

Research on Coordinated Development of Chongqing Agricultural Product E-commerce Logistics Based on System Dynamics Model

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Abstract. At the moment of the rapid development of information society, agriculture is achieving industrial quality growth through the "Internet+" path. Agricultural e-commerce is an important application area. Agricultural e-commerce is a non-linear complex system that involves multiple entities such as trading platforms, trading entities, and farmers. Scientific and technological progress, policy adjustment, and industrial level will have an impact on the agricultural e-commerce industry. The development of the industry requires a systematic analysis of various influencing factors. Based on the in-depth investigation of Chongqing agricultural product e-commerce and logistics, this article uses system dynamics principles to analyze and simulate its internal dynamic mechanism analysis and simulation of the internal dynamic mechanism, and build a coordinated development model of agricultural e-commerce and logistics. Chongqing agricultural product e-commerce and logistics coordinated development system dynamic models, study the way to study the coordinated development of rural e-commerce and logistics, and use Chongqing's relevant data of Chongqing 2015-2020 for empirical simulation analysis. The impact of the influence proposed the effective strategy and method of coordinated development of Chongqing agricultural product e-commerce and logistics. Based on this, this article puts forward countermeasures for the coordinated development of Chongqing's agricultural products e-commerce and logistics, and provides decisions for the development of agricultural product e-commerce development policies for relevant government departments. Based on the development of the stable development of Chongqing agricultural product e-commerce and logistics.

Keywords: System Dynamics; Agricultural Products; E-commerce; Logistics.

1. Introduction

With the development of the Internet and cloud computing, today, when the market economy is booming and the network technology is changing with each passing day, e-commerce has emerged as the emergence of e-commerce, and its development momentum has become an emerging industry that more and more people pay attention to.[1] E-commerce is open and global. The advantages such as asization and other industries are widely used. The "Internet+" model is becoming an important opportunity for the transformation and development of various industries.[2] It has a strategic position in the development of the country's economic development and gradually becomes a new driving force to promote my country's economic transformation and upgrading. "Internet+Agriculture" has become an important direction for modern agricultural development. Agricultural e-commerce has become a new way of circulation, known as the final "e-commerce blue ocean". The current agricultural development has the problem of "selling difficulties" and the "expensive" problem of consumers. The rapid development of agricultural e-commerce is conducive to the solution of these issues. It will consolidate these issues. It is of great significance to promote farmers' income. However, compared with developed countries, the development of agricultural e-commerce and logistics industry in China is still in its infancy, and there is still much room for development. At present, there are still factors that hinder the development of e-commerce and logistics industries that are not adapted to management methods, irregular market order, and incomplete integrity systems. The total amount of agricultural e-commerce has continued to grow, but the proportion of the entire e-commerce transaction is still small. The agricultural e-commerce

enterprises have less profit, logistics companies cannot keep up, and there are more companies testing water. Decreased operations have become the norm of the industry, and the recognition of agricultural e-commerce main body has low recognition of Internet finance.[3] These issues restrict the development of agricultural e-commerce and logistics industry. With the strong support of national policies, the development of agricultural e-commerce and logistics shows prosperity, but the potential huge crisis behind it is what the relevant government departments and theoretical researchers should pay attention to. Agricultural e-commerce and logistics are emerging industries in recent years. At present, the coordinated development research on agricultural e-commerce and logistics is still in the initial stage. many. At the same time, agricultural e-commerce and logistics are the concept of a system.[4] It is a multi -factor system that integrates social, economic, policies, and markets. It has multiple complexity and system dynamics. The search found that there are fewer literatures based on the coordinated development of agricultural e-commerce and logistics as the research object from the perspective of system dynamics. Therefore, the coordinated development of agricultural e-commerce and logistics and the system framework for building agricultural e-commerce and logistics has become an urgent task of current theoretical research.

