

Research on the Construction of the Industrial Chain of China's Rural Digital Economy

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Abstract: *The digital economy provides a new impetus for industrial development in rural areas of China, reconstructs the organizational form of the industrial chain of the rural economy, and affects the operation mode of the industrial chain. On the basis of relevant research literature, this paper defines the connotation of the industry chain of China's rural digital economy and analyzes the feasibility and necessity of building the industry chain of China's rural digital economy. Furthermore, the upstream, midstream, and downstream industrial chain paths of rural digital economy are constructed in theory, and the reliability of the industrial chain is verified in practice.*

Keywords: *industry chain of digital economy; rural areas; construction path; practice goal*

1. Introduction

From the "Fourteenth Five Year" National Agricultural and Rural Informatization Development Plan to the "Digital Rural Development Action Plan (2022-2025)" government documents, the content of fostering rural digital economy has been listed as the top priority. On May 23, 2022, the General Office of the CPC Central Committee and the General Office of the State Council issued the Implementation Plan of Rural Construction Action, and implementing the digital rural construction and development project has become one of the important tasks of rural construction. With the popularization of the Internet, digital economy has been widely used in rural areas with its big data technology advantages, which has improved the production efficiency in many rural areas, promoted the development of rural industries, and helped rural revitalization. However, at present, the development of rural digital economy is mostly carried out independently with rural areas as the center, but most of its upstream suppliers and downstream consumers are enterprises and urban residents. Due to the differences in information and resources between rural and urban areas, there is a one-sided tendency to analyze rural subjects or urban subjects unilaterally. Based on the particularity of the rural market, it is urgent to build the framework of the rural digital economy industry chain, put the market subjects into a whole for comprehensive analysis, explore the operating mechanism and connotation of the industry chain, and promote the efficient development of the rural digital economy.

2. Related research literature review

The digital economy plays an increasingly important role in China's economic development, promoting stable economic growth, improving the efficiency of existing models, and promoting the emergence of new industrial forms. Integrating the digital economy and rural economy also plays a significant role. The current literature mainly studies the following three aspects: The first aspect is constructing an agricultural and industrial chain. Su and Wang (2022) elaborated on the path of mutual integration of primary, secondary, and tertiary industries under the rural revitalization strategy, built a relatively complete agricultural industry chain, and affirmed the critical role of "Internet plus" in the agricultural industry chain^[1]. Zhu (2022) proposed four steps to promote rural development from the "three chains" of industrial chain, supply chain, and value chain around the development status of Jiangsu Province, namely, "to highlight the extension of the chain, to vertically integrate production, processing, and marketing; to highlight the excellent chain, to horizontally expand and integrate agriculture, culture, and tourism; to highlight the strong chain, to cultivate strong subjects internally; to highlight the complementary chain, and to externally empower all elements," which summarized the path of building a high-quality rural industrial chain^[2]. The second aspect is constructing the "Internet plus" rural tourism industry chain. L. Su and W. Su (2021) noticed the vital role of "Internet plus" in the construction of the

rural tourism industry chain and pointed out that it is necessary to take "Internet plus" as the support to realize the optimization and upgrading of the rural tourism industry chain from the four aspects of the industrial foundation, product development, marketing, and characteristic services^[3]. Deng (2021) introduced the specific concept of the rural tourism industry chain and proposed the development path of building a rural tourism industry chain^[4]. The third aspect is the digital economy and rural industry. Wen and Chen (2020) concluded that digital economy and agricultural and rural economy integrated development can better meet the needs of agricultural production and operation mode transformation and promote agricultural modernization and sustainable development^[5]. Guo and Miao (2022) introduced two paths for the digital economy to promote the revitalization of rural industries: the first path is to "empower" rural primary industries, boost "agriculture plus," and promote the quality and efficiency of agricultural development; The second path is to expand the agricultural industry chain and ecological chain vertically, promote the integration and development of various rural industries horizontally, to achieve better integration of multiple rural industries and reshape the industrial structure^[6]. However, Jiang (2022) pointed out that under the digital economy, agricultural transformation and rural industrial integration still face specific problems. There are still many obstacles in data resource sharing, infrastructure construction, talent introduction, etc. It is necessary to solve the issues faced by enabling agricultural transformation and rural industrial integration led by digital economic achievements through field surveys and case studies to summarize development suggestions^[7].

