ABSTRACT
Currently, the grain processing industry excessively pursues the goal of fine processing, resulting in serious waste of grain processing enterprises, increasing raw material cost and low machining efficiency, etc. To solve problems, this paper builds a food processing and data analysis system which can perform various data analysis. The system has following functions: Grain processing database is able to store and call consumer market surveys and data of grain processing enterprises, visualizing the national diet and grain processing process. Data analysis can carry out statistical analysis of data sets extracted according to required indicators, diagnostic optimization based on Data Envelopment analysis, prediction analysis based on curve fitting, classification analysis based on clustering algorithm, etc. It can obtain conclusions of relationships between the output rate, loss rate and unit power consumption of each link, and influencing factors of grain processing links like rice milling and polishing on products. The diagnostic evaluation system can evaluate consumption of raw materials and power for different product enterprises, and improve the scheme to avoid loss caused by the mismatch between raw materials and process in production process. The production practice shows that the grain processing data analysis system designed in this paper is effective.

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1. Introduction
As we all know, China is a big grain producer and a big grain processing country in the world. However, China has a large population and relatively backward grain processing technology. In recent years, the land for grain has decreased (Liu, Feng, Yang, & You, 2011). China’s grain resources are in a tight balance state of dependence on imports (Yao, 2015). According to the latest estimates of the State Food Administration, the total amount of waste loss in grain storage, transportation and processing are more than 70 billion kilograms per year in China, and the total loss in grain processing is more than 13 billion kilograms per year. In the Outline of the 13th Five-Year Plan for the Development of the Food Industry, it is emphasized to speed up the readjustment of the grain industrial structure, give full play to the role of the engine of the grain processing industry, and speed up the appropriate processing of grain products. Because of China’s vast territory, underdeveloped transportation, imperfect market development and poor storage conditions, China’s food security and security system are relatively fragile, China’s food processing informatization has great potential for development (Xu, 2001). Establishing an analysis system that can diagnose, predict, classify, count and compare the production data of each link in the process of grain processing can promote the development of China’s grain processing industry, promote the renewal of technology and equipment, help enterprises achieve the purpose of increasing production and reducing consumption, help the government formulate relevant policies of saving grain and reducing loss, and avoid abnormal production in the grain processing industry. All what mentioned above are of far-reaching significance to the whole grain industry in China.

At present, the application of this type of system is still in the initial stage in China. For small grain enterprises, due to the size and funding problems, most of them lack instruments to test raw materials and product indicators (Yao, 2014). Therefore, the recognition of raw materials and products is insufficient. Due to the variety of grain processing and the complexity of processing technology in large and medium-sized grain processing enterprises, the loss and waste in the process of grain processing are also serious. In addition, many countries and organizations in the world have achieved some results in the information construction of food-related data (Kong & Wu, 2008). The Food and Agriculture Organization of the United Nations (FAO) has designed and implemented...
the Global Food and Agriculture Information and Early Warning System (GFIAS) (Benini & Bertozzi, 2003), also managing to analyze relevant data. The United States International Development Representative (USAID) has designed and implemented the 'Hunger Warning System (FEWS)' (Gerin, Yoo, Nicolesu, & Jerraya, 2001).

Under the above background, based on the current situation of grain processing industry, this paper constructs a diagnosis and optimization system for grain processing. Through data analysis, the system can give a clear and specific understanding of the loss of grain processing process. At the same time, the system can selectively open the corresponding functions of the system according to the specific needs of users. The core functions of the system include consumer data analysis and display, industry data analysis and display, diagnosis optimization based on Data Envelopment analysis, prediction analysis based on curve fitting, classification analysis based on clustering algorithm. The system can not only help the grain processing industry increase production and reduce consumption, but also promote the degree of informatization of the grain processing industry. It can not only maximize the interests of enterprises, but also play a key positive role in the development of national grain.

2. Technical selection

2.1. Database management software

MySQL, web application is the best relational database management system (RDBMS). After years of development and updating, it can handle tens of millions of data and run efficiently. In addition to the official WorkBench, there are a variety of visual database management softwares supporting MySQL; it supports common structured query statements (SQL) and multiple character sets, and has open source community edition. Compared with other large databases, it has better performance-price ratio, development difficulty and maintainability. At the same time, the system implements object persistence through Hibernate (Han-zeng & Lin, 2003), which maps Java objects with data stored in relational database through its powerful O/R mapping function, avoids developers using a large number of SQL statements to operate the database through JDBC, and can effectively improve the efficiency of development. Applying it to the network report system can make full use of its advantages.

2.2. Data visualization

Considering that the system involves a large amount of data in various stages of grain processing, the data functions of the system mostly display the data stored in the database or the analysis results or imported sampling data intuitively in the form of charts to improve the user experience. Considering the cost of development and the difficulty of later maintenance, the system uses ECharts to realize data visualization (Li et al., 2018). Echarts is an open source visualization library implemented by JavaScript. It can run smoothly on PC and mobile devices, compatible with most current browsers (IE8/9/10/11, Chrome, Firefox, Safari, etc.). The bottom layer relies on the lightweight vector graphics library ZRender to provide interactive and highly customizable data visualization charts.

2.3. MVC framework

The full name of MVC is Model View Controller. In order to build an efficient, flexible and easy-to-use Model-View-Controller mode implementation mechanism, a Spring framework-based MVC framework (Zhang, Wang, & Zhang, 2010). The code is organized by a method of separating business logic, data and interface display, and the business logic is aggregated into one component. While improving and customizing the interface and user interaction, the business logic does not need to be rewritten. Xue et al. (2012) based on the analysis of the basic composition and principle of MVC architecture, introducing explicitly the composition principle and application configuration of SpringMVC architecture. This system adopts SpringMVC framework, SpringMVC is an open source, lightweight and universal framework on Java platform.

2.4. Realization of basic Essential functions

Apache Software Foundation projects are widely used in the basic functions of the system, such as servers, project management tools, batch import and export functions, security framework and so on. Apache Tomcat is a Servlet container developed by the Jakarta project of Apache Software Foundation. According to the technical specifications provided by Sun Microsystems, it supports Servlet and Java Server Page (JSP). Apache Maven, a project management tool, has high reusability of default construction rules, which greatly reduces the workload of developers and maintainers. Batch import and export functions provide APIs to Java programs to read and write Microsoft Office format files through Apache POI. Apache Shiro is a powerful and easy-to-use Java security framework that implements authentication, authorization, password and session management.

3. Construction of grain processing system

3.1. Design of grain processing evaluation system

This system is the first time to construct a general grain processing evaluation system. The standard values of each index in the system come from thousands of
data provided by national grain processing enterprises. Through the function of diagnosis and optimization, the user data are compared with the data of national grain processing enterprises, and the diagnosis results and optimization opinions for grain processing schemes are obtained.

In this paper, the output rate and loss rate are determined based on the data of artificial processing precision, raw material type, processing equipment type and so on. For individual enterprises which are in order to accurately process or cater excessively to the needs of consumers, the index of broken rice rate, loss rate of edible substances, loss rate of nutrients and so on are also measured. Considering the generality, accessibility and intuition of the grain processing evaluation system, the output rate, loss rate and waste rate of each link are selected as three basic indicators of the grain processing evaluation system.

Output rate $y$ refers to the proportion of the finished products entering the next link to the raw materials entering this link. The mathematical expression is:

$$y = \frac{f}{r} \times 100\%$$

In the formula: $f$ represents the amount of finished products and $r$ represents the amount of raw materials.

The output rate can also be expressed by the proportion of finished products of all links to the whole processing process of the raw materials entering the whole process. The expression is:

$$Y = \frac{F}{R} \times 100\%$$

In the formula: $Y$ represents the production rate, $F = \sum_{i=1}^{n} f_i$ represents the amount of finished product, $R = \sum_{i=1}^{n} r_i$ represents the amount of raw material. If $y$ of a link is less than $Y$, it means that the process of this link or other factors need to be optimized.

Loss rate $l$ refers to the share of the loss of the link to the amount of raw materials entering the link. Its expression is:

$$l = \frac{d}{r} \times 100\%$$

In the formula: $d$ represents the amount of loss and $r$ represents the amount of raw material.

The loss rate can also be expressed by the proportion of the loss $D$ in the raw material quantity $R$ that enters the whole process. The expression is:

$$L = \frac{D}{R} \times 100\%$$

Where $L$ represents the loss rate, $D = \sum_{i=1}^{n} d_i$ represents the amount of loss, $R$ represents the amount of raw materials.

Waste rate $W$ refers to the difference between the loss rate of this link and the average loss rate of national sample points, under the same process and equipment.

$$W = L - LA$$

Where $L$ represents the loss rate and $LA$ represents the evaluation loss rate.

3.2. System pattern and functional correlation design

This system is B/S mode, that is, the browser/server structure, is, with the rise of Internet technology, the C/S structure of a change or improvement of the structure. Under this kind of structure, user interfaces entirely with the WWW browser implementations, implementing part of transaction logic at the front end, but the main transaction logic was implemented in the server sides. Using general browser can achieve the original need complex specialized software to realize the power of and save the cost of development and users only need to access via a browser. C/S is based on the LAN, and B/S is based on the WAN. B/S does not need to install software, does not need to consider the system in the user’s personal computer compatibility. Moreover, the users do not need to download the system update, just changing the system on the server. B/S mode is more suitable for a wide range of users of the system, as shown in Figure 1.

The system consumer survey data and grain processing industry data filling authority are only assigned to the system developers; The data survey, basic data and statistical analysis data will have a certain impact on the diagnosis and evaluation, so that the diagnosis and evaluation can put forward diagnostic suggestions for grain processing from a perspective that is more suitable for consumer preferences and enterprise needs, as shown in Figure 2.

3.3. Core database design

Database technology is a very important step in software development. The development of database technology has become one of the most important components of
information technology. Scientific database designs can provide relevant information efficiently and accurately after issuing instructions, thus improving the operation speed. The large amount of information stored in the database and the excellent data design make it convenient for users to quickly find the required information, timely update the stored information, and clean up some invalid data, which can give full play to the functions of the system. This system database, according to the past design experience, as well as from the user’s point of view, as far as possible all-round consider system function, makes the data more accurate. It mainly stores three types of data, namely user data, consumer survey data and food processing industry data, which are closely related to the design of system functions, as shown in Table 1. The functions of the system correspond to the database tables one by one.

User rights management is one of the most basic and important functions of the database system. It can prevent the damage caused by ordinary users to the file data, and is particularly important when some important file data may not be open to all users. User data in this database includes not only account number and password, but also system privilege level, which is used to realize the function of external schema/schema mapping for different users, ensuring the security and independence of data in the database, as shown in Table 2.

Types: The user types
Authority A: Consumer data analysis and display authority
Authority B: Industry data analysis and display authority
Authority C: The authority of predictive analysis based on curve fitting
Authority D: The authority of classification analysis based on clustering algorithm
Analysis: Data envelopment analysis based on the permission of diagnostic optimization

Grain processing efficiency is related to the industrial performance of China’s grain circulation industry and the country’s major strategy of grain saving and loss reduction. As direct stakeholders, consumers are important participants in food processing supervision, and the survey results will serve as an important indicator for enterprises to formulate reasonable processing plans. The consumer surveys data onto the database of this system come from consumers’ cognition of grain processing products, and regular surveys on the market, in which the questionnaires are presented in the form of multiple choice questions, and some data are shown in Table 3.

Grain processing industry data is one of the important indicators, optimizing diagnosis system through the analysis of the processing of various enterprises scale, grain type, the type of raw materials, processing

| Table 1. Functions and data table correspondence. |
|---------------------------------------------------|
| The core function | The data table |
| The user login | User data table |
| Consumer data analysis and presentation | User data table, consumer survey form |
| Industry data analysis and presentation | User data table, industry survey form |
| Diagnostic optimization based on data envelopment analysis | User data table, consumer survey table, industry survey table |
| Prediction analysis based on curve fitting | User data table, industry survey form |
| Consumer data analysis and presentation | User data table, consumer survey form |

| Table 2. Part index design and simulation data of user data table. |
|---------------------------------------------------|
| Types | Account | Password | Authority A | Authority B | Analysis | Authority C | Authority D |
|---------------------------------------------------|
| The developer | View, Modify, Use | View, Modify, Use | View, Modify, Use | View, Modify, Use | View, Modify, Use | View, Modify, Use |
| Corporate management | View, Modify | View, Modify | View, Modify | View, Modify | View, Modify | View, Modify |
| The average user | View, Modify | View, Modify | View, Modify | View, Modify | View, Modify | View, Modify |

| Table 3. Design and simulation data of some indicators in consumer survey form. |
|---------------------------------------------------|
| Serial number | The survey of time | Buying experience | Buying decision | The product of cognitive | Demand | Eating habits | The purchasing power | Age groups | Income |
|---------------------------------------------------|
| C185450 | 20181211 | A | C | A | D | B | E | A | C |
| C190300 | 20190301 | C | A | D | D | A | B | A | A |
Table 4. Design and simulation data of some indexes in the questionnaire of grain processing industry.

| Serial number | The survey of time | Sampling area | Processing size | Type A | Type B | Equipment | Consumption | Output | Loss rate |
|---------------|--------------------|---------------|----------------|--------|--------|-----------|-------------|--------|-----------|
| B181075       | 20181211            | 15            | Big Rice       | Import | Mix and match | 5000        | 78     | 30        |
| B190023       | 20190301            | 28            | middle Wheat   | Domestic | Import | 1000       | 65     | 15        |

Figure 3. Main interface for consumer data analysis and presentation.

4. Core functions

The core functions of this system use traditional statistical analysis methods and modern data analysis algorithms to analyze the investigated consumer data, market and industry data of grain processing, analyze the data onto diagnosis optimization, prediction analysis and classification analysis, and visually present the data onto users in the form of charts.

4.1. Consumer data analysis and presentation

The functional data comes from the consumers onto product purchase experience, cognitive and purchase decisions for grain processing product, demand for grain and oil product survey, respondents were initiated the demographic characteristics of the four aspects of grain processing product cognition and market survey regularly, questionnaire is multiple choice form, which can get the current social the eating habits of different groups. This function realizes the import and export function of data files through Apache POI, exporting Excel template file of questionnaire statistical table, and then relevant personnel will fill the template file with the survey results, and then import the template file into the system database. Users can check the indicators in the front-end page, and the system carries out traditional statistical analysis on the corresponding data, which can be visually presented to users through Echarts. The administrative department can also formulate appropriate policies to guide the people to develop good eating habits. Grain processing enterprises can get the current consumer market eating habits and then design reasonable processing plans.
Users click on consumer data in the system interface, then click on purchase decision, you can view the results of all consumer questionnaires, but also for different problems, input options to query, as shown in Figure 3. You can also view the impact of different factors on consumer decision-making in the data visualization interface, as shown in Figure 4.

4.2. Industry data analysis and presentation

The data filled with this function come from the sample points of national grain processing enterprises for regular sampling, and the specific indicators include the raw material variety, storage time, sampling area, processing type, processing equipment, processing scheme, etc. Investigators clean and encrypt the data, and store the encrypted data onto the database. Like the consumer data analysis and presentation function, batch import is realized through Apache POI, and Echarts realizes the graphical display. This system in the role authority, user password encryption, imports data monitoring, data encryption storage these aspects to ensure the security of users at the same time protect the privacy of the data source enterprise.

By using traditional data analysis, the data onto grain processing evaluation system and cost of different types of grain processing under different statistical indexes can be statistically analyzed, according to varieties, regions, scales, provinces, equipment, processes and other dimensions, and displayed by percentage pie charts or bar charts of average values of different levels. In each dimension, there are a variety of indicators, which can be selected to display separately, such as processing type optional rice processing type, wheat processing type, oil processing type, etc., loss rate type optional starch loss rate, protein loss rate, crude fat loss rate, cellulose loss rate, mineral loss rate, etc. As shown in Figure 5.

4.3. Diagnostic optimization based on data envelopment analysis

4.3.1. Functional design

This system USES data envelopment analysis to realize the function of diagnosis optimization. According to meiju li and guohong Chen (2003)’s description of the idea, model and application steps of data enveloping analysis method, it is a quantitative analysis method, which evaluates the relative effectiveness of comparable units of the same type according to multiple input indicators and multiple output indicators and based on the method of linear programming (Qi, Li, Liu, & Meng, 2003). Jianzhi Feng verified and the affirmed efficiency and objectivity of DEA method on. Data envelopment analysis method is suitable for complex systems, multiple input multiple output for decision-making units, the weight of each input or output variables, to evaluate from the perspective of the most conducive to the decision making units, so as to avoid the weights of the indexes in the sense of priority; Given that each input is associated with one or more outputs, and that there is indeed some relationship between
the input and the output, it is not necessary to determine the display expression of this relationship using the data envelopment analysis method.

The system takes different processing schemes as the decision-making unit, the number and precision of each processing link as the input index, and the output rate as the output index. Combined with the grain processing evaluation system, the influencing factors of loss and waste in the grain processing process are analyzed, which can put forward reasonable, effective and feasible and can verify corrective measures, to promote the food processing link loss, grain for grain processing enterprise research and development and promotion of high efficiency, low consumption, loss of new processing technology, improve grain processing and conversion and comprehensive utilization of the by-product, produce new festival food and nutritious grain processing products, as shown in Figure 6.
4.3.2. Function implementation
The optimization analysis function makes decisions based on linear programming, according to multiple input indexes and multiple output indexes provided by users. Users input the corresponding multiple indicators, and the system makes prediction and judgment on the data according to the data envelopment analysis method, and outputs the corresponding result value for users’ reference, judging the relationship between the current operation mode and profit value, and makes macro-control and micro-rectification. The specific steps are as follows:

Step 1 Initialization, the user imports the corresponding processing scheme data file locally as the decision unit \( k_0 \), and makes a decision unit \( k_i \) (\( i = 1, 2, \ldots, n \)), where input index \( p \), output index \( q \), \( x_{ij} \) is the \( i \)th input of the \( j \)th decision making unit, and \( y_{rj} \) is the \( r \)th output of the \( j \)th decision making unit.

Step 2 The weights of input and output indexes of data envelopment analysis were set according to the existing data in the database.

Step 3 The efficiency evaluation index \( h_0 \) of decision unit \( k_0 \) was defined, and the C2R model was established.

Step 4 DEA effectiveness evaluation was conducted on \( k_0 \) according to \( h_0 \).

Step 5 According to DEA evaluation results, judge whether the current user processing scheme is reasonable, and put forward optimization Suggestions for each link.

Step 6 Generate the analysis results file for the user to download and view.

4.4. Prediction analysis based on curve fitting
4.4.1. Function design
The prediction analysis function forecasts the total loss of grain enterprises through simulation, which provides reference and theoretical support for the promulgation of policies. When making processing plans, traditional grain processing enterprises usually use methods such as actual processing test and manual estimation to evaluate whether the processing plans are reasonable. These methods are not only of low accuracy, but also cause a lot of cost waste and increase the burden on enterprises. The system uses curve fitting to predict and analyze a large amount of data in the grain processing database, which can reduce the cost of making processing plans and increase the authenticity of the predicted results. At the same time, users can adjust the processing parameters for many times, choose different indexes, obtain the prediction results of different dimensions, evaluate the rationality of the processing scheme through the multidimensional prediction results, and make a more scientific and reasonable arrangement for the development of enterprises. As shown in Figure 7, the user clicks on the prediction and classification function, checks the processing accuracy and broken rice rate, and inputs the processing progress value, clicks the prediction button.

![Grain Processing Diagnostic Optimization System](image)

*Figure 7.* Select indicators and input data to be test.
to predict the broken rice rate of the processing plan, as shown in Figure 8.

4.4.2. Function realization
The curve fitting used in this system is mainly based on the index selected by the user and the input data to carry out the curve fitting of the corresponding index of the grain processing data in the current database. In this way, the relational function of the two indexes in the current database can be obtained, and the user input data can be substituted into the function to calculate the predicted value, so as to obtain the optimal solution of the processing index quantity. The specific steps are as follows:

Step 1 Users tick the x and y indicators in turn on the front-end page, input the z value of the processing data index x to be predicted, and start the prediction. For example, checking the processing accuracy and broken rice rate as indicators, users need to input new processing accuracy values.

Step 2 Read the corresponding index data from n pieces of processing data in the database according to the index selected by the user. The corresponding index of each piece of processing data constitutes the vector \( s_j (x, y) \), which constitutes the vector set \( S \).

Step 3 In the development process, set the highest order \( L \) of the independent variable of the curve fitting function, according to the existing data and programming language performance. Set up the collection: \( X = \{ (x^L, x^{L-1}, \ldots, x^0), (x^L, x^{L-1}, \ldots, x^0), \ldots (x^L, x^{L-1}, \ldots, x^0) \}_{n-1}, Y = \{ y_0, y_1, \ldots, y_n \} \).

Step 4 \( y = a_0x^L + a_1x^{L-1} + \cdots + a_{n+1}x^0, A = \{a_0, a_1, \ldots, a_{n+1}\}, Y = A \cdot X. \)

Step 5 Calculate the least-squares method parameter according to \( A = (X^T X)^{-1}X^T Y. \)

Step 6 According to the curve fitting function obtained by fitting the input data z, the corresponding expected value can be generated and output to the front page.

Step 7 If necessary, repeat step 1-step 6 through adjusting function type and sample number for multidimensional fitting.

4.5. Classification analysis based on clustering algorithm
4.5.1. Function design
This function classifies and analyzes the data in grain processing based on clustering algorithm. Macqueen proposed the idea of cluster analysis in 1963 (MacQueen, 1967), which was developed and applied by Lloyd (1982). The macro function of classification analysis is to read the corresponding data of each index in the basic data table, according to the user’s choice, so as to classify the macro data of grain processing industry. Understanding the food situation and production and processing efficiency of each region can play a guiding role in the regional circulation of food, so as to alleviate the pressure of food in the regions short of food. Taking the processing technology and other indicators as the information component vector as an example, the user can know the current industry using a variety of processing technology.
corresponding to the index of the enterprise group, and can also know which several kinds of processing technology corresponding to the other indicators close for the enterprise is not updated. These can be used for their own enterprises processing technic selection as a reference to harvest the most cost-effective process update and avoid useless expenditure. Through data clustering analysis, enterprises with less processing loss and better finished product quality can be obtained. Provincial governments can provide financial subsidies to these enterprises, so as to improve the enthusiasm of grain processing enterprises and promote the development of grain economy. They can also issue policies in line with the grain processing and production situation of the province to reduce the waste and improve the efficiency of grain production and processing. The micro application of classification analysis is to analyze the user’s own data. The user imports the data under different processes into the system, selects the indicators, combines them into such indicator vectors as (processing accuracy, broken rice rate), (processing accuracy, dehydration rate), and then classifies the data. If an enterprise needs to cut production and stop loss, it needs to stop part of the processing flow. Users can judge which processing line is more reasonable from the classified information, as shown in Figures 9 and 10.

4.5.2. Function realization
The clustering analysis algorithm used in this system mainly divides all the observed values into k groups to minimize the variation within each group and maximize the variation between groups. It is a very classical and important hard clustering algorithm, which divides objects into one or more clusters based on distance. As tabu search algorithm attaches great importance to the initial solution, this algorithm has a very high dependence on the cluster centroid. This system will adopt the average diameter method to select k centroid from the initial data. The specific steps are as follows:

Step 1: The user selects the query function after checking the x and y indicators in turn on the front-end page. For example, check the processing accuracy and broken rice rate as indicators.

Step 2: The system reads the corresponding index data from n pieces of processing data in the database according to the index selected by the user. The corresponding index of each piece of processing data constitutes the vector \( a_i \), which constitutes the vector set \( A \).

Step 3: Randomly select \( k \) vectors from the set \( A \) as the initial centre of mass.

Step 4: Compute the Euclidean distance from all the remaining vectors \( a_j \) to the \( k \) centres of mass, \( l_{jk} \).

Step 5: For all vectors \( a_j \), if the Euclidean distance from point \( a_j \) to the \( k \)th centre of mass is less than the Euclidean distance from all other centres of mass, then \( a_j \) and the centre of mass \( k \) constitute the set \( k \).

Step 6: Calculate the new centre of mass in all sets \( K \), and update the centre of mass \( K \).

Step 7: Repeat step 4-step 6 until the centre of mass remains the same.

Figure 9. Selection indexes.
Step 8: Output the classification results to the front-end page.

Step 9: If necessary, the new processing data is brought into the current vector set $A$ to calculate which set $k$ the data belongs to.

5. Conclusion

There is still much room for the improvement of technology and equipment and informationization in China’s grain processing industry. The establishment of an analysis system that can diagnose, predict, classify, statistics and compare the production data of each link in the process of grain processing can promote the development of China’s grain processing industry, promote the renewal of technology and equipment, help enterprises achieve the goal of increasing production and reducing consumption, and avoid abnormal updates in the grain processing industry.

Aiming at the problems of high loss and inefficient processing of information in the domestic grain processing industry, this paper proposes a diagnosis and optimization system for grain processing based on various data analysis algorithms, expounds the technical conditions and key functions of the system, and emphatically describes the optimization and improvement of the corresponding problems in the grain processing industry.

To a certain extent, this system has played a great reference role in China’s grain processing industry and helped the government to formulate relevant policies to save grain and reduce losses.

The food processing evaluation system constructed in this paper only regards the output rate, loss rate and waste rate as the basic indicators of the system. With the development of social economy, people’s dietary requirements will be further improved. In order to promote the development of food processing industry, in the future, we will collect a large number of processing data that meet the dietary requirements of the public, such as dehydration rate, protein loss rate, taste, viscosity and so on, to build a more perfect food processing evaluation system, where intelligent optimization algorithm and data mining algorithm are combined to make the evaluation system more optimized, so as to help food processing enterprises increase production and reduce consumption, but also help enterprises to develop food processing products suitable for consumer markets, guide and cultivate healthy national dietary habits.

Disclosure statement
No potential conflict of interest was reported by the authors.

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