In most parts of Chongqing, the sales of agricultural products have been difficult to trouble. In order to solve this problem, the Chongqing Agricultural Bureau and other departments focused on the rural revitalization strategy, and used e-commerce as a carrier of "Internet+agricultural products" to vigorously develop agricultural e-commerce, which strongly promoted the sales of agricultural products in the vast countryside. With the rapid development of "Internet+Agricultural Products", Chongqing's agricultural product e-commerce and agricultural product logistics have entered a period of high -speed development. Poverty alleviation and farmers, live broadcasts and goods have effectively broaden agricultural product sales channels. However, in most parts of Chongqing, agricultural product logistics is still in a traditional stage of logistics. After investigation, there are fewer third -party logistics companies in Chongqing's real agricultural products. The level of logistics is far from meeting the needs of rapidly developing agricultural e-commerce companies and urgently needs to be resolved.[5] Based on this, the application of system dynamics in this article, build a dynamic development system model of agricultural e-commerce and logistics, and apply it to Chongqing agricultural product e-commerce and logistics systems. From it to the main factors that affect the coordinated development of agricultural e-commerce and logistics, and the effects of different factors on agricultural e-commerce and logistics, predict the development trend in different industrial policy environments, so that there are targeted and targeted agricultural e-commerce companies Countermeasures with the development of the logistics industry.[6] This not only provides theoretical support for the coordinated development of agricultural e-commerce and logistics, but also improves the management and service level of the government and scientific research institutions on the management and service of the agricultural e-commerce and logistics industry. Increasing efficiency has important practical significance.[7]

2. Theoretical research

2.1 System Dynamics Concept

System dynamics was proposed by Professor Fredster, Massachusetts Institute of Technology in the United States, that its use of system simulation to study various complex social, political, and business phenomena, which is a science of research information feedback system.[8] With the help of system dynamics, this article uses the coordinated development of Chongqing agricultural product e-commerce and logistics as the research object, and explains the logical relationship between system elements through qualitative and quantitative analysis. Use Vensim software to establish the number of factors in the system in the system in horizontal equations, speed equations, etc., in-depth analysis of the causal relationship between the influencing factors, and combine the relevant statistics of Chongqing 2015–2020 to conduct empirical analysis. Finally, combine

countermeasures to combine countermeasures It is recommended to perform simulation verification.

2.2 Research Hypothesis

The coordinated development model of Chongqing Agricultural E-commerce and Logistics includes Chongqing agricultural product e-commerce subsystems and Chongqing agricultural product logistics subsystems. Because the boundary conditions are the foundation of the model, in order to ensure the rigor of the model and the authenticity and accuracy of the simulation results, exclude the impact of the external environment and some abnormal data, the construction causality system dynamic model of Chongqing agricultural products e-commerce development causality system, Chongqing agricultural products The dynamic model of the development causality system and the cause and effect system, as well as the following assumptions when Chongqing agricultural product e-commerce and logistics coordinated development system dynamic models.

Assuming 1: Technical renewal and infrastructure construction in the development of agricultural product e-commerce and logistics are a continuous and gradual process, excluding influencing factors such as emergencies and policy changes.

Assuming 2: In the process of building a system dynamic model, we only consider the relevant factors of agricultural e-commerce and logistics development, and do not consider the connection effect. The data used during the simulation process came from Chongqing Statistics Yearbook, Chongqing Internet Report, Chongqing Transportation Website Announcement of Chongqing Statistical Yearbook, Chongqing Internet Report, Chongqing Transportation Website, and data on site surveys and questionnaires. The data is true and effective.

2.3 Agricultural Product E-commerce Logistics Development Subsystem Causal Relationship

Cause and effect in system dynamics is an important concept of system dynamic theory. It refers to the interaction between the various elements of the system. If there is a result, there must be a reason. In order to build a system dynamic model coordinated by agricultural product e-commerce and agricultural product logistics, model variables are selected from the aspects of agricultural e-commerce and agricultural product logistics. The main influencing factors of coordinated development.

2.3.1 Chongqing agricultural products e-commerce system

The main influencing factors of Chongqing agricultural product development subsystems are Internet penetration rates, number of Internet broadband users, per capita disposable income of rural residents, e-commerce information service stations, and online shopping penetration rates.

2.3.2 Chongqing agricultural product logistics subsystem

The main influencing factors of Chongqing agricultural products logistics development systems include logistics practitioners, agricultural product logistics, A-level logistics enterprises, cargo transport volume, courier business volume, national policy, etc., and the system dynamic subsystem.