Through the study of the above literature, we found that there are still some contents that are not covered by existing literature: (1) The definition of connotation is unclear. The connotation of rural digital economy industry chain in the literature is not clearly defined for the time being, and most of them are "agricultural industry chain," "Internet plus," etc. The differences between the rural digital economy industry chain mentioned in this paper and the agricultural industry chain of "Internet plus" that has been studied more in the past still need to be explored and defined in depth. (2) The research perspective is unidimensional. The existing literature has covered chiefly the agricultural industry chain. Scholars have found that the leading role of the digital economy is to enable the agricultural industry chain outward and to complement the rural industry chain. However, the digital economy has not yet been summarized and studied as a single focus of the whole industry chain. (3) Decentralized research topics. The existing research only analyzes the path of industrial chain construction for rural tourism or agricultural production, which is one of the applications of the digital economy in rural areas. From a micro perspective, it does not reflect the internal linkage and linkage mechanism of the whole industrial chain of the rural digital economy. In addition, as far as the existing literature is concerned with the construction of a rural industrial chain mainly for single industries such as agriculture and tourism, the rural digital economy industrial chain constructed in this paper applies to all industries in rural areas, including agriculture, industry, service industry, etc.

At present, scholars have studied extensively in rural revitalization strategy research and the digital economy application field in combination with the current development situation of rural areas in China. Nevertheless, there is insufficient research on reconstructing the rural industrial chain into the digital economy. Therefore, how to build a rural digital economy industrial chain is a topic worthy of in-depth study, which is also the primary content of this paper.

3. Feasibility and necessity analysis of constructing the industrial chain of China's rural digital economy

3.1. The connotation of the industrial chain of China's rural digital economy

The industrial chain is a chain relation objectively formed by several relevant industrial sectors based on the internal technical and economic relations of economic activities in real economic activities^[8]. The word "chain" of the industrial chain not only reflects the "chain-type" correlation form between various parts, but also contains the substantial relationship of "link" in which each part depends on and affects each other. As shown in Figure 1, the industrial chain is composed of the four classic dimensions which include "value chain", "enterprise chain", "supply and demand chain" and "spatial chain"^[9]. Based on this, we will further analyze the connotation of the industrial chain of China's rural digital economy.

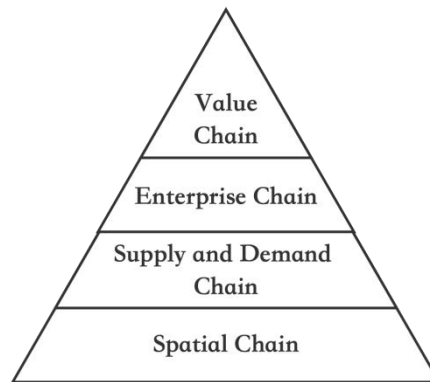


Figure 1: Conceptual diagram of industrial chain

In the classic four dimensions, as shown in Figure 1, the value chain is at the top of the "pyramid", which is the core of the industrial chain. The value chain is the ultimate goal of enterprise chain, supply and demand chain and space chain, through which the value is realized. For the industrial chain of rural digital economy constructed in this paper, the value chain is also in the core position. In the industrial chain of rural digital economy, the value chain is composed of the value activities which are supported by digital technology equipment and carried out by rural producers or service providers, including the substantive activities of production management, and the activities to support the substantive activities. The core of the value chain is to obtain profits by meeting customer demands and making reasonable profit distribution to meet the interest demands of various cooperative departments in the chain^[10]. Therefore, under the background of digital economy, with various digital technologies boosting the efficiency, quality and variety of rural production, the rural supply side can provide more and better products and services to meet the market demand. With the development of digital platforms and digital logistics, the products and services at the supply side of rural areas can also reach the demand side with large quantities and quick speed, which can satisfy substantial demand. At the same time, the popularity of online payment enables the payment of final consumers to be realized quickly, which is the key step of realizing the value of production management in rural area, namely exchange. Efficient exchange processes can also promote the cycle of economy and create more value across the rural area. Therefore, in the industrial chain of rural digital economy, the value chain focuses on the digital transformation of production management in midstream, as well as the digital research linking the demand side of downstream.

Enterprise chain refers to the chain formed by the flow of material, capital and technology. Enterprise chain organically integrates enterprise with different core capabilities into systems, dynamically connects value-creating activities on the basis of division of labor and cooperation, and generates economic benefits with superiority products^[11]. In the industrial chain of rural digital economy, there are mainly four types of enterprise nodes, which are the R&D and supplier of digital technology equipment in the upstream, the producer or service provider in the midstream, the transportation side and the platform side at the connection parts between every node. Vertically, these four types of enterprise nodes can share information with each other to achieve win-win cooperation. Horizontally, there are a number of enterprises in each type of nodes, and there is a stronger competitive relationship between them, which also promotes the innovation and development of enterprise chain.

