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Integration and Innovation of Rural Industries based on the Concept of Blockchain

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Abstract. The purpose of this study is to explore the integration and innovation of rural industries based on the concept of blockchain. In this study, firstly, the current research status of the integration and innovation of rural industries under the background of blockchain is summarized. Secondly, taking the rural areas of Xinxiang in Henan province as an example, and Grey Relational Analysis (GRA) model is used to analyze the correlation between agriculture and secondary and tertiary industries. The results show that the correlation between agriculture and non-staple food processing industry is the highest; The correlation between agriculture and culture, sports and entertainment industry is second only to non-staple food processing industry; the correlation between agriculture and transportation, storage and postal service industry is moderate; and the correlation between agriculture and food manufacturing industry, education industry, scientific research technology service and geological survey industry is relatively low. Finally, the strategy of the integration and innovation of agriculture and the secondary and tertiary industries is proposed, that is, the government encourages integrated industrial development based on financial support; develop the agricultural Internet of things; and improve the agricultural education service system. Therefore, this study has some practical significance.

Keywords: blockchain; industry integration; innovation; rural; agricultural internet of things.

1. Introduction

Since the 1970s, the modern information technology revolution has developed rapidly, and the high and new technology represented by it has achieved rapid development. In particular, the international information industry has shown an unprecedented trend of integrated development [1]. Information integration industry, as a new industry, is not only paid attention to by many scholars academically, but also regarded by the government as a direction of future development, thus gradually forming a new economic phenomenon of integration of practice and theory. The result that the information industry merges development brings is remarkable, a lot of rural areas also begin to explore this kind of new-style development pattern [2]. The specific performance is as follows. Firstly, it is the penetration of high and new technology into the agricultural field, and the integration of agriculture, biological industry and information industry appears. Secondly, it is the integration of agriculture, industry and service industry, so that the boundaries between the three industries are not so clear. Therefore, the integrated development of agriculture and the secondary and tertiary industries in rural areas has gradually become a new direction to solve the problems of agriculture, rural areas and farmers, increase farmers' income and realize the secondary development of rural economy [3].

Nowadays, information technology has made breakthroughs in many fields, which not only promotes the development of information industry, but also has a profound impact on industry and service industry, and promotes the integration of information technology industry and other industries. The most representative is the integration of computer, communication technology and terminal consumer goods industry, that is, 3C integration. Scholars began to study this integration. With the continuous extension of the research field and the accumulation of achievements, it gradually developed into the theory of industrial integration [4]. Blockchain technology is also widely used in the integration of rural industries. It is the basic technology used to build the bitcoin blockchain network and the encrypted transmission of transaction information. The core problem to be solved by this technology is how to reach consensus among the nodes distributed in the network in the absence of trusted central institutions and channels. Blockchain is defined as a distributed ledger in which all participating nodes have transaction information and data on the whole chain [5]. Therefore,

blockchain technology is extremely robust, because each participating node on the chain only serves as a part of the whole chain. Each participating node has equal rights, they all store the same ledger, and breaking a part of the participating node has no impact on the whole chain. On the other hand, the operation mechanism of blockchain can ensure the security of transactions. In such a large system, unless most nodes are mastered and controlled, the whole system will decide the real result by referring to the key of participants in the chain, and it is meaningless to modify some information on the chain. Finally, because there is no centralized institution with excessive power in the blockchain, the transaction cost is greatly reduced and the transaction efficiency is greatly improved [6].

2. Literature Review

Many scholars have studied the integration and innovation of rural industries under the concept of blockchain. For example, Daniels et al. believe that the integration of rural industries is the result of the effect of high and new technologies on traditional industries. It is a process of integrating two or more industries into a new industrial form [7]. Puthal and Mohanty believe that industrial integration needs to be based on a common technology. Industrial integration should be achieved in technical fields, such as blockchain technology [8]. Meng et al. used the blockchain technology and combined the distributed network nodes of the blockchain to design a distributed agricultural Internet of things platform [9]. In view of the transaction storage problem under the current agricultural supply chain, Esposito et al. proposed the realization method of credible traceability in the supply chain with the block chain technology [10].