3. System dynamics model

3.1 Coordinated Development System Model of Agricultural E-commerce and Logistics

In system dynamics, the relevant influencing factors in each causal relationship are refined through the system flow diagram, and the qualitative analysis of each influencing factor is carried out to clarify the influence mechanism and feedback loop between variables, thus paving the way for the subsequent quantitative analysis. The system dynamics model for the coordinated development of Chongqing's agricultural e-commerce and logistics is mainly based on six state variables, namely, regional GDP, Internet application, informatization level, agricultural logistics enterprises, agricultural e-commerce practitioners, and agricultural e-commerce information service stations, and other relevant auxiliary variables and constants are introduced, as shown in Fig 1.

Considering that before 2015, the statistical data of agricultural products e-commerce and logistics in Chongqing were incomplete, the statistical methods were not uniform, and the data acquisition was relatively difficult, the Chongqing Statistical Yearbook and the Chongqing Internet Development Report from 2015-2020 were selected for simulation analysis. In the above system dynamics model, the single-line arrow represents the feedback loop, and the double-line arrow represents the stock status.

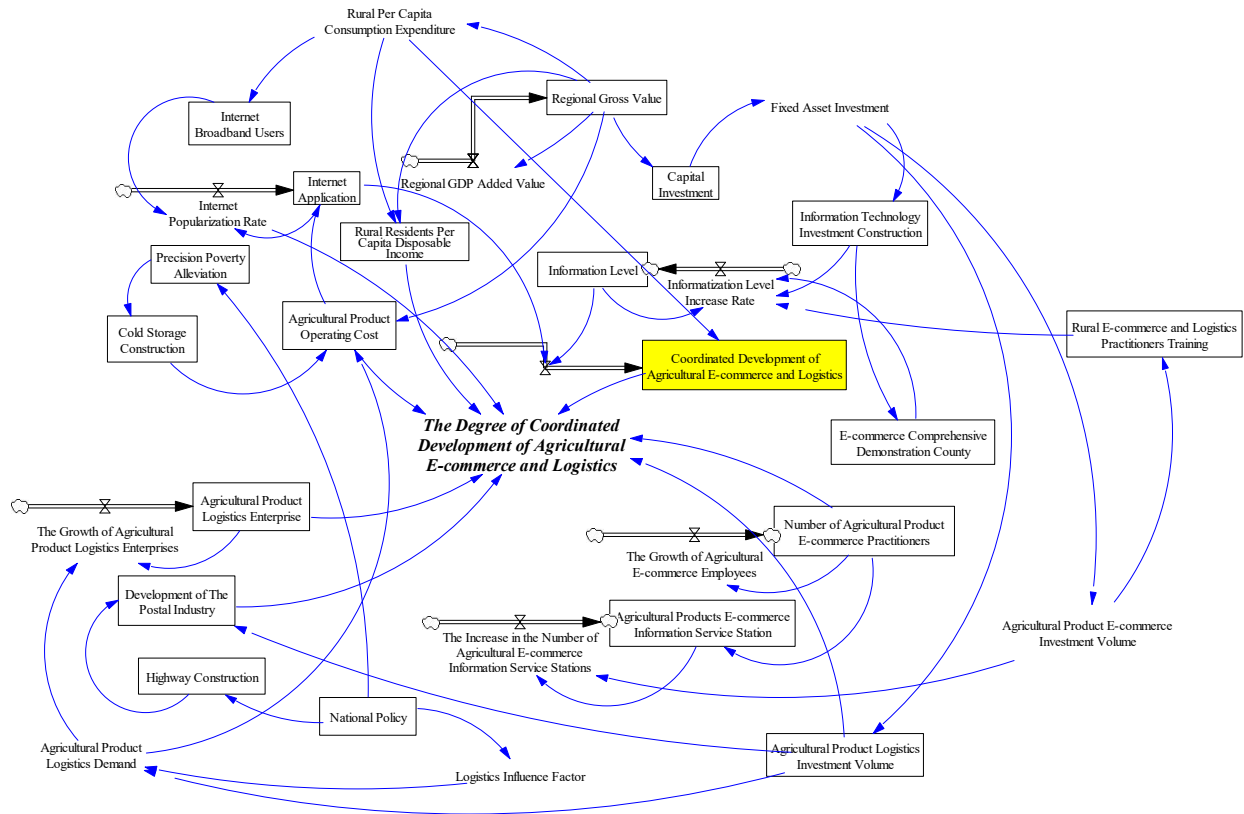


Fig. 1. System dynamics model of coordinated development of e-commerce and logistics of agricultural products in Chongqing

