



Study on Standardized Approaches of Agriculture-Related Data Under the Background of Rural Revitalization – Take Shandong Province as an Example

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Abstract. With the development of a new generation of information technology, all walks of life in the economy and society have been impacted to varying degrees. To meet the requirements of the new situation, local governments have carried out different degrees of digital construction according to the current situation of local industry development. However, in the actual construction process, it is found that there are some problems, such as insufficient ideological understanding, incomplete construction of agriculture-related data standard system, and incomplete supervision system of agricultural product quality, which need to be solved using standardized, unified standard working methods. Taking Shandong province as an example, this study in-depth analysis research of Shandong agricultural standardization construction present situation and the demand in the course of the construction of data, and explore aspects of the standard development path, the method put forward the direction for the construction of agriculture data standardization, to promote the local governments further to support the agriculture data standardization, promote the quality of the data optimization and improve efficiency.

Keywords: The digital economy · Agricultural data · Standardized

1 Introduction

Issues concerning agriculture, rural areas and farmers are fundamental to China's economy and people's livelihood. The year 2022 will be crucial for comprehensively promoting rural revitalization and accelerating agricultural and rural modernization during the 14th Five-Year Plan period. It is of special significance to stabilize the basic structure of agriculture and do a good job in our work related to agriculture, rural areas and farmers. Digital work key point of countryside development in 2022 pointed out that to give

full play to the informatization of rural revitalization of the driver can assign role and speed up the building lead rural industries system of the digital economy, build digital management system to adapt to the development of urban and rural integration, push the country revitalization made new progress, promote the construction of digital China new strides. Rural revitalization, as the focal point of the work related to agriculture, rural areas and farmers in the new era, is an overall and historic task of building a modern socialist country in an all-around way. Digital rural construction is not only the strategic direction of rural revitalization but also an important part of the construction of digital China. It is driving and upgrading the modernization of agriculture and rural areas and providing a strong impetus for rural economic and social development.

Data plays an important role in digital rural construction as an element of equal significance with land, capital and technology. From the perspective of national development strategy, the 19th CPC National Congress proposed to build a network of power, digital China, fashionable society. The fourth plenary session of the 19th CPC Central Committee included “data” as a factor of production. The fifth Plenary Session proposed to build smart agriculture, providing a good environment and policy support for promoting agricultural and rural informatization. Regarding the development trend of science and technology, the integration of information technology with various industries is accelerating. Big data not only helps improve the efficiency of agricultural production but also provides effective support for rural governance, grassroots Party building and targeted relief. But, although agriculture has many national standards and industry standards, to be able to guide the development of agriculture data standards and norms directly is less, only released four bi data about agriculture in Shandong province local standards, the current rural digital data formats, standards, the inconsistent problem is still serious. Its data management is relatively chaotic, with scattered data resources. To better build the digital countryside and promote rural revitalization, it is urgent to clarify the management and standardization path of rural data related to the digital countryside.

2 Literature Review and Research Value

2.1 Research on Big Agricultural Data in the Digital Countryside

With the development of digital rural construction, academic circles have conducted much research on digital rural. Based on the actual situation of digital rural construction, some scholars carried out extensive case studies, analyzed digital supervision [1] and informatization service mode [2] They believed that the application of digital technology could enhance the interaction between rural government and society and transform rural social governance into two-way interaction [3]. Data is the core of digital rural construction. Some scholars have discussed the application of big data technology in agriculture and rural areas from the perspective of big data application, such as the construction of agricultural big data platforms, Agricultural big data engineering and application analysis [4], Agricultural and rural digital resource architecture [3], There are few studies on the standardization of data related to agriculture.

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In recent years, scholars' research on digital countryside based on big data mainly focuses on the application of data in the agricultural field, including the hardware and software of big data analysis [5], Availability of technology and methods [6], The guidance of government departments and so on, Research on the management and standardization of agriculture-related data is scarce.