3. Experimental Procedure

3.1 Use of the GRA Model

Firstly, GRA model is used to analyze the correlation between agriculture and secondary and tertiary industries. Specifically, the following five steps are included: first, understand the various behavioral characteristics of the system. Secondly, analyze the influence of the behavior characteristics on the existing system behavior, and conduct quantitative analysis and treatment in written form. Thirdly, compare and analyze existing grey correlation coefficients. Fourthly, calculate the final correlation degree. Fifthly, effectively sort the final result, as shown in Figure 1.

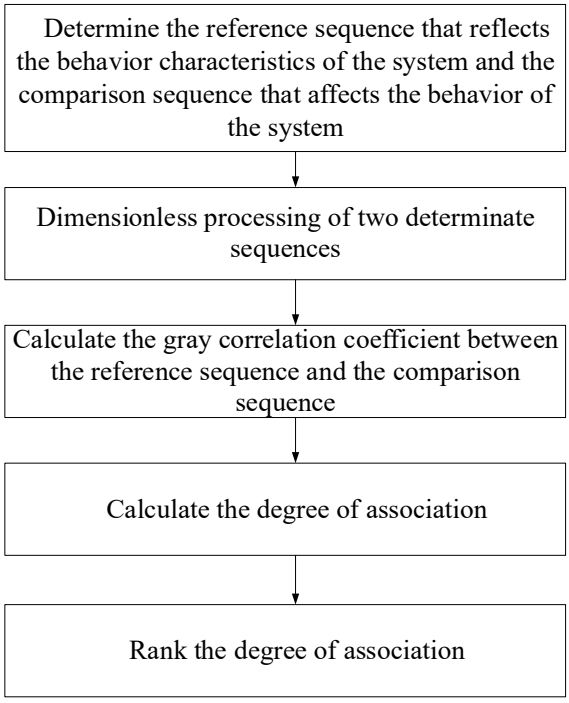

Figure. 1 Calculation flow of GRA model

3.2 Application of Blockchain Technology

The working principle of blockchain is not complicated. All nodes in the network jointly maintain a blockchain ledger, which is stored on all nodes. Nodes on the network do two things. One is to broadcast their transaction information to all the nodes in the network, request the node authentication, and then write to the block, the nodes in the network will calculate the transaction broadcast in the network. If a transaction is approved by the majority of nodes in the network (usually more than half), it is considered to be a safe and feasible transaction, which is about to be written to the block; another is that nodes in the network work together to calculate a problem. The node that calculates the problem has the billing right of the block. It is responsible for collecting the transactions in the network during this period, writing the transaction to the block, and then connecting the block to the end of the blockchain. Through such operations, it is ensured that the transactions on the block are collectively verified by the network, thereby ensuring that the transactions on the network are safe and trustworthy.