3.2 Simulation Results and Analysis

According to the formula (1) and formula (2), the coordination C can be obtained from the S_1 and S_2 systems.

$$f = \sum_{i=1}^n W_i X_i \quad (1)$$

$$C = \sqrt{\{(f_A \times f_B) / [(f_A + f_B)^2]\}} \quad (2)$$

Formula W_i — The weight factor in the system

X_i — Elements in the system

f — The comprehensive development level of the system at a certain moment

f_A — System S_1 's comprehensive development level at a certain moment

f_B — The comprehensive development level of the system S_2 at the same time

C — The coordination of the two systems S_1 and S_2 at the same time

From 2015-2020, the coordination between Chongqing Agricultural Products E-commerce System and Logistics subsystems is shown in Table 2.

Table 2. Coordination degree between e-commerce subsystem and

logistics subsystem of agricultural products in chongqing

Years	2015	2016	2017	2018	2019	2020
Coordination C	0.354	0.368	0.411	0.443	0.456	0.479

Combining the coordination results of Table 2, the coordinated development system dynamic model of chongqing agricultural products e-commerce and logistics (Fig 1) can be used to perform the coordination prediction results through Vensim software simulation. It can be seen from Fig 2 that the curve has a certain volatility. It is speculated that the main reason is that the information level rate rate, the number of logistics companies, the regional production value of the region, and the Internet application in the coordinated development of the agricultural product e-commerce and logistics of Chongqing and the number of agricultural e-commerce information service stations is a function of changes in the dynamics equation over time and system dynamics. Informatization levels are affected by the number of information investment, information personnel training, and comprehensive demonstration counties in e-commerce. Logistics enterprises are affected by fixed investment and employees. From the perspective of the trend of the curve, the coordination exhibition of Chongqing agricultural product e-commerce and logistics in 2021-2025 showed a rise.

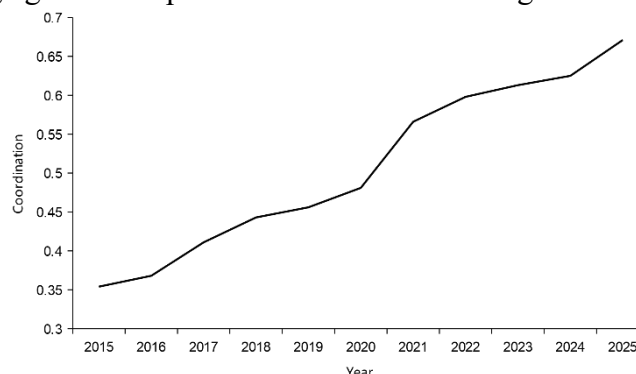


Fig. 2. Forecast trend of coordinated development of e-commerce and logistics of agricultural products in Chongqing

In 2021-2025, the coordinated development trend of Chongqing agricultural product e-commerce and logistics forecast is as shown in Table II, showing a slow growth trend.

Table 2 Coordination degree prediction statistics

Years	2021	2022	2023	2024	2025
Coordination	0.566	0.598	0.613	0.625	0.671

4. Summary

4.1 Analysis of Simulation Results

Through the system dynamic model, analyze the coordinated development factors of Chongqing agricultural product e-commerce and logistics, combined with the relevant data released by the Chongqing Bureau of Statistics, using Vensim software to simulate the development trend of influencing factors. The coordinated development of Chongqing Agricultural E-commerce and Logistics has affected the disposable income of rural residents, Internet penetration rates, regional GDP, the number of rural e-commerce service stations, and the number of logistics companies. According to the causal relationship between various influencing factors, the system dynamic causal feedback model coordinated by Chongqing's agricultural product e-commerce and logistics

has been established; the demand for the coordinated development of Chongqing agricultural product e-commerce and logistics has been established. Simulation and simulation environment under the software; collect and analyze the data of the development of agricultural product e-commerce and agricultural product logistics in Chongqing, and use the established system models to predict the development trend of coordinated development of agricultural products and logistics in Chongqing. There is a tendency to rise, but the growth rate is relatively small.