The Association for Operations Management (APICS) defines a supply and demand chain as a life-cycle process consisting of the flow of materials, information, capital, and knowledge to provide products and services to meet the needs of end users through a number of linked suppliers. In the industrial chain of rural digital economy, the information and funds contained in the supply and demand process will rarely be presented in physical form, but flow in the industrial chain in the form of data. At the same time, a larger proportion of materials will be produced in non-physical form, which can quickly flow through the industrial chain. And the materials in the physical form will have rapid circulation between regions through the digital media. Therefore, the length of supply and demand chain's life cycle will be shortened, while the occurrence time will be increased in a certain period. Moreover, for the rural digital economy, the flow of knowledge is also crucial in the multi-stream supply and demand chain. On the one hand, the flow of digital technology knowledge within the R&D and suppliers in the upstream will be conducive to promoting technological innovation and development. On the other hand, the outward flow of digital technology knowledge to the midstream and the downstream, namely the users of digital

technology, will be more conducive to the promotion and application of digital technology.

Spatial chain is at the bottom of the “pyramid” in Figure 1. It refers to the distribution of the same industrial chain in different regions. In the industrial chain of China's rural digital economy, the most basic thing is to satisfy the integrity of the spatial chain, so the spatial chain is at the bottom of the "pyramid" of the industrial chain. It is necessary to ensure the flexible connectivity between rural areas and downstream markets by improving rural infrastructure and digital infrastructure construction. Only in this way can the value chain, enterprise chain and supply and demand chain have the means to realize utility and value. Within China, from macroscopic perspective, the whole industrial chain of China's rural digital economy is basically complete. However, under the influence of geographical location, climate, resources, policies and other factors, production operators in the midstream have obvious regional characteristics. Within a specific region, they tend to engage in a certain type of production management activities. For example, we have more animal husbandry in the west and more agriculture in the east. And in a certain area, some villages are based on tourism, while others are based on agriculture. For the suppliers of digital technology in upstream and consumers in downstream, they are spatially dispersed. Although the existence form of each link is spatially dispersed, in the context of digital economy, the industrial chain is more inclusive to the spatial distribution, and it can ensure the effective connectivity and integration of upstream, midstream and downstream through digital technology. To achieve such a state, the key lies in the comprehensive and accurate collection, storage and processing data information in all links, as well as the aggregation and re-decentralization effect of digital media on dispersed things. Attention should be paid to the standards of data collection, the establishment of data information system and the effectiveness of enterprises that can play the role of digital media. For example, the intelligent optimization of delivery service provided by logistics enterprise, and the more accurate data collection and delivery conducted by the platform.

3.2. Characteristics of the industry chain of China's rural digital economy

The industrial chain of China's rural digital economy is a chain formed by the organic combination of four dimensions: supply and demand chain, enterprise chain, spatial chain and value chain based on all relevant links from the upstream to the downstream of the industry, which is an effective path for the countryside to achieve sustainable green development. The main features of this industry chain are as follows:

3.2.1. Diversity of participants

The construction of the rural digital economy industry chain includes many enterprises, farmers, governments and customers from upstream to downstream, with diversity in roles and functions. At the same time, the rural digital economy industry chain realizes the organic operation of the industry chain through the organic composition of multiple participating subjects, with the needs and services of each subject as the main driving force.

3.2.2. Mutual integration of multiple chains

In the rural digital economy industry chain, it contains multiple industry chains, such as the agricultural industry chain and rural tourism industry chain, among which the agricultural industry chain is the main component to realize the integration of multiple industries, with agriculture Based on agriculture, the industrial integration of agriculture with service industry and cultural and creative industry is obvious.

3.2.3. Distinct regionalization characteristics of the industrial chain

Combined with the dimension of spatial chain, the industry chain of rural digital economy has obvious regionalization characteristics throughout the country. Take rural tourism included in the industry chain as an example, rural tourism has clear geographical space and geographic differences, with the countryside as the main place and rural landscape and rural culture as the main tourism resources. The localization characteristics of the rural tourism industry chain are also of great significance and value in the construction and maintenance of the rural digital economy industry chain.