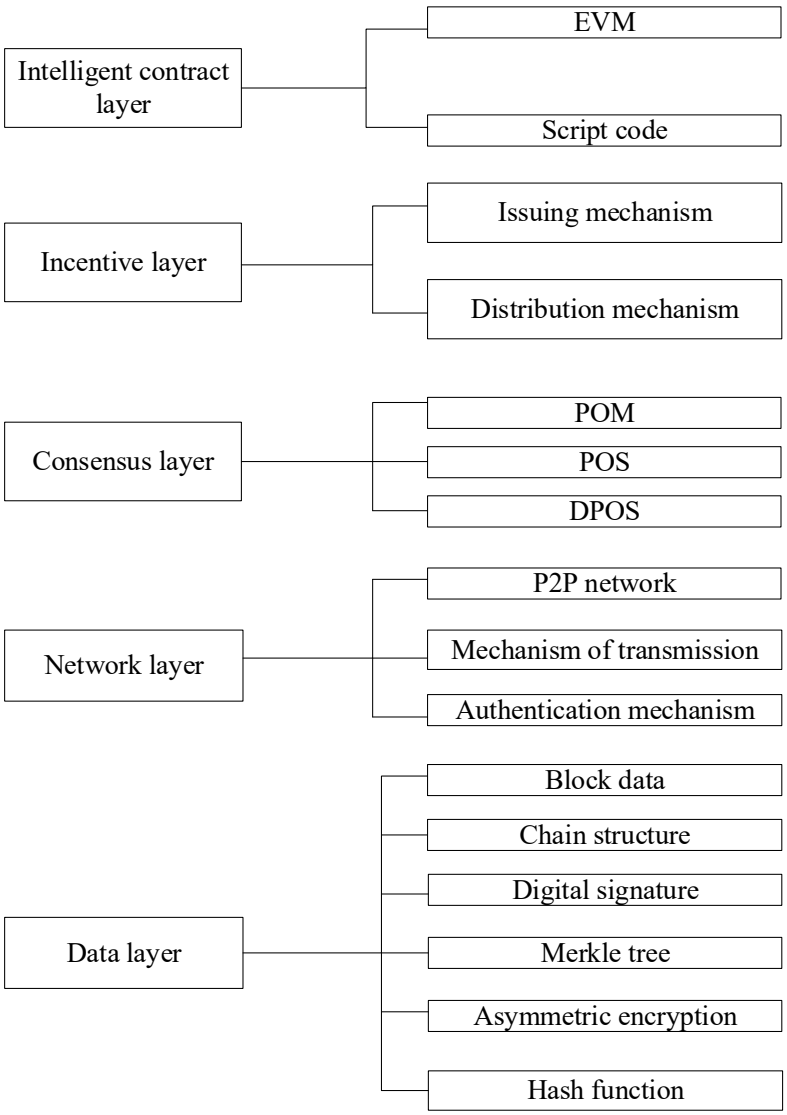

Figure. 2 Technical architecture of blockchain

4. Results and Discussion

4.1 The Analysis of Correlation between Agriculture and Secondary and Tertiary Industries

Table 1. Value added of agriculture and related industries in Xinxiang from 2014 to 2018(unit: 100 million yuan)

Year	Agriculture	Industry		Service industry			
	Fisheries, animal husbandry, agriculture and forestry	Various processing and food industries related to agriculture	Food related manufacturing industry	Post industry, storage industry and transportation industry	Geological exploration industry, technical services and scientific research	Education and teaching	Entertainment industry, sports industry and culture industry
2014	227.37	21.34	5.22	48.22	9.14	34.81	6.23
2015	227.28	21.98	5.96	48.69	9.76	35.11	6.91
2016	216.45	18.77	5.04	46.73	8.61	33.85	6.17
2017	222.12	20.99	6.47	50.11	9.84	36.43	7.42
2018	231.19	21.08	6.53	51.01	10.16	36.88	7.61

Table 2. The calculation results of the correlation between agriculture and the secondary and tertiary industries in Xinxiang area

Agriculture	Industry		Service industry			
Fisheries, animal husbandry, agriculture and forestry	Various processing and food industries related to agriculture	Food related manufacturing industry	Post industry, storage industry and transportation industry	Geological exploration industry, technical services and scientific research	Education and teaching	Entertainment industry, sports industry and culture industry
--	0.412	0.287	0.349	0.217	0.246	0.387

It can be concluded from the correlation calculation results that the current relationship between agriculture, industry and service industry presents the following characteristics:

First, the correlation degree between agriculture and non-staple food processing industry is the highest, with the correlation degree of 0.412. Agricultural and non-staple food processing industry requires low capital investment and technical requirements, so in recent years a large number of small and micro enterprises have started to operate non-staple food. This results in a closer relationship between agriculture and non-staple food processing industry.

Second, the correlation between agriculture and culture, sports and entertainment industry is 0.387, second only to agricultural and non-staple food processing industry. When traveling in rural areas, tourists also buy a large number of consumer goods, making the relationship between agriculture and culture, sports and entertainment industry more and more close

Thirdly, the correlation between postal service industry, warehousing industry, transportation industry and agriculture reaches 0.349, and the correlation between the two is relatively low. However, with the continuous improvement of the country's comprehensive strength, the links between different industries are increasingly close. As a result, the level of transportation, warehousing and postal services will continue to rise, making agriculture increasingly relevant to them.