4.2 Countermeasures and Suggestions for Coordinated Development of E-commerce and Logistics of Agricultural Products in Chongqing

4.2.1 Improve the Policy System for the Development of Agricultural Products E-commerce and Logistics in Chongqing

(1) Establish an Authoritative Coordinating Body

Set up an authoritative organization and coordination organization, which is specially responsible for the research, coordination and formulation of agricultural e-commerce and logistics industry development policies. The purpose of this organization is to meet the development needs of agricultural e-commerce, achieve resource integration, macro-control, and provide a good external environment for the development of agricultural e-commerce and logistics, so as to achieve high-quality and high-speed development of agricultural e-commerce and logistics.[9] Coordinate the distribution of rights and interests between agricultural product e-commerce and logistics coordination system entities, so as to ensure the coordinated and steady development of all entities; Strengthen the supervision and management of e-commerce platforms, and realize information communication and data sharing among industry and commerce, agriculture, commerce and other government departments; We should build a working mechanism for consumer rights protection and consumer dispute adjustment, and strengthen the crackdown on illegal acts such as selling fake and inferior products online; Plan the construction of agricultural products e-commerce logistics center, cold chain logistics and other infrastructure as a whole. At the same time, increase the investment in the construction of agricultural products e-commerce infrastructure, formulate some relevant policies, guide and encourage diversified market entities to inject funds into the construction of agricultural products e-commerce infrastructure, and improve the agricultural products e-commerce infrastructure system.[10]

(2) Formulate and Improve Corresponding Supporting Policies

Study and formulate relevant policies, regulations, laws and regulations, regulate the development of agricultural e-commerce and logistics industry, study and formulate incentive policies to attract investment in agricultural e-commerce and logistics industry, and mobilize the enthusiasm of farmers; Propose specific measures to promote the reform and transformation of agricultural e-commerce enterprises in the production and circulation of agricultural products, clarify the responsibilities and obligations of agricultural e-commerce and logistics enterprises, and formulate support policies for enterprise finance and financial institutions; We will improve the tax management policies for agricultural e-commerce and logistics industry, reduce and reduce the corresponding taxes according to the national policies, determine a reasonable tax base, fully implement the relevant national policies, and formulate preferential policies for the use of agricultural e-commerce and logistics industry infrastructure. At the same time, we will introduce relevant policies related to the qualifications of agricultural e-commerce and logistics enterprises, technological progress, talent training, and other aspects.

(3) Formulate the Overall Plan for Coordinated Development of Agricultural Products E-Commerce and Logistics in Chongqing

Clear construction priorities, rational layout, unified market planning, strengthen real-time monitoring of agricultural products, and assist public governance through dynamic monitoring, forward-looking research, strategic planning and other decision-making information; Encourage the combination of production, learning and research, and the government department to take the lead, connect scientific research institutions and universities to jointly establish the agricultural product

e-commerce and logistics strategic research institute, so as to expand the scope and scope of exchange and cooperation; Do a good job of grasping the development status of agricultural products e-commerce and logistics industry, the problems encountered in the development, and the development difficulties in real time. This requires fully mining and monitoring the big data of agricultural products industry, regularly completing the industrial development research report, letting the public know the development status of agricultural products e-commerce and logistics industry, widely soliciting opinions from all parties, and further improving the overall development plan of Chongqing agricultural products e-commerce and logistics industry.

4.2.2 Improve the Agricultural Product E-Commerce Logistics Distribution System

Logistics level is one of the important factors restricting the development of agricultural products e-commerce in Chongqing, and the construction of logistics system matching the development of agricultural products e-commerce is particularly important. The logistics distribution center is reasonably arranged, and on the basis of information technology, the traditional logistics enterprise resources are integrated, and a set of modern agricultural product e-commerce logistics platform integrating data analysis, logistics distribution, packaging and release information is established. On the one hand, promote the construction of rural terminal channels, connect the agricultural product terminal logistics chain, and pay attention to the construction of standardized field preliminary processing; On the other hand, we should improve the public logistics distribution system, form the pilot of up and down and joint distribution cooperation, and realize the effective linkage of the whole process of agricultural products logistics and share resources through the integration of the logistics supply chain, so as to reduce the logistics costs and improve the service level and circulation efficiency on the basis of mutual benefit. In addition, cold chain logistics should also be developed to solve the problem of perishable agricultural products. However, the characteristics of cold chain logistics in terms of capital and cost determine that it is difficult for general enterprises to achieve cooperation with manufacturers. It is urgent for the government to support the development of enterprises, attract well-known domestic and foreign logistics enterprises, establish independent cold chain logistics operation departments, adjust industrial structure, establish large circulation, develop large markets, and expand the development space of mountain agriculture.

