

Research on Digital Agricultural Supply Chain

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Abstract

In recent years, the development of data supply chain and big data transactions has been rapid. China first proposed the concept of "data supply chain" in the "Government Data Supply Chain White Paper" officially released at the 2nd China International Intelligent Industry Expo in 2019. Afterwards, other countries and local policy documents also included content on data supply chain. On April 7, 2020, the National Development and Reform Commission and the Cyberspace Administration of China jointly issued the "Implementation Plan for Promoting the Action of 'Cloud based Data Empowerment' to Cultivate New Economic Development", proposing to build a "data supply chain", "lead the material chain with data supply chain, promote efficient collaboration of industrial chain, and effectively support the upgrading of industrial foundation and modernization of industrial chain".

Keywords

Agricultural supply chain, data products, data transactions.

1. Introduction

Agriculture, as the cornerstone of human social development, its importance is self-evident. Throughout thousands of years of history, agriculture has not only provided basic food and survival materials for humanity, but also promoted the development of society, economy, culture, and technology. This article will explore in detail the importance of agriculture in various aspects, including its economic, social, ecological, and cultural values, as well as its new role in modern society.

Agriculture is one of the pillars of the national economy, providing important support for the country's economic development. Firstly, agricultural products are essential for people's daily lives, and the stable development of agriculture ensures national food security and food safety. Secondly, the agricultural industry chain is long, involving multiple links such as planting, breeding, processing, and sales, providing employment opportunities for rural economic development and increasing farmers' income. In addition, the development of agriculture has also driven the development of related industries such as agricultural machinery, fertilizers, pesticides, etc., further promoting economic growth.

2. Current Status of Agricultural Big Data Development

The data trading industry in China first started in 2014, and has developed from just one big data exchange - Guiyang Big Data Exchange - to the emergence of data management institutions and trading platforms across the country, covering various categories such as datasets, data APIs, data reports, models, and services[1]. This means that the digital economy, based on new generation information technology and with data resources as a key element, has become the most active field in China's economic development, and the enormous value that data circulation can generate is increasingly expected by society. Data continuously creates value through transactions and sharing in circulation, interpreting[2].

The multiplier effect and empowering role of promoting economic development.

Empowering modern agricultural development with data elements is conducive to achieving agricultural modernization[3]. From the perspective of building a modern agricultural production system, the combination of data elements and agricultural Internet of Things can help further optimize resource input, achieve refined management, automated control, intelligent quality classification, etc[4].thereby improving the market adaptability of agricultural products and services, promoting green and intelligent agricultural production, reducing production costs, and improving production efficiency and product quality.

3. Research Methods and Data Collection

3.1. Research Methods

The key idea of grounded theory research is to compare, gradually refine, and condense data multiple times, in order to conceptualize and extract more categories until no new concepts or categories appear in the data [5]. Encoding is the most important part of grounded theory, which includes three levels: open coding, axial coding, and selective coding.

The reason for choosing programmatic grounded theory as the research method in this article is as follows: (1) The agricultural big data studied in this article currently belongs to a relatively new research field. Grounded theory is applicable for discovering new phenomena and problems in new fields. (2) At present, the research on agricultural big data is still in its initial stage, and only a small number of literature have conducted simple analysis on current agricultural big data cases, but have not systematically analyzed them using existing theories. This article attempts to analyze and code the collected primary and secondary data from a supply chain perspective using grounded theory, and finally explore the characteristics of agricultural big data and their relationships.

3.2. Data Collection

The information collected in this study includes: ① conducting one-on-one telephone interviews with agricultural big data platforms to obtain certain first-hand data; ② Collect 30 research reports on agricultural big data from existing journals, media reports and comments, authoritative industry reports and data analysis websites (such as China E-commerce Research Center, iResearch, iMedia, Alibaba Research Institute, Ministry of Commerce website, etc.) and consulting agencies; ③ 10 relevant policy documents issued by various ministries and governments at all levels of the country.

4. Encoding

4.1. Open Encoding

Suppliers refer to enterprises that can provide raw materials, equipment, tools, services, and other resources for enterprise production. Managing suppliers can help[6].

Table 1. Open Encoding Table

Secondary encoding	First level coding	Partial original data
Product category	Raw data	Collect raw data on the light and temperature production potential, climate production potential, and soil quality of agricultural production, and systematically analyze the quality issues of the raw data
	Data software products	The agricultural and rural big data application software system includes four major categories: precision planting, intelligent breeding, digital intelligence for the entire industry, and intelligent management services
	Agricultural Industry Report	The Report on the Market Competition Pattern and Investment Prospects of China's Agricultural Products Industry from 2024 to 2030 provides a specific analysis of the development environment and market operation status of the agricultural products industry
	Agricultural data analysis products	Granular's data analysis engine integrates multiple data sources to achieve precise monitoring and management of farmland, helping farmers make more informed decisions.
	Agricultural data prediction products	This product aims to use deep learning technology to predict future crop yields using historical agricultural data.
Sales platform	Agricultural digital trading platform	Huinong Network, developed and operated by Hunan Huinong Technology Co., Ltd., is a digital service platform for the agricultural industry.
Traceability system	Accountability system	The County Agriculture and Rural Bureau is implementing the supervision of the digital management platform for pesticides, ensuring that the "three aspects of work" are in place and effective
	One item, one voucher	A data transaction voucher, also known as a "data invoice," is an important proof of the transaction behavior of both the buyer and seller in a data transaction.
	Traceability information query	At present, big data trading platforms use blockchain underlying technology to record the transfer of usage rights between data using blockchain
Purchase channels	Online purchase	The Shenzhen Data Exchange has recently launched online trading of agricultural and rural related data products
	Face-to-face interview	Thanks to the precise docking and matching of procurement demanders and data providers by South China Digital Industry Group, the data products of Chenxi Rice Flower Fish, Luchuan Pig, and Sansui Duck have successively completed their first transactions.
Promotional effort	Promotion strategy	The promotional activities on big data platforms are usually aimed at attracting new customers, promoting sales, or giving back to existing customers
	Infrastructure Capability	In the era of digital economy, network facilities, computing power facilities, application facilities, etc. have constructed digital infrastructure.
	Diversified Promotion	Guizhou gift vouchers are promotional vouchers that can be obtained through the activity platform
Regulatory environment	Government regulation	Big data trading should establish a regulatory model that combines self regulatory and administrative supervision, with government departments and big data trading platforms assuming regulatory responsibilities respectively, and following the overall supervision of government departments
	Industry association supervision	The administrative department in charge of the data center industry is mainly the Ministry of Industry and Information Technology.
Policy environment	Release demand	Taking the promotion of high-level application of data elements as the main line, by strengthening the traction of scenario demand, we aim to drive high-quality supply of data elements
	Incentive subsidies	When purchasing Guizhou computing power services or Guizhou data trading products that meet the conditions, comprehensive policy incentives will be provided, with an annual support amount not exceeding 80 million yuan.

4.2. Main Axis Coding

The main axis coding needs to further summarize the logical relationships between each subcategory on the basis of open coding, and derive the main category.

Table 2. Spindle coding table

Main category	Corresponding category	Category meaning
Supply side	Product category	The product categories in the agricultural data supply chain include raw data, data software, agricultural industry reports, agricultural data analysis, and agricultural data prediction products
Sales side	Sales side	The main sales platform for agricultural data supply chain is the agricultural digital trading platform
	Traceability system	A good traceability system provides support for consumers to purchase high-quality data products
	Promotional effort	A good traceability system provides support for consumers to purchase high-quality data products
Consumer side	Purchase channels	Various purchasing channels provide support for consumers to purchase data products
Regulatory side	Regulatory environment	A good regulatory environment provides a foundation for consumers to purchase high-quality data products
Policy side	Policy environment	National and local policies affect the operation of the agricultural data trading market

5. Conclusion

Based on the perspective of the supply chain, through analyzing first-hand and second-hand information, it is found that there are various types of products on the supply side of the agricultural data supply chain; The sales side includes sales platforms, traceability systems, and promotional efforts, among which the traceability system provides support for consumers to purchase excellent data products; The consumer side mainly focuses on purchasing channels, and various purchasing channels provide convenience for consumers to purchase data products; The supervision end and policy environment end penetrate into various links of the supply chain, maintaining and promoting the orderly operation of the agricultural data trading market.

In the analysis, it was found that the government should enrich market entities, which is conducive to maintaining fair competition in the industry and stimulating industry innovation capabilities. Local governments should actively introduce relevant support policies such as special trade subsidies, tax reductions, and rental incentives to attract relevant enterprises to settle in, while forming a cluster effect and driving the rapid development of China's agricultural data supply chain. Accelerate the exploration and improvement of digital security policies and regulations[7].

Governments in various regions should actively introduce relevant policies to encourage enterprises to innovate agricultural data trading models. On the one hand, innovative transaction models are beneficial for enterprises to integrate internal and external factors, enhance their core competitiveness, and improve operational efficiency; On the other hand, innovative trading models are conducive to promoting the innovative development of the agricultural data trading industry.

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