Fourthly, the correlation between agriculture and food manufacturing industry, education industry, scientific research and technical services and geological survey industry is relatively low. At present, the agriculture in Xinxiang area is just in the stage of promotion and development. The enterprise scale is small, and most of them are concentrated in the non-staple food processing industry. Therefore, the correlation between agriculture and food manufacturing industry is not high at present.

The reason for the low correlation between education industry, scientific research and technical service, and geological survey industry and agriculture is that the policy measures of agricultural extension and agricultural industrialization development are still in the initial stage with few achievements. New agricultural technologies and methods are in the stage of research and development.

4.2 Development Strategy of Integration of Agriculture and Secondary and Tertiary Industries

Firstly, government encourages integrated industrial development based on financial support; develop the agricultural Internet of things; and improve the agricultural education service system. In the process of industrial integration, there are inevitably many difficulties. The government should actively support and absorb social funds through various channels, increase the investment in the integrated development of agricultural industry, expand the scale of industrial development and improve the ability of industrial development.

Secondly, develop the agricultural Internet of things. The Internet of things is not a new industry that exists independently, but a new ecological model that is deeply combined with traditional industries in different fields and empowered by the Internet of things. As the application of the Internet of things technology in the agricultural field, the agricultural Internet of things plays an important technical supporting role in the process of China's agricultural modernization. In addition, it is also limited by the level of agricultural development. Among them, the most important problem is that China's agricultural production is still dominated by small-scale mode, and the cost, stability and application threshold of IoT technology limit its promotion among farmers. The decentralized mechanism of blockchain can solve the cost and efficiency problems caused by too many access devices in the agricultural Internet of things, but it is not urgent in terms of the current situation of the development of agricultural Internet of things in China. In addition to boosting the agricultural Internet of things technologically, another use for blockchain is to transform the economic model. The biggest advantage of adopting blockchain technology is that it can provide direct transactions to the trusted intermediaries and enforce terms through smart contracts. When the condition is reached, it is automatically traded and executed. Monitoring data is considered a valuable asset in the general economy, and smart contracts can be designed through blockchain technology. When the Internet of things generates a monitoring data, it will automatically give a certain token reward to farmers, which will effectively enhance the willingness of farmers to use the Internet of things equipment.

Thirdly, improve the agricultural education service system. In the process of adjustment and optimization of the industrial structure of agriculture, the ideas of integrated development of modern agricultural industries, such as improving the level of agricultural science and technology, optimizing the industrial structure of agriculture, and improving the agricultural social service system, are all based on education. Therefore, in the process of integrated development of agricultural industry, the improvement of agricultural education system is of vital importance. Therefore, the government should perfect the current agricultural education service system and strengthen the foundation of farmers' education.

5. Conclusion

The theory of integrated industrial development has provided new opportunities for the reform and development of many industries and pointed out a new direction for the development of agriculture. Therefore, in this study, the rural areas of Xinxiang in Henan province are taken as the specific objects, and the issue of integrated development of its agricultural industry is discussed in detail. Through analysis, it is found that there are relatively few links between agriculture and other processing industries, and the current development level of enterprises with higher agricultural production correlation is still at a low level. Therefore, the government must constantly promote the diversified development of industry, strengthen the integrated development of agriculture and other related industries, and promote the common progress of energy agriculture, leisure agriculture and ecological

agriculture according to the actual situation of its own development. In the process of industrial structure optimization and upgrading, it also needs to strengthen the cooperation and integration with other industries in combination with the related requirements of agricultural industry structure, promote the integration of agriculture, sports, entertainment and other industries, and explore ways to integrate agriculture, transportation, education and other industries. In addition, the adoption of blockchain technology to develop agricultural Internet is a very feasible strategy. Through this study, it hopes to provide some references for the subsequent research on the integration and innovation of rural industries based on the concept of blockchain.

Acknowledgments

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