4.2.3 Strengthen the Construction of Agricultural Product E-Commerce Information Infrastructure

Agricultural product e-commerce is a related business activity with agricultural products as the core and relying on the Internet as the means.[11] All links of the agricultural product e-commerce ecosystem, from production, sales, management to logistics and distribution, can not be separated from the Internet to release the production base, supply and demand information, price changes and other information of agricultural products. It is particularly important to improve the information technology support of the agricultural product e-commerce industry. First, we should strengthen the construction of information infrastructure and platform, both hard and soft. We should follow the development of modern science and technology while setting up fixed limited broadband and equipped with unlimited mobile broadband, promote the construction of cloud computing resource center and big data platform, and ensure the smoothness of the network to the greatest extent; Second, optimize and improve the network infrastructure, vigorously support wireless broadband and fiber-to-home access, strengthen the construction of Internet information network, improve the "triple play" system, and promote the full coverage of information network points. In addition, give play to the role of the government in the development of agricultural e-commerce information technology, build a third-party information service and data sharing platform, and accelerate the construction of agricultural e-commerce information data system; We will improve the construction of mobile service platforms such as e-commerce, social networks, and mobile payments, and build a social public service network to provide residents with basic convenience services and government services; Improve the process of Chongqing's development to a data city, pay attention to the cultivation of professional talents, activate the innovation ability of "big data+", build a government

big data public service platform, realize intelligent and lean daily life services for residents, and promote the final development of the city to a "smart city".

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6. References

- [1] Zhu Xinyan. Research on the coordinated development of Agricultural Products E-commerce Logistics based on SD models. *Agricultural Engineering*, 2022, 12 (6): 4. 4.
- [2] Ministry of Agriculture and Rural Affairs Information Center, China International E-commerce Center 2021 Digital Agriculture and Rural E-commerce Development Report at County level in China, September 2021.
- [3] Guzzo D , Pigosso D , Videira N , et al. A system dynamics-based framework for examining Circular Economy transitions[J]. *Journal of cleaner production*, 2022(Jan.20):333.
- [4] Wang Lidong. Research on the development of rural network merchants based on system dynamics. *Journal of Lishui College*, 2020, 42 (3): 9.
- [5] Huang Lijuan, Zhao Wende, Dou Zixin, et al. Establish and simulation research based on system dynamics -based rural e-commerce ecosystems. *Journal of Guangzhou University: Social Science Edition*, 2017, 16 (8): 10.
- [6] Zhao Liying. Based on system dynamic agricultural product e-commerce ecosystem simulation research: take Chongqing agricultural product e-commerce ecosystem as an example. Chongqing: Chongqing University of Technology, 2018.
- [7] Qiu Zeguo, Yang Yi, Liu Wenjun. Research on the development simulation and countermeasures of rural e-commerce development based on SD models. *Northern Gardening*, 2019 (14): 9.
- [8] McGarraghy S , Olafsdottir G , Kazakov R , et al. Conceptual system dynamics and agent-based modelling simulation of interorganisational fairness in food value chains: Research agenda and case studies. *EconStor Open Access Articles and Book Chapters*, 2022.
- [9] Delima R , Budi H , Andriyanto N , et al. Development of Purchasing Module for Agriculture E-Commerce using Dynamic System Development Model[J]. *International Journal of Advanced Computer Science and Applications*, 2018, 9(10).
- [10] Arshad F M , Noh K , Bach N L , et al. Phase 2 System Dynamics Model of Industrial Crops. 2020.
- [11] Li Huijing. Research on dynamic mechanism mechanisms of rural e-commerce logistics system in Guizhou Province -based on e-commerce poverty alleviation vision. *E-commerce*, 2020 (12): 2. 2.