Research on the Establishment of a Vegetable Industry Chain Information Platform and Its Application in Market Demand and Supply Analysis

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Abstract. With the continuous development of the agricultural industry,the establishment of a vegetable industry chain information platform has become the key to improve agricultural efficiency and market competitiveness. This study aims to provide a scientific basis for the optimization of vegetable industry decision-making by building a comprehensive information platform and analyzing the market demand and supply relationship in depth. The information platform covers the functions of data collection, storage, processing and analysis, and integrates the key information of vegetable production, processing, circulation and sales.

Keywords: Vegetable industry chain, information platform, market demand and supply analysis, big data, data analysis, supply chain

1 Introduction

As the global agricultural industry continues to develop, the production, distribution and market demand for agricultural products are facing increasingly complex and volatile challenges. Vegetables, as a basic food and source of nutrition, occupy an important position in people's daily lives. However, the problems of information asymmetry and imbalance between supply and demand in the vegetable industry chain hinder the healthy development of vegetable production and market[1]. To meet this challenge, this study is committed to establishing a vegetable industry chain information platform to deeply analyze the relationship between market demand and supply and provide a scientific basis for agricultural decision-making. This information platform not only covers the key information of each link of vegetable production, processing, distribution and marketing, but also realizes the interoperability of the whole chain data through the functions of data collection, storage, processing and analysis[2].

My research aims to explore how the information platform can promote the balance between market demand and supply, optimize the vegetable supply chain, and improve the science of agricultural decision-making. Through in-depth analysis of market demand, we can better predict future market trends and provide farmers and enterprises with scientific advice on planting planning and product positioning. Meanwhile, by monitoring the supply chain, we can identify and solve bottlenecks in a timely manner and improve the efficiency of the supply chain.

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2 Vegetable Industry Chain Information Platform Overall Structure

The construction of vegetable industry chain big data platform should be based on the data resources of the key links of the whole industry chain, such as production, processing, circulation, supervision, etc., with the goal of improving the level of vegetable production, operation and management decision-making, focusing on the problems and pain points of industrial development, integrating the upstream and downstream data and information resources, and fully exploring the value of industrial big data through the comprehensive use of information technology, such as big data, Internet of Things, satellite remote sensing, artificial intelligence, and so on[3]. Through the comprehensive use of big data, Internet of Things, satellite remote sensing, artificial intelligence and other information technologies, the platform fully exploits the value of industrial big data, serves the needs of government supervision and production and operation, promotes the change of industrial mode and supervision, and assists the scientific and healthy development of the vegetable industry. The overall architecture of the platform can be divided into three platforms. The overall architecture of the platform can be divided into three major logical levels, namely, the data resource layer, the data analysis layer and the data application layer. The data resource layer should establish technical connections with the data sources of each link of the industrial chain such as monitoring stations in the main producing counties, collect relevant data, and govern and store the collected data to form a database and data warehouse for analysis and application; the data analysis layer is to use big data technology to mine and analyze the huge amount of data collected, and build various analysis models such as price prediction models for data application; the data application layer is to use the huge amount of big data to mine and analyze, and build price prediction models for data application; the data application layer is to use the huge amount of big data to analyze and analyze. The data application layer is to build various kinds of analysis models such as price prediction models for data applications with the support of massive big data and thematic analysis models[4].

The data application layer is supported by massive big data and thematic analysis models to build business application systems such as monitoring and early warning systems for end users such as competent departments. The overall architecture of the platform is shown in Figure 1.