3.2.4. The government act as a leader, promoter and coordinator

In this chain, the leading role of the government is an important factor in promoting the completion of the industry chain. The government fully drives the infrastructure construction of the countryside and the ideological transformation of farmers, and makes balanced efforts on multiple subjects such as enterprises, farmers and customers to break the link barriers of the industrial chain and realize the

sustainable development of the rural digital economy industrial chain.

3.3. Feasibility analysis of constructing the industrial chain of rural digital economy

In recent years, with the two-way support of technology and policies, China has achieved some practical results on the road of rural digital economy boosting rural revitalization. In the future, the development mode of the whole industrial chain gradually formed in rural areas will be a key step to accelerate the establishment of new industries, new forms of business and new models in rural areas.

3.3.1. The countryside is a value depression, with broad prospects for development

With the advancement of agricultural modernization and the continuous upgrade of national consumption level, the role of finance in helping the continuous promotion of rural revitalization strategy is gradually coming to the fore. At this stage, the development of the whole industry chain in rural areas is in its initial stage, with high growth value and abundant potential space. If we can guide the flow of financial water to rural depressions, make local rural financial institutions focus more on serving the rural real economy, while improving the rural credit system and solving problems such as farmers' loan difficulties, rural values will be more fully explored.

3.3.2. Farm support policy guides rural industrial revitalisation forward

In accordance with the key policies to strengthen agriculture and benefit farmers issued by the government in 2022, the state will continue to increase fiscal input to support agriculture and promote the smooth implementation of key projects. In the enhancement of the whole agricultural industry chain, the government will coordinate the layout and construction of a number of national modern agricultural industrial parks, advantageous and characteristic industrial clusters and strong agricultural industry towns, with a view to promoting the integrated development of the agricultural industry; the reasonable layout and construction of cold storage and preservation facilities for the origin of agricultural products around vegetables, fruits and other fresh agricultural products; and the promotion of the development of the geographical indication agricultural products industry around production standardization, product characterization, identity marking and digitalization of the whole process. In terms of training of business subjects, the government will carry out training for high quality farmers in terms of business services, farming skills, innovation and entrepreneurship, and rural governance. The government will carry out training for high-quality farmers in various aspects, such as management services, farming skills, innovation and entrepreneurship, rural governance, etc., and launch the implementation of the "the leading wild goose" project for rural industrial revitalization. The government will support the application of advanced technology by new agricultural business entities, enhance the scale, intensive and information-based production capacity, and promote their high-quality development. It also supports new agricultural business entities to apply advanced technologies, enhance their scale, intensification and informatization production capacity, and promote their high-quality development. We also provide agricultural credit guarantee services to small and micro agricultural enterprises and other business entities, and provide subsidies to provincial agricultural guarantee companies that carry out related businesses.

3.3.3. The application of digital information technology gradually permeates every link of social production

With the advent of the 5G era, the application of Internet information technology in various industries in China has become very popular, and the current level of technological development can basically realize the application of digital means to all aspects of the industrial chain. The application of information technology, sensors, mobile smart devices, etc. can realize the transformation of traditional agricultural production mode into smart agricultural production^[12]. With the empowerment of digital technology, the efficiency of the production chain in the upstream part of the agricultural industry chain is significantly improved. In recent years, the booming development of e-commerce platforms has also brought new opportunities to the downstream of the industry chain. The emergence of new business models such as rural e-commerce has opened up the retail link at the end of the agricultural industry chain and provided new ideas and channels for the sale of rural agricultural products.

3.3.4. People's ideas of production and consumption change

For producers in the upstream of the industrial chain, with the continuous improvement of rural infrastructure and the widespread popularity of the Internet in recent years, more and more people realize that the application of digital economy to production and sales is a shortcut to increase income and get rich. In terms of agricultural production, the smart agriculture represented by COFCO Smart Farm and

Huangtu ecological agriculture has begun to take shape. In rural e-commerce, more and more farmers choose to use Taobao, Jingdong, Pinduoduo and other e-commerce platforms for product sales, to a certain extent, across the space restrictions of both buyers and sellers, and effectively solve the problem of unsalable agricultural products. For consumers at the lower end of the industrial chain, the increase of residents' income leads to the change of consumption concept and consumption demand. For example, in rural tourism, compared with traditional tourism, people pay more attention to the comfort and experience of rural residence integration.

3.4 The necessity analysis of building rural digital economy industrial chain

The development of rural digital economy is mostly carried out independently with villages and towns as the center, and there are many problems. Therefore, it is necessary to establish an industrial chain that is able to link the digital technology and its enabling infrastructure in the upstream of the industry, the production and supply side in the midstream of the industry, and the customer market in the downstream as soon as possible.