2.2 Research Value

Domestic research on the digital countryside is mainly based on studies and theoretical studies. Most of them only emphasize the importance of big data in the digital countryside without in-depth discussion on the management and standardization of all agriculture-related data. Foreign research on digital rural and agriculture-related data mainly focuses on applying big data in agricultural automation and pays little attention to the management and standardization of agriculture-related data. It is important to consider the data elements in digital rural construction to fully use its value and further improve the level of digital rural construction. It is necessary based on analysis of large data perspective, in the construction of digital rural agricultural data collection, cleaning, storage, mining, analysis, application, protection and so on whole life cycle management model, data standardization path. To promote the rational and orderly flow of data elements and maximize the driving role of data in digital rural construction.

3 The Role of Agricultural Data Standardization

3.1 Improve the Quality of Agricultural Products

Agricultural product quality safety problem has been the country attaches great importance to, national concerns, there are many factors will affect the quality and safety of agricultural products, such as environmental pollution, excessive pesticide residues, agricultural products detection mechanism is imperfect, the lack of a sound supervision mechanism and detecting system, the lack of effective management in the process of agricultural production and processing. Comprehensive implementation of standardized development of agriculture-related data can be standardized from all aspects of agricultural production control to ensure the quality and safety of agricultural products. Shandong province always insists on putting the quality and safety of agricultural products first place in livelihood projects and pays attention to the standardization of agricultural production to improve agricultural products quality and safety. In agricultural product quality management, all indicators of agricultural products need to have standards to follow. Implementing agricultural data standardization is the basis and guarantee of agricultural product quality improvement.

3.2 We Will Enhance the International Competitiveness of Agricultural Products

With the deepening of economic globalization, the level of standardization largely determines the market dominance and discourse power. Only by vigorously implementing the standardization of agriculture-related data and improving the quality and safety of

products can the brand be established in the market. Only through the implementation of agriculture-related data standardization China's agricultural products can realize the transformation from "quantity" to "quality", comprehensively improve the quality and safety of agricultural products, let China's agricultural products go abroad, and enhance international competitiveness.

3.3 We Will Promote Quality Development of Agriculture and Rural Revitalization

The standardization of agriculture-related data is closely related to rural development and revitalization quality. The primary issue of rural revitalization is to improve agricultural production efficiency, change agricultural production's structure, shift from an extensive mode of production to an intensive mode of production, promote the prosperity of rural industries, and improve the happiness of rural residents. Promote agricultural development; data standardization can promote agricultural science and technology into productivity, promote the agricultural supply-side structural reform, improve the efficiency of agricultural production, promote the development of leading agricultural brands, will vigorously promote the development of rural industries, promote the characteristic agriculture in poor areas and advantages of agricultural development, high quality and efficiency to achieve poverty further to get rich. It is an important measure for China to implement the rural revitalization strategy and boost the quality of agriculture.

4 Development Status of Agricultural Data Standardization in Shandong Province

Shandong province is a big agricultural province and one of the earlier provinces in the standardization of agricultural data. By analyzing the achievements and problems in the implementation of agriculture-related data standardization in Shandong Province. It can be seen that the standardization of agriculture-related data plays an important role in modern agriculture and reflects the situation of the implementation of agriculture-related data standardization in China. Digital agriculture in rural construction data contains social governance, wisdom, agriculture and other fields; in this paper. This paper studies the data utilization of rural agricultural construction in Shandong province, including data management, standardization, obvious problems and deficiencies, complexity, heterogeneity and dispersion of digital agricultural data in rural construction.

4.1 At Present, Agricultural Data Standardization Construction Achievements

4.1.1 Based on Local Advantages of Agricultural Products, the Standardization of Agriculture-Related Data Will Be Carried Out Extensively

To effectively improve the popularization and application of agriculture-related data standardization, promote the progress of agricultural technology, and give full play to the role of standardization in the development of high-yield, high-quality and efficient

agriculture. In recent years, with the acceleration of agricultural informatization construction in the province and the development of rural e-commerce, agricultural departments at all levels have been increasingly aware of the importance of big agricultural data and the awareness and ability of new business entities to use data have been constantly enhanced, which has promoted the development and application of big agricultural data. The province has initially established more than 20 databases of agricultural inputs such as fertilizers, pesticides and seeds, high-quality agricultural products with “three products and one standard”, agricultural statistics, practical technology, quality standards, laws and regulations related to agriculture, agricultural experts, agricultural film and television and leading enterprises, and the data content includes text, pictures, audio and video formats. Some counties and cities have also explored the application of big agricultural data. For example, Changyi and Zhucheng have established a collection system and query application system of agricultural data such as soil testing formula and scientific and technological services, which is convenient for agricultural cooperatives, agricultural leading enterprises and farmers to use and serve agricultural production. “Agricultural Big Data Industry Technology Innovation Strategic Alliance” has actively conducted research and development in applying big agricultural *data*.