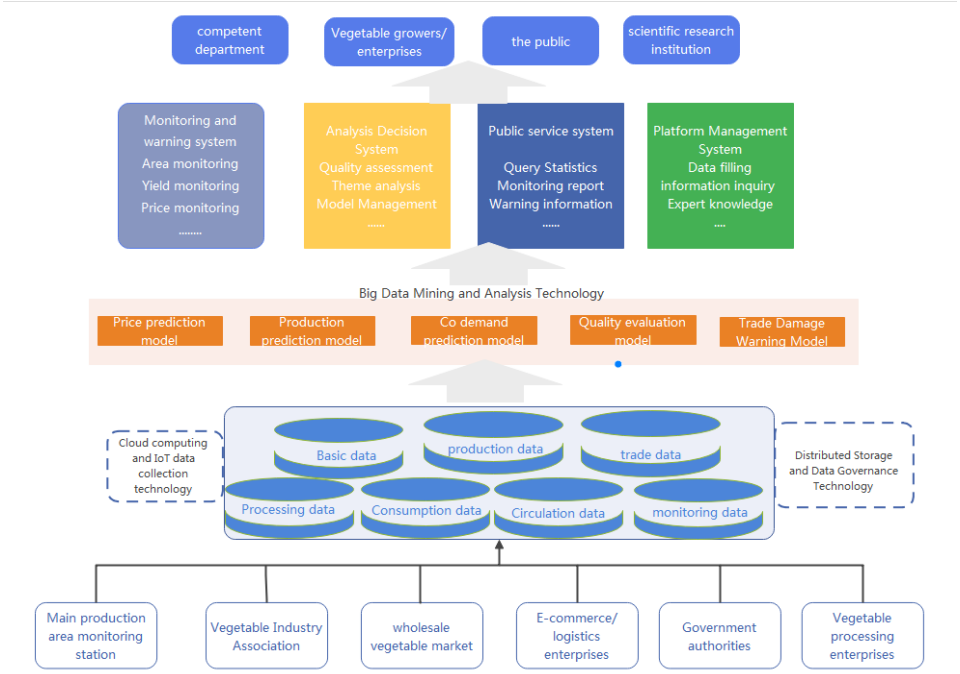

Fig. 1. Research methods and processes

2.1 Platform architecture

The SpringBoot framework incorporates two very key strategies: outofbox and convention over configuration. out of the box, it's about importing the relevant dependency packages into the configuration file of a MAVEN project and replacing the XML outline with the appropriate annotations to manage the lifetime of that object. Conventions are better than configurations; it is a software design paradigm through which developers add information to the structure. This feature reduces flexibility to some extent and complicates the location of bugs, but reduces the amount of configuration in the XML document by the developer. A vegetable industry chain information platform was built, including data storage module, data processing module, analysis module and application module. The platform realizes the data interoperability of the whole chain through cloud computing technology[5].

2.2 B/S model

The B/S (Browser/Server) model is a change and improvement over the traditional C/S (Client/Server) model. This model can reduce the load on the client, reduce the maintenance and update costs of the system, and reduce the overall cost to the user.

Compared with the C/S model, the B/S model has the following advantages: strong openness, easy to expand, economical maintenance, diversified system upgrades, consistent user interface, diversified information exchange, diversified information distribution, and good information system integration. Figure 2 shows the network architecture of B/S system:

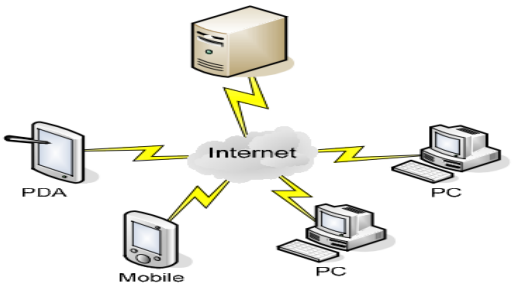

Fig 2: Network Architecture for B/S Systems

2.3 Date resources system construction

The construction of the data resource system is the foundation for the construction of the big data platform. However, when building a big data platform for the whole agricultural industry chain, the lack of information collection and processing capacity has brought certain difficulties to stakeholders in providing accurate information. At present, the construction and application of agricultural big data still has a lot of room for improvement and needs to be promoted with the help of diversified forces. In order to form a source of vegetable big data, it is necessary to ensure that the vegetable industry chain completes the connection, flow and operation of each link under the support of information system and forms digital records[6]. Therefore, to build the data resource system of the vegetable industry chain big data platform, it is necessary to comprehensively transport a variety of technologies and methods such as IoT sensing, remote sensing monitoring, API access, Internet collection and bulk purchase, integrate various data channels, and establish unified data standards, collection networks and databases. At the same time, it is necessary to carry out continuous data monitoring and governance to ensure that the big data platform is provided with fresh and continuous data resources. Data resources are provided in table 1.