3.4.1. Promote the interconnection of various elements of the industry and form an efficient coordination mechanism

At present, the degree of integration among the subjects of the rural digital industry needs to be improved, and the production factors held by producers, technology enterprises, grass-roots political organizations, and other subjects have not been integrated and utilized, resulting in the situation that digital technology and its enabling infrastructure are difficult to be applied to the production side in China's rural areas and therefore achievement of breakthroughs in production efficiency is more challenging to be achieved. However, the construction of the rural digital economy industry chain can not only horizontally drive more farmers to join the digitalization process of the industry, forming larger production units with villages, towns and counties, but vertically provide stronger financial support for the introduction of upstream digital technology and the construction of information infrastructure, and provide more diverse channel choices for the sale of downstream terminal products. On the whole, it has the ability to promote the implementation of the whole digital industry and the efficient development of the digital countryside.

3.4.2. Unimpeded information communication in all links of the industry

Rural producers' low acceptance of digital economy and their difficulties in keeping up with the quick pace of updates and iterations in the digital industry are two factors contributing to the obstacles of rural digital economy development. Nevertheless, the construction of the rural digital economy industry chain has facilitated the exchange of information between the upstream and downstream of the industry, which helps farmers to bridge the information gap brought by the digital divide. Under the linkage mechanism of the industry chain, demand information from the downstream can be fed back to the midstream in time, so that the midstream production entities can accurately grasp the development of regional digital sales methods and promptly adjust production and marketing strategies; updated information from the upstream can also be transmitted to the midstream, so that the midstream production entities can better grasp the development of digital equipment technology and formulate reasonable strategies for the introduction of digital technology and investment in basic equipment. The integration and sharing of industry chain data allows all links of the industry to understand the overall status of the industry in a superior way, forming a stable development mechanism for continuous optimization and adjustment, and promoting the sustainable development of the rural digital economy.

3.4.3. Improve farmers' employment and income equity, and protect their interests in the development of rural digital economy

When digital technology fuels the rural economy, the demand for labor has shifted due to the digital change in production, so that new skilled workers have mostly replaced low-skilled workers, depreciating farmers' labor payments and damaging employment fairness. Besides, the model of selling products based on digital platforms has also exposed problems such as high transaction costs, high fluctuations in product prices, and unstable product sales. As the disadvantaged group in the industry chain, farmers' income equity is also undermined. The bridging of the digital industry chain in rural areas allows production individuals to develop new bigger volume production units organized in villages and towns as a foundation for establishing production organizations and unified administration of digital production. Furthermore, a trusteeship mechanism can be established to provide comprehensive services for the whole production process, so farmers can have more job options, such as working outside the villages and developing side businesses. In addition, the rural digital economy industry chain also incorporates

the digital governance mechanism of village committees to help farmers introduce digital equipment and technology, support farmers' digital production, broaden product sales markets, protect farmers' rights and interests. In this way, farmers can share more dividends of digital economy development.

4. Analysis of the construction path of the industry chain of China's rural digital economy

4.1. Analysis of the construction path of the upstream, midstream and downstream of the chain

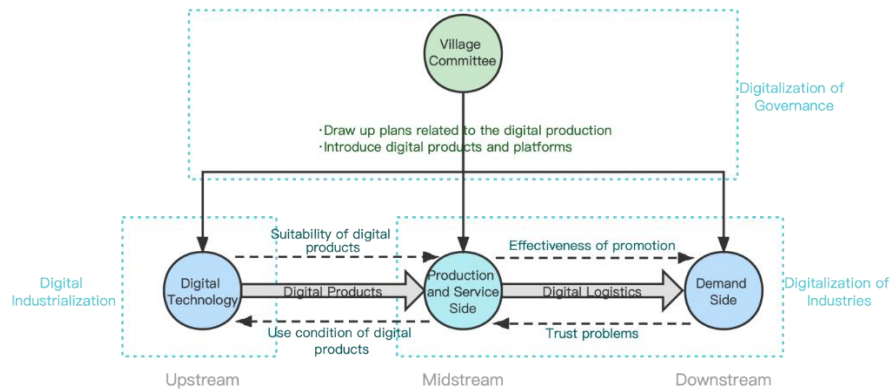


Figure 2: Schematic diagram of the industry chain of China's rural digital economy

The industry chain of China's rural digital economy constructed in this paper is significantly different from the existing "Internet+" agriculture and "Internet+" rural tