17] indicates that subsidy policies directly promoting the increase of farmers' income level will help them increase their agricultural investment. Literature [18] believes that the subsidy policy has little effect on the production input of farmers. At present, domestic scholars' research on farmers' input behavior mainly focuses on the mechanism of farmers' input behavior and the factors that affect farmers' input. Regarding the mechanism of farmer household input behavior, scholars mainly inquire into whether farmer household behavior is rational or not. From the perspective of farmers themselves, literature [19] believes that farmers are rational, and the behaviors used to prove farmers' irrational behaviors just show farmers' rational performance under external conditions. Literature [20] believes that the premise of analyzing the behavior mechanism of farmers' farmland investment is farmers' rationality.

The above research focuses on agricultural subsidy policy from an international macro perspective, and the research on agricultural support policy still needs to be filled and perfected. It is necessary to innovate, considering the actual national conditions while absorbing the international advanced theories, experiences, and methods to study agricultural subsidy policy issues.

3. Statistics of Grain Subsidy Data

This paper considers that agricultural subsidies include market price support measures and government financial subsidies to agricultural producers or agricultural sectors, and on this basis, the relevant research on food subsidies is carried out.

Stratification theory is first applied in the field of social science. It is one of the important basic theories in the research of sociology of science abroad in recent years. Western scholars have widely used it as a powerful tool to study the internal structure of science. In social science, its data structure is often hierarchical in the following sense: we have variables to describe individuals, but individuals form a large group, and each group is composed of a certain number of individuals. For larger groups, there are a series of variables to describe.

Through the application in various disciplines, the concept of stratification is given in mathematics.

3.1. Hierarchical Definition. Let X and Y be two topological spaces and f: $X\longrightarrow Y$ be a continuous correspondence. The so-called "Y layered by f" refers to the decomposition of Y into the sum of several disjoint subspaces, as follows:

$$Y = Y_0 \cup Y_1 \cup Y_2 \cdots, \tag{1}$$

where $Y_0, Y_1, \cdots$ is defined as follows.

Y_0 is the largest open set of Y and makes

$$\left(f^{-1}(Y_0), Y_0, f|_{f^{-1}(Y_0)}\right), \tag{2}$$

a local space of Y.

Y_1 is the largest open set of Y–Y_0 and makes

$$\left(f^{-1}(Y_1), Y_1, f|_{f^{-1}(Y_1)}\right), \tag{3}$$

a local space of Y_0. By analogy, we can get the following.

Y_i is the largest open set of $Y_i - Y_{i-1}$ and makes

$$\left(f^{-1}(Y_{i-1}), Y_{i-1}, f|_{f^{-1}(Y_{i-1})}\right)(i = 1, 2, 3 \ldots), \tag{4}$$

a local space of Y_{i-1}.

The idea of layering theorem is based on the layering concept. According to the maximum system granularity, divide the system space into two parts and so on, and finally obtains the layering subsystem.

3.2. Layering Theorem. Let $E(X_k)$ be a space composed of k variables and ρ_k represent the maximum rank up to which the space $E(X_k)$ can be divided, and then the layering theorem can be expressed as follows:

$$\begin{aligned} E(X_n)&: \cdots \longrightarrow E(X_{k+1}) \longrightarrow E(X_k) \longrightarrow \cdots \longrightarrow E(X_1),\\ &\quad \downarrow\rho_1 \downarrow\rho_{k+1} \downarrow\rho_k \downarrow\rho_n,\\ W(X_n)&: \cdots \longrightarrow W(X_{k+1}) \longrightarrow W(X_k) \longrightarrow \cdots \longrightarrow W(X_1). \end{aligned} \tag{5}$$

The finally obtained $W(X_i)$ is a set of layered subspaces and meets the requirement that any subsystem cannot be subdivided.

According to the layering theorem, which describes the idea of solving complex information problems, we can describe the emergency information resources hierarchically. The hierarchical description of emergency information resources is based on the hierarchical theorem. According to the previous description of the characteristics and classification of emergency information resources, emergency information resource space $E(X_n)$ is divided into knowledge resource $W(X_n)$ and auxiliary response information resource $E(X_{n-1})$ and then further layered according to the different properties of the two spaces. Applying the hierarchical theory to the field of emergency management can layer the complex and diverse emergency information resources according to certain laws, which is conducive to the extraction of emergency decision knowledge and the construction of metadata structure.

With people's understanding of things deepening, they have a better grasp of the factors affecting the occurrence and development of events. People prefer a structured representation operation method to express the known development laws and rules. This way can solve similar problems more systematically. We call this method modeling method. The key to the success or failure of modeling method is the representation of model.

According to the analysis and classification principles of emergency information resources, based on system engineering, the representation of emergency information resources is modeled and abstracted from the perspective of knowledge and according to the general law of people's understanding of the world.

It is shown as follows:

M_O represents the basic concept attribute set of emergency information resources; M_I represents emergency information resource data and information set; M_S represents emergency information resource structure and knowledge set; M_P represents the set of emergency information problems; M_M represents the mathematical model set of emergency information; M_D represents emergency decision or optimization model set.

In general, according to the breadth or comprehensiveness of the model's described things, there are the following relationships:

$$M_O \succ M_I \succ M_S \succ M_P \succ M_M \succ M_D. \tag{6}$$

However, according to the depth or logic of the model's described things, there are the following advantages:

$$M_O \prec M_I \prec M_S \prec M_P \prec M_M \prec M_D. \tag{7}$$

In the modern computing environment, in addition to performing complex mathematical analysis and calculation, computer and its network can also carry out complex set of operations such as membership, intersection, or association of massive datasets. Therefore, many decision-making models in emergency management are not limited to M_M and M_D; more and more people have considered the description of things for which it is difficult to apply mathematical models and analyzed them directly at the data or information level, that is, made full use of the analysis and processing ability of computer to M_O, M_I, M_S, and M_S models. Therefore, from the perspective of modern computing environment and management, the new model concept should be a hybrid model of knowledge, data, information, rules, and mathematics. This kind of model is set as

$$M = M_O \cup M_I \cup M_S \cup M_P \cup M_M \cup M_D. \quad (8)$$

This kind of model is also one, or metamodel. Metadata and metamodel are essentially knowledge; the research of model management is to reveal and apply this knowledge. There are differences and limitations in the perspective of knowledge domain in the understanding of model management. From the perspective of mathematical analysis, it focuses on the mathematical logic mechanism and deduction of the model, and the management of M_M and M_D. The knowledge perspective focuses on the research and management of unstructured M_I, M_S, and M_S models. The management decision-making perspective pays more attention to the model accuracy and practicability, while the information technology perspective pays more attention to the system implementation of the representation, storage, and operation of the existing model. Obviously, a single application of knowledge in a knowledge domain cannot well realize the model scientific management; that is, there are limitations in the knowledge domain. Therefore, it is necessary to apply the ideas and methods of system science, comprehensively apply the knowledge of various disciplines, and explore the systematic model management method.

Metadata management in data management is a very important core part. It provides a hierarchical way to construct metadata according to the classification of metadata of emergency information resources. From the bottom layer, core metadata management provides a front-end support for users to access storage resources. Through core metadata management, the connection between users and the underlying storage resources are established. From the high level of the business domain, application metadata integrates the management process to define application metadata from the practical perspective of emergencies and completes the release, sharing, and management of application metadata.

The knowledge system of model is a more extensive knowledge model, which is the basis of model formalization and model management. In the field of emergency management, the dependence on knowledge model is more extensive. Therefore, we make model emergency information resources from the commonness of emergency knowledge model to obtain knowledge description, abstract the basis for the establishment of a metaknowledge model, and provide theoretical support for the further division of emergency information resources.

The common knowledge feature of the model is the basis of general model management and model integration; it mainly comes from the generalized concept of the model, as the basic concept and attribute feature of the model objective thing. Corresponding to a specific model $m\,(m \in M)$, set N_m as the concept and attribute name of the corresponding thing; let A_m represent its corresponding attribute state set and R_m represent the mapping relationship set on $A_m \times A_m$ to describe the attribute state change and interaction relationship. Then, the common knowledge described by the corresponding model can be expressed as the following triple:

$$K_m = (N_m, A_m, R_m) \quad \forall m \in M. \quad (9)$$

Generally, for a recognized thing, there are $N_m \neq \phi$, $A_m \neq \phi, R_m \neq \phi$ contrast to $\forall m \in M$. When $\forall m \in M_O \cup M_I \cup M_S$, generally, A_m is the state set described qualitatively, and R_m is the attribute state change relationship set described by structural relationship and rule or knowledge. When $\forall m \in M_P \cup M_M \cup M_D$, generally, A_m is the measurable state set described quantitatively, and R_m is the attribute state change relationship set described by mathematical logic relationship and function.

Set $a \in A_m\,(m \in M)$; if the change of the corresponding attribute state itself at different time points is comparable, it is said to be descriptive. If the corresponding attribute state is measurable, it is said to be measurable and has measure dimension d_a. If the attribute state changes randomly, d_a represents the probability distribution. If the attribute state is fuzzy measurable, d_a represents the corresponding fuzzy number. If the attribute state is measurable and the change of state value with time is identified, there is a function $a_t = f_a(a_{t-1}, t)$, where the attribute state value at time t. In this way, there are knowledge elements corresponding to attributes

$$K_a = (p_a, d_a, f_a) \quad \forall a \in A_m \quad (\forall m \in M), \quad (10)$$

where p_a is the measurable feature description. When $p_a = 0$, it indicates that the attribute state is indescribable; when $p_a = 1$, it can be described; when $p_a = 2$, it is conventionally measurable; when $p_a = 4$, it is random and measurable; when $p_a = 4$, it is fuzzy and measurable; etc. Obviously, there is $p_a > 0, d_a \neq \phi$, but f_a may be empty.

Set $r \in R_m\,(m \in M)$ as a mapping relation on $A_m \times A_m$; in general, r has mapping attribute description p_r, such as structure, membership, linear, nonlinear, fuzzy, random, and specific mapping functions. At the same time, there are r: $A_r^I \longrightarrow A_r^O\,(A_r^I \subseteq A_m$ and $A_r^O \subseteq A_m, \quad \forall m \in M\delta)$, where A_r^I is called the input attribute state set and A_r^O is called the output attribute state set. There is a specific mapping function $A_r^O = f_r(A_r^I)$, where the attribute state value at time t. There is a knowledge element corresponding to the change relationship as follows:

$$K_r = \left(p_r, A_r^I, A_r^O, f_r\right) \quad \forall r \in R_m\,(\forall m \in M), \quad (11)$$

where p_r can not only describe the attribute characteristics of f_r, but also expand the method characteristics of how to identify the formula. Here, $p_r \neq \phi, A_r^I \neq \phi, A_r^O \neq \phi, f_r \neq \phi$.

In this way, the common knowledge or basic knowledge K of the model can be comprehensively described as follows:

$$K_b = \bigcup_{m \in M}\left(K_m \cup \left(\bigcup_{a \in A_m} K_a \bigcup_{r \in R_m} K_r\right)\right). \quad (12)$$

Therefore, the further division of emergency information resources can be described in three parts: conceptual

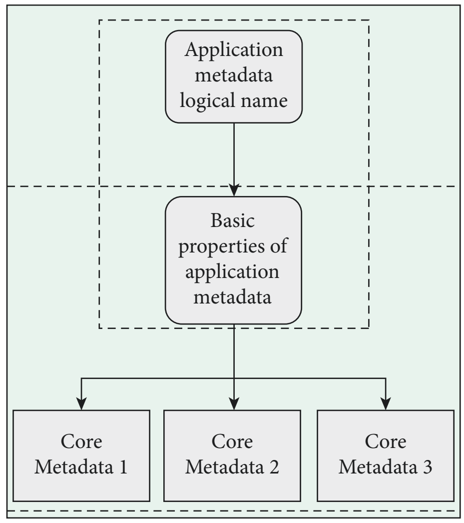

Figure 1: Application metadata hierarchical naming method.

attributes, states, and mapping relationships according to the above formula.

In the emergency information resource management environment, there are different application metadata according to different emergency information requirements. How to store and manage application metadata has become an important issue that needs to be considered in emergency information resource management. The application layer of emergency information resource management provides a kind of tree-shaped metadata management, and the sharing mechanism of data resources and storage resources can be formulated on this management layer.

The core metadata is in the middle layer of the metadata management model. It is a bridge connecting storage resources and application metadata. It is used to describe the information associated with the metadata and storage, as well as the basic information that can describe the core of the emergency. For the underlying storage resources, the core metadata only provides information that identifies and describes the physical aspects of the metadata, such as titles and identifiers. For the application layer of the upper level, the core metadata provides basic information about the core of the emergency, such as the location, latitude, and longitude. The core metadata is abstracted from the previous accumulation of business work in the form of emergency information resources. We have extracted 10 core metadata elements in the field of emergency response: data table, picture, text, hypertext, database table, text library table, GIS attribute table, external database table, database view, and xml information object.

The middle layer of metadata management is similar to the human brain and is used to govern the fundamental knowledge of the entire system model. The basic information of each subcategory of the four major categories of public emergencies is stored in the middle layer. This information is stored according to the structure, state, and mapping relationship defined on the metadata base. Complete the classification, naming, and library table organization of core metadata in related fields, and complete the mapping relationship according to the organization provided by the organization layer.

Application metadata is integrated by the organization strategy of the organization layer and the core metadata resources of the middle layer. It belongs to a higher-level metadata application. Therefore, it not only has the elements of metadata itself, but also inherits some basic attributes of core metadata. In order to meet these two requirements, we adopt a hierarchical naming method, as shown in Figure 1.

This naming structure can adopt loose coupling relationship between core metadata and application metadata. This loose coupling can make metadata management more flexible and quickly solve problems according to different needs. At the same time, this naming structure can better solve the metadata structure problem of the index system.

At the application layer, it is the high-level management level of the metadata management model. It mainly integrates the metadata of emergency information resources from the perspective of emergencies.

In order to unify the access mode of data, metadata management should define the information resources in emergencies in a unified standard format. The core includes data resources, image resources, and text resources. All resources can be broadly understood as a "file" stored in data management, and its metadata must include one of the core metadata elements that can be marked in the system.

Each application metadata element records its own basic attributes, and the basic attributes of calling the core metadata, mark whether it is the root node or the id value of the child node in the library table stored of the attribute structure, and the data structure is defined as follows:

$$
\begin{aligned}
&\langle ?\text{xml version} = {''}1.0{''}\text{encoding} = {''}GB2312{''}\rangle ?\\
&\langle IDTOE\rangle\\
&\langle ID/\rangle\\
&\langle NAME/\rangle\\
&\langle PID/\rangle\\
&\langle DPTYPE/\rangle\\
&\langle CHTLD/\rangle .
\end{aligned}
\quad (13)
$$

The application metadata closely related to the application can create new application metadata according to different requirements from different organizational strategies proposed by the organization layer and different core metadata in the middle layer.

According to its metadata classification, emergency information resources can be divided into two domains, which can be defined as physical domain and virtual domain. Each physical domain provides the emergency information description and auxiliary decision information description of emergency information resources. At the same time, the resources in this domain can integrate the metadata structure of emergency information resources through the integration template component called by the organization layer. In a single domain, the metadata organization structure can be defined as a binary tree; between multiple physical domains, the root metadata node of each domain constructs a common tree for interconnection to describe an application metadata. The structure is shown in Figure 2.

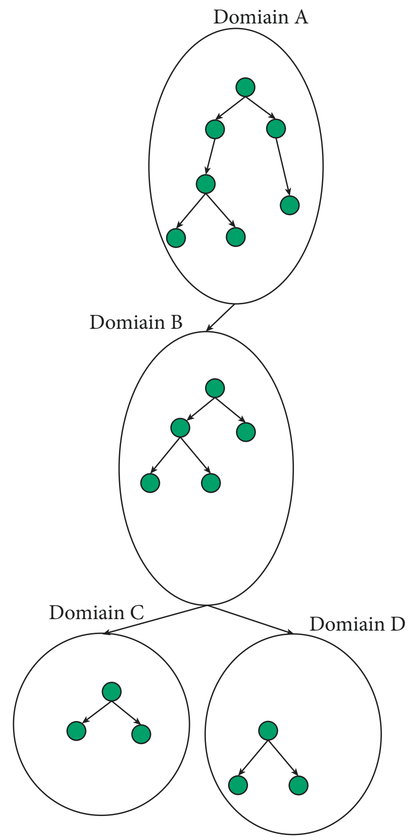

FIGURE 2: Application metadata tree structures.

All business processes are controlled by metadata, and different application metadata is established according to different businesses. Therefore, the business components we implement in emergency management are flexible and changeable models based on metadata.

According to the previous description of the characteristics of emergency information resources, we can know that there will be entry and exit of some metadata in emergency decision-making management. In view of the above situation, this section adopts a dynamic management method to meet the needs of emergency management.

In data processing and analysis, how to discover predictable data in massive data and predict the future based on data processing is an important function of data warehouse. It is necessary to display the development trend of data processing and business process in front of users in an intuitive way.

For the general situation in emergency decision management, the metadata management platform has provided a series of available application metadata domains for management activities. The fields and subdomains included in the domain can meet the requirements of basic transactional work in emergency decision-making. However, for some unconventional emergencies, the general application metadata may not meet the requirements of describing events; therefore, the function of dynamically adding and deleting basic metadata is provided in this model. The specific workflow is shown in Figure 3.

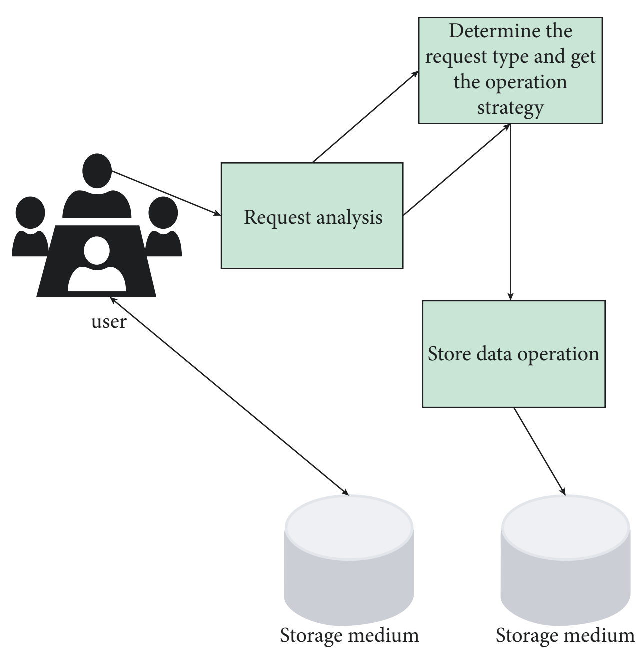

FIGURE 3: Workflow of dynamic management.

It can be classified into two main functions: data information maintenance and data presentation, which together constitute user interaction management components. Data information maintenance includes data entry, data addition, data deletion, and data query functions, and data presentation includes graphic display function and table display function.

After a user enters the system and establishes an access right, the metadata management model establishes metadata access and operation policies in the middle layer. After the user sends a request to add application metadata, the metadata management model is based on the following two situations.

Case 1: add the metadata as a node in the emergency domain. Case 2: add the metadata as a single domain for its

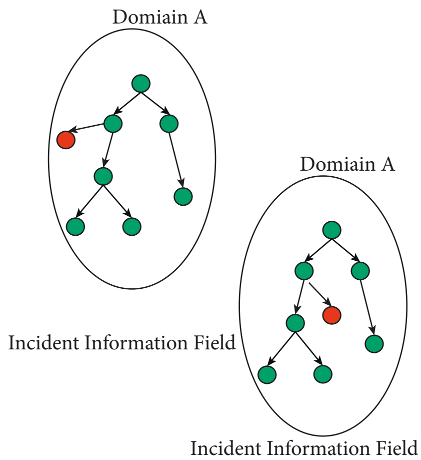

Figure 4: Root node change in emergency domain node.

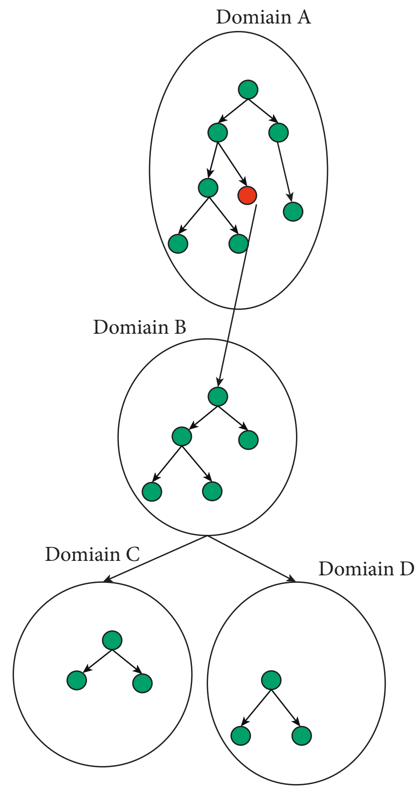

Figure 5: Added root node applied to metadata.

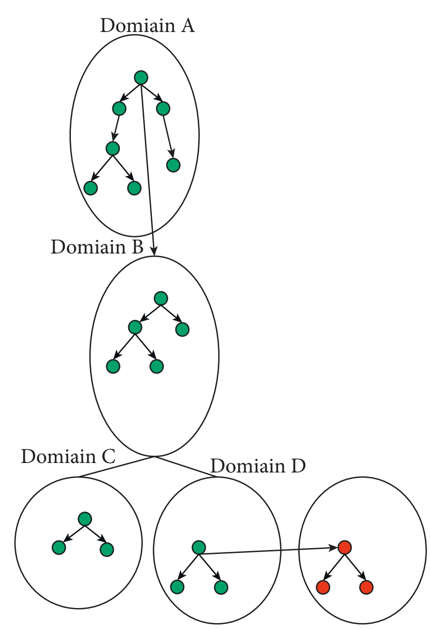

Figure 6: Single physical domain joining tree structure.

node, and request that it becomes any node in the auxiliary information domain. In a single physical domain, you can request that the new application metadata be inserted into any position in the tree structure of the domain, which can be divided into two cases: being added as a leaf node and a root node in the emergency domain. The system processes the request. The dynamic nodes joining in the emergency domain involve the structural adjustment of different trees in the two domains. In the emergency domain, the added node is the common tree leaf nodes addition and deletion of the metadata in the physical domain. From the whole application metadata tree domain, the emergency domain is the root node domain of the whole domain, as shown in Figures 4 and 5.

In general, components encapsulate the details of design and implementation. Only one interface is provided externally. In this way, the component can realize the clear identification of the function through the interface.

When it comes to the domain group combination of multiple application metadata, for the security of metadata management, only allow the domain to join the whole application metadata domain as a leaf node; at this time, only add one leaf node to the parent node of the domain, which will not affect the established tree structure, as shown in Figure 6.

4. Evaluation of the Effect of Grain Subsidy Policy Based on Mathematical Statistical Analysis

The components used to control business flow and user interaction are called presentation components. The system presentation component expresses a complete user interaction scene by assembling logical components and user interface through a component-oriented graphical development environment.

Take a certain area as an example for research, combined with the physical structure of data statistics proposed in this article for data processing. According to the purpose of this empirical study, the object of the study, and the characteristics of operability, the main data selected is to sort out and calculate the amount of food subsidies in a certain area from 2011 to 2020. In the past ten years, the grain sown area for the ten years' period from 2011 to 2020 is mainly increased. The time span of the research data is ten years, and the consumer price index will be different every year. The difference in the consumer price index will influence the

Table 1: Changes in grain sown area and grain subsidies.

Years	Sown area (thousand hectares)	Direct food subsidies (100 million yuan)	Subsidies for improved varieties (100 million yuan)	Comprehensive subsidies for agricultural materials (100 million yuan)	Agricultural machinery purchase subsidy (100 million yuan)
2011	6261.0	7.6	0.0	19.0	2.7
2012	6158.0	7.7	6.9	20.9	3.3
2013	6219.6	7.8	0.0	31.4	4.7
2014	6279.2	7.8	12.4	35.8	5.8
2015	6344.8	7.8	14.6	45.4	6.6
2016	6349.5	7.9	14.8	51.6	6.6
2017	6365.4	8.4	15.5	52.8	7.4
2018	6379.1	8.8	15.9	58.0	9.5
2019	6395.3	9.4	16.4	60.9	10.4
2020	6456.3	9.8	16.3	63.7	11.4

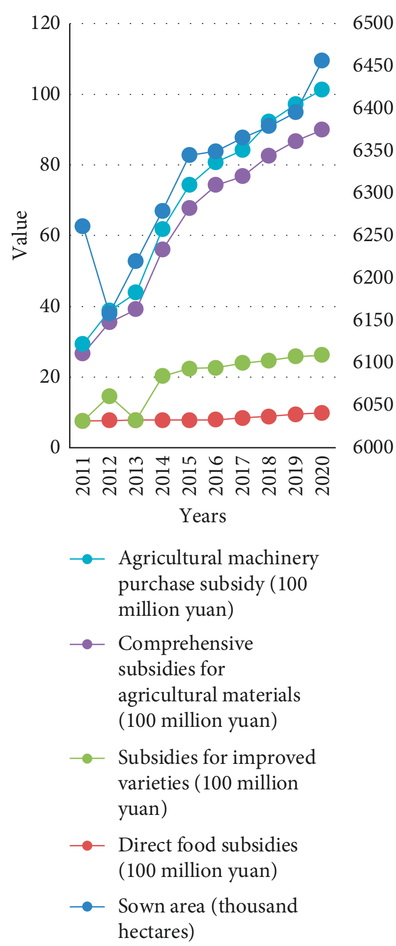

Figure 7: Data change line plot.

effect of the amount of grain subsidies on the sown area of grain. In order to avoid the impact on the results after the measurement analysis is carried out, the price of each year will be adjusted before the measurement analysis is carried out. The factors are eliminated and then analyzed to ensure the correctness and scientificity of the results.

The data of the empirical analysis in this paper mainly includes the grain sown area from 2011 to 2020 and the annual specific direct grain subsidies, subsidies for improved varieties, comprehensive subsidies for agricultural materials, and subsidies for the purchase of agricultural machinery. Among them, the specific amount of various political subsidies is obtained through detailed calculation and collation. See Table 1 and Figure 7.

If the original initial data is directly regressed, it may be affected by the price factor every year, and the final result will be wrong. Therefore, the annual price factor should be eliminated before the regression analysis to ensure the

Table 2: Grain sown area and changes in food subsidies after excluding the price index.

Years	Sown area (thousand hectares)	Consumer price index (%)	Direct food subsidies (100 million yuan)	Subsidies for improved varieties (100 million yuan)	Comprehensive subsidies for agricultural materials (100 million yuan)	Agricultural machinery purchase subsidy (100 million yuan)
2011	6260.99	101.00	7.58	0.00	19.00	2.68
2012	6157.97	106.15	7.30	6.60	19.87	3.11
2013	6219.58	109.18	7.19	0.00	29.04	4.36
2014	6279.17	101.30	7.80	12.34	35.71	5.79
2015	6344.82	104.64	7.52	14.09	43.79	6.33
2016	6349.47	107.57	7.39	13.87	48.46	6.16
2017	6365.42	103.53	8.20	15.15	51.53	7.24
2018	6379.06	104.54	8.48	15.36	56.02	9.18
2019	6395.32	102.82	9.26	16.10	59.84	10.24
2020	6456.33	101.51	9.80	16.23	63.42	11.33

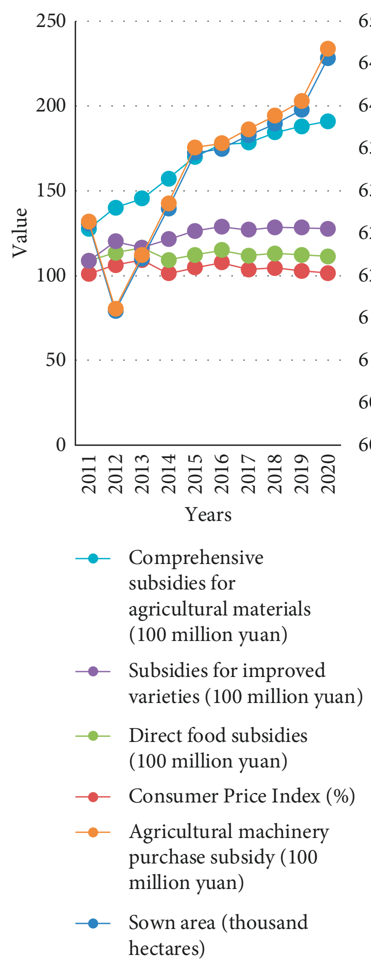

Figure 8: Line plot after data analysis.

accuracy of the analysis result. Among the results, 2011 is the initial year as the base period, and the price index is 100. The data after deflation is shown in Table 2 and Figure 8.

Through the above analysis, we can see that the method proposed in this paper can realize the effective evaluation of food subsidy policy.

5. Conclusion

After a long period of continuous optimization and adjustment, the food subsidy policy has achieved certain results while still having shortcomings. This article first summarizes and organizes the effects of food subsidy policies in detail through the study of relevant literature and previous studies on the effects of grain subsidy policies. Considering the actual development of agricultural production today, it analyzes the implementation content of the grain subsidy policy; the structure of the policy; and the changes in the grain sown area, farmers' income, and total power of agricultural machinery under the implementation of the grain subsidy policy. Finally, the effect of the implementation of the grain subsidy policy is studied, and a mathematical statistical model is used to empirically analyze the impact of the grain subsidy policy and the grain sown area and draw conclusions. Through research and analysis, we can see that the method proposed in this paper can realize the effective evaluation of food subsidy policy.

Data Availability

The labeled dataset used to support the findings of this study is available from the author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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