Table 1. Vegetable Industry Chain Data Resources

Data categories	Data content	Data sources	Acquisition method
Production data	Production environment, ecological environment, growth status, germplasm resources, production factors Production scale, production management, remote sensing images	specialized body	Real-time monitoring, web, docking databases, API access, sharing by professional organizations
Process data	Processing enterprises, processing of manufactured goods	processing company	Third-party sharing, web crawlers Access
Consumption data	Consumption varieties, origin preferences, brand preferences, transaction prices, transaction volumes, sourcing sources	Vegetable Wholesale Markets/Industry Associations Associations	Purchase, API Access, Networking Crawler access
Circulation data	E-commerce, logistics, supermarkets, food markets	E-commerce/logistics companies	Purchase, API Access, Networking Crawler access

Regulatory data	Statistical survey data: planting area, cost of production, planting intention, consumption intention, etc.; industrial policy data	Government authorities	Purchase, API Access, Networking Crawler access
Trade data	Import and export trade volume, trade volume, trade share and flow, trade price, trade policy, etc.	Customs, Bureau of Statistics	Search for macro statistics such as statistical yearbooks Statistical data
else	Geographic base map and other basic data	Specialized agencies such as surveying and mapping departments	Purchase, API Access

3 Process of utilizing the platform to study supply and demand for vegetables

3.1 Data acquisition

We collected key information from each link in the vegetable chain, including farm production data, processing data, distribution and transportation data, and marketing data[7]. These data were obtained through field surveys, electronic records and online data acquisition by partners, government agencies and related enterprises, using MySQL as its database.

3.2 Data storage and processing

Database technology is used for data storage and data processing tools are used to clean and organize the collected data. The accuracy and completeness of the data is ensured[8].

3.3 Market Demand Analysis

Extract historical market demand data through the platform and analyze demand trends in different seasons and geographies.

3.4 Data modeling

Use statistical and machine learning methods to model data on market demand and predict future market trends.

3.5 Supply analysis and optimization

The platform is utilized to monitor all aspects of the vegetable supply chain in real time and identify bottlenecks in the supply chain.Through data analysis, recommendations are made to optimize the supply chain, including reducing production chain time and improving transportation efficiency.

3.6 Application of information platforms in agricultural decision-making

Analyze how farmers, businesses and government departments use the platform's data to make decisions and provide support services accordingly.

3.7 Evaluation and feedback

To assess the impact of the information platform on the effectiveness of decision-making through field surveys and user feedback, and to make timely adjustments to the platform's functionality to meet user needs.

4 Research results of the vegetable industry chain information platform

4.1 Monitoring and early warning

The monitoring and early warning function is based on the data results of the construction of the data resource system, realizing comprehensive access and dynamic monitoring of the production data, processing data, consumption data, trade data and regulatory data of vegetable varieties[9]. It supports threshold setting, realizes early warning of key indicator information such as area, production, price and consumption, and sends alerts to users when the data of a certain indicator exceeds the threshold range and appears obvious abnormality.

4.2 Analyzing Decision Making

he analysis and decision-making function is based on vegetable price forecasting model, production analysis model, supply and demand forecasting model, quality evaluation model, trade damage model and other professional analysis models, and makes use of big data mining and analysis technology and data visualization technology to provide quality evaluation and thematic analysis services to decision-making users such as government authorities, so as to provide decision-making support for the authorities in charge of the formulation of industrial policies and the supervision of the industry[10].

4.3 Public service

The public service function is based on the big data of the whole industrial chain of vegetables aggregated by the big data platform, and comprehensively utilizes big data analysis and statistical reporting technology to provide value-added data services such as query statistics, monitoring reports and early warning information for various types of users such as growers, planting enterprises, scientific research institutes and members of the public. It enables users to grasp the key information on planting area, crop yield, trading volume and trading price in each segment of vegetable production, processing, consumption, trade and supervision. In particular, by actively pushing the trend prediction information based on big data mining and analysis to growers and other market players, it can significantly improve their ability to cope with market changes and grasp market trends, avoid passive "blind planting", and solve the problems of unbalanced industrial development caused by asymmetric market information.

4.4 Platform application

The application function of the platform is to take advantage of the popularity and convenience of mobile intelligent terminals such as mobile phones to provide basic services such as data filling, information inquiry, expert knowledge and quality traceability to vegetable growers, planting enterprises and the public in the form of small programs. Among them, the data filling

function can flexibly customize data items, through the end user's report, so that the platform can obtain first-hand real data in time, and promote the provision of more comprehensive and accurate information query, expert knowledge and other services for users; The quality traceability function can quickly identify product quality information through various ways such as "taking photos". The application functions of the platform not only serve users, but also take advantage of the geographically dispersed but large number of target users to transform passivity into initiative, and to a certain extent solve the problem of difficult data collection and quality traceability caused by the fragmentation of the industrial chain.

5 Challenges and prospects

5.1 The problem of obtaining and sharing heterogeneous data from multiple sources needs to be solved

How to obtain timely, accurate and comprehensive information of the vegetable industry chain has always been the difficulty of big data construction. It is necessary to overcome the decentralization of the industry chain, encourage production and operation subjects to establish information and network connections, and promote the digital record of goods flow, capital flow and information flow in the industry chain, so as to complete the accumulation of big data. In recent years, the Ministry of Agriculture and Rural Affairs has continued to promote the construction of digital agriculture pilot projects to enhance the digitalization of agricultural production. With the economic development, more planting bases and large planting households have invested in mechanization and intelligence, and intelligent agricultural Internet of Things equipment is also increasingly welcomed by more farms, and it is believed that problems such as difficult data production and difficult data access in the future will be gradually solved.

5.2 The standard system of single-species data resources needs to be explored

There are many kinds of vegetable products, the same variety contains many types, taking Chinese cabbage as an example, according to the plant type can be divided into upright, semi-upright, open 3 types; The ball type has four types: comfort, twisting, hugging and folding. The outer leaf color includes 5 types: yellow green, light green, green, gray green, dark green; Petiole color is divided into white, green white, light green, green 4 types; The color inside the leaf ball includes white, light yellow, yellow, orange 4 types. In order to deal with such a complex situation, we need to build a simple and practical data standard system based on huge digital resources to regulate the acquisition, analysis and application of data resources.

5.3 Big data analysis models need continuous research and optimization

Big data analysis modeling is a key part of big data application, which effectively organizes raw data and provides important support for data presentation. Building a mature data analysis model is a complex and long-term process that requires five steps: selecting the model, training the model, evaluating the model, applying the model, and optimizing the model structure. In practical application scenarios, we need to strengthen business demand research and business architecture optimization, and consolidate the data foundation and application foundation. Through the continuous selection, training, evaluation, application and optimization of models,

promote the application of big data analysis modeling, and lay a solid foundation for the construction of big data in the whole industrial chain.

6 Suggestions

6.1 Integration of agricultural science and technology information

Provision of farmers' science and technology extension services, including new planting techniques and pest control, to improve the efficiency of agricultural production

6.2 Introduction of market pricing models

Assisting farmers and enterprises in accurate pricing and reducing the risk of market fluctuations. At the same time, it is recommended to strengthen industrial chain cooperation, promote the formation of agricultural cooperatives, facilitate the integration of production and marketing, and strengthen collaboration with industrial chain partners to achieve synergistic development of the whole industrial chain.

6.3 In terms of policy and financial support

Calls for stronger policies on agricultural informatization and promotes the establishment of special funds to support the research, development and application of agricultural informatization technologies.

6.4 Strengthening agricultural information dissemination

Increased awareness of the information platform among farmers and businesses and increased participation in its use.

6.5 Conduct user training

Regular training on the use of the information platform to improve users' understanding of the platform's functions and their ability to use it.

Through the above suggestions, we can further promote the healthy development of the vegetable industry chain information platform and provide a more solid foundation for the sustainable development of the vegetable industry.

7 Conclusions

This research successfully established the vegetable industry chain information platform, realized the information interoperation of the whole industry chain, provided a scientific basis for agricultural decision-making, and promoted the optimization and upgrading of the vegetable industry chain. In the market demand analysis, through historical data analysis and model prediction, insight into the changing trend of market demand, so that farmers and enterprises can more accurately develop planting and supply plans, and improve market response ability. In terms of supply analysis and optimization, through real-time monitoring of the supply chain, some bottlenecks were successfully identified and solved, and optimization suggestions were

put forward to improve the efficiency of the supply chain and reduce resource waste and environmental impact. The information platform is recognized by users in agricultural decision-making, provides important decision support information for farmers, businesses and governments, and ensures the performance and usability of the platform through continuous evaluation and adjustment.

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