4.1.2 Agricultural Standardization Promotes the Overall Development of Agricultural Economy and Agricultural Science and Technology and Has Achieved Many Results

Increasing production and income has achieved remarkable economic benefits. In recent years, Shandong has given full play to its advantages as a large agricultural province, seized the rare opportunity of the national standardized comprehensive reform pilot program, launched the rural revitalization standard support project, continuously improved the agricultural standard system, and further promoted the agricultural standard demonstration, providing strong support for the high-quality development of the province’s agriculture.

Last year, Shandong’s agricultural output exceeded 1 trillion yuan, making it the first province in China to do so. Its agricultural exports exceeded 120 billion yuan, leading the country for 22 consecutive years. So far, give priority to the Shandong agricultural sectors of the national industry standard to reach more than 230, the number ranked among the top nationwide, the accumulative release implement local agricultural standards, 1388 group standards, 427 basic covers the whole process of agricultural production, initially formed based on national standards, community standards as the main body, local standards and local regulations as the complement of modern agriculture standard system.

Under the guidance and support of the modern agricultural standard system, Shandong province’s agricultural development continues to advance toward intensive production and high-end industry. The transformation and upgrading have achieved initial results. For example, Relying on the construction of a national vegetable quality standard centre and experimental, and demonstration base, Shandong has built a standard system for the whole industrial chain of the solar greenhouse and identified 29 experimental and demonstration bases in the main producing areas of vegetables in the country, radiating the standardized production area of vegetables of 800,000 mu, further consolidating

the dominant position of Shandong vegetables. For example, it actively carried out the construction of the national comprehensive standardization project of peony for oil use, insisted on the synchronization of product development and legal development, mastered the dominant power of the development of peony for oil use, and strongly promoted the upgrading of the peony industry from ornamental to edible, medicinal and health care in the whole province and even the whole country. In 2021, Zibo City of Shandong Province implemented 40 major digital agriculture and rural projects under the “Ten Major Projects”. Up to now, the investment has reached 5.186 billion yuan, accounting for 115% of the annual investment plan and exceeding the annual investment and construction task. In 2020, the Zibo Municipal Committee and Municipal Government of Shandong Province insisted on digital enabling, lane changing and overtaking, actively occupied the “new track” of digital agriculture and rural areas, fully implemented the “Ten major projects”, and proposed to build a central city of digital agriculture and rural areas in China first. Over the past year, Zibo’s digital agriculture and rural central city construction has accelerated, promoting rural revitalization and high-quality agricultural and rural development.

4.2 There Are Still Problems and Deficiencies

4.2.1 Ideological Understanding Is not in Place

Some leaders still have a certain deviation in their understanding of the standardization of agriculture-related data. They have not realized the important role of the standardization of agriculture-related data in improving agricultural competitiveness. There are many slogans but few concrete actions in the implementation process. Many farmers mistakenly believe that the standardization of agriculture-related data will increase the cost of agricultural production, and it is difficult to increase their income, so they are unwilling to participate in the implementation of the standardization of agriculture-related data.

4.2.2 Rural-Related Data Standard System Is not Perfect

First, agricultural standards are not sound. Although our country’s agriculture national standards and industry standards are constantly improved, as a result of agriculture data standardization system construction in China started relatively late, weak foundation, there are many agricultural products have not yet set standards, the unreasonable structure of established standards, procedures during production technology and product inspection standards, less postpartum and series of standards, Some agricultural products in the city have no standard to follow.

Second, the existing agricultural standards are not perfect. China’s agricultural standards, some standards targeted are not strong; the focus is not prominent, some standards are too long, some standards are incomplete, lack of supporting and integrity, and can not be in line with international standards, so some of the city’s agricultural standards are difficult to implement. Looking at this city’s circumstances, existing production

quality standards and technical regulations are not standard enough. Also, concrete maneuverability is not enough.

Agricultural Products Quality Monitoring System Is not Perfect

First, agricultural product sales channels lack effective detection and supervision mechanism, resulting in a considerable part of agricultural products marketing is not standardized, quality is not competitive price, and shoddy phenomenon occurs from time to time, directly affecting the overall quality of agricultural products.

Second, the agricultural monitoring mechanism is not perfect; monitoring means backward. There is a lack of a perfect inspection system and corresponding evaluation and analysis instruments for the technical indicators stipulated in the standards. The quality monitoring of agricultural production materials such as pesticide residues, veterinary drug residues, seeds and fertilizers is mostly still in the stage of sensory evaluation. At the same time, post-processing facilities such as harvesting, drying, refrigeration, grading and sorting, circulation and storage facilities, cold chain system and evaluation and identification technology are all bottlenecks in implementing agricultural data standardization in this city and the whole country.

In a word, in the new period of great development of rural economy, how to establish and implement rURal-related data standardization more scientifically and better serve the development of rural economy needs to be well summarized and further studied and discussed.

5 Construction of Rural-Related Data Standard System

The report to the 19th National Congress of the Communist Party of China (CPC) listed “building a modern agricultural industrial system, production system and management system” as one of the main measures of the rural revitalization strategy. Related standards in the field of combing large data at home and abroad, this paper combined with related research on digital rural agricultural data in Shandong province, considering different fields such as social governance digitalization, digital agriculture, and agricultural production, data collection, cleaning and various links such as storage, mining, data standards, and based on the carding of the big data standard and the grasp of the characteristics of the digital village in various fields, Put forward the standard system of data related to agriculture (see Fig. 1).

5.1 Standards for Data Collection Related to Agriculture

Agriculture-related data collection is the cornerstone of agriculture-related data management and application sharing and also the “first button” of applying big data technology to agricultural ecological management and production management. To be specific, agriculture-related data acquisition mainly involves data elements, data acquisition and data preprocessing, so the standard of agriculture-related data acquisition should be established around these three parts.

In the preliminary data collection stage, it is necessary to specify the specific data content to be collected and establish the composition frame of the data element set. Data

sources are diversified in agriculture, including agricultural production data, agricultural resources data and social governance data. Therefore, hardware devices such as sensors must be deployed to collect and transmit data. For example, key data such as temperature, humidity, farmland water level and weather rainfall under agricultural production conditions are related to the level of agricultural output. Corresponding sensor equipment is deployed to collect key data under agricultural production conditions, which plays an important role in effectively improving data analysis efficiency and agricultural output. This is also an important task and role in formulating standards for data acquisition related to agriculture.

Specifically, data elements, also known as data nodes or records in big data analysis, are composed of multiple data items. Our data acquisition sensors and other equipment under tests, such as the analog and digital measuring unit automatic acquisition of information process, its purpose is to measure temperature, humidity, farmland in farmland environment water level, rainfall and other information, it is based on measuring the hardware and software and the communication module to measurement and transmission of data needed, it should integrate communications, sensors, data acquisition hardware and software.

5.2 Agricultural Data Management Standards

Data management is the middle level of the agricultural data evaluation index system, which has the important function of “connecting the preceding and the following”. It mainly refers to the indicators that must be coordinated and managed in agricultural data sharing. It mainly includes the metadata, data security, data storage, data quality control and evaluation, through the management standards can be acquisition phase of agriculture data storage, data security and safety management, agricultural data can be data visualization, data analysis, data mining, can restrict agriculture data sharing the behaviour of the parties, thereby giving impetus to the development of the entire data sharing work.

In the management stage, storing the collected and pre-processed agricultural data in a relational or distributed database is necessary and then forming a data management centre. The safe storage of agricultural data is the basis for data analysis and mining tasks. Data visualization, data analysis and mining are important methods to explain agricultural data clearly and intuitively.

5.3 Application Standards for Data Related to Agriculture

Data application is an important basis for data sharing and the core of agricultural data resource sharing systems. Data application mainly involves social governance, agricultural operation, agricultural management, and data resource ownership information. After analyzing and mining agricultural data, it is used in rural ecological governance, agricultural product traceability and agricultural production management.

Agriculture-related data application is a standardized description of agricultural data resources. It can accurately and completely describe the identification, content, quality and other relevant information of agricultural data resources. It can help data users and managers quickly discover, locate and obtain data. Agricultural operation data covers

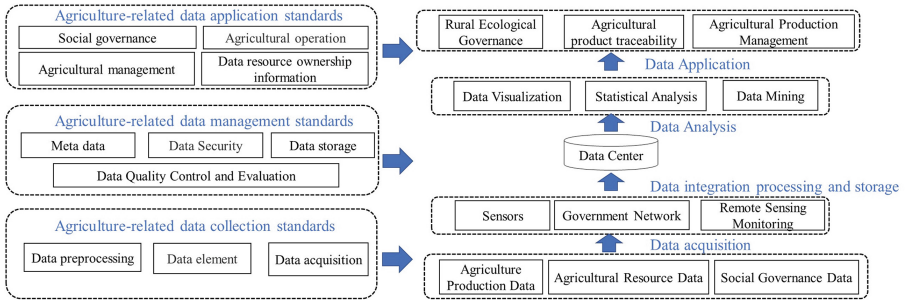


Fig. 1. Standard system of agriculture-related data.

the quality control and related quality inspection standards of various business data of agricultural data resources, which provides a strong guarantee for the data quality and authority of agricultural data resources, and is also an effective means to ensure high-quality agricultural data sharing.

6 Policy Suggestions

6.1 Establish a Complete Set of Organizational Leadership and Management Institutions

The standardization construction of agriculture-related data needs the promotion and macro guidance of the government. Because of its huge project, it needs to be planned and completed in stages. Advanced decision-making and legislation of government departments are the keys to avoiding duplication and waste of resources. To better implement the strategy of rURal-related data standardization, a coordination group for rural-related data standardization should be set up, led by the Agriculture Committee of the NPC and coordinated by other departments and scientific research institutions. Each district (county) should also set up the corresponding part-time institutions. Its task is to develop long-term development planning, standards and regulations related to agricultural data coordination of the implementation of the project plan, to avoid duplication, waste and detours.

6.2 Give Full Play to the Value of Data and Realize the Effective Integration of Information Data

First, accelerate the construction of rural infrastructure, promote the upgrading of existing rural information facilities and equipment, and gradually improve network facilities such as big data collection and storage.

Second integration of agriculture-related resources. Relying on local agriculture-related information platforms and information technologies such as the Internet, cloud computing and big data, municipal agricultural big data centers will be built to realize cross-industry and cross-sector collaborative sharing of all kinds of data. Establish a social sharing service platform that can simultaneously meet the needs of agricultural scientific research, management promotion and production.

6.3 Strengthen the Construction of Information Personnel, Improve Farmers' Information Awareness and Information Literacy

First, improve the agricultural technology extension service mechanism by combining distance education with on-site education, organize all kinds of agriculture-related business entities to carry out various information consulting service training on mobile Internet access skills, e-commerce skills, and information technology application skills to improve farmers' technical level, business ability and information literacy.

Second, it promotes the construction of informatization talents training and strengthens the key and applied talents training. Agricultural informatization talents should be brought into the new professional farmers cultivating plan, constructing the model is given priority to with family farmers production informatization professional farmers, by various means the cultivation of information quality, strengthen information consumption ability.

7 Conclusions

This paper discusses the standardized path construction of agriculture-related data in Shandong province under the background of digital economy to provide theoretical support for the application of agriculture-related data. In the case study, the standardization construction of agriculture-related data in Shandong province is taken as an example. Through the analysis of Shandong province's achievements and current difficulties, some suggestions are put forward. This paper has theoretical reference value for the construction of "agriculture-related data standardization" in Shandong Province, and can also provide reference for other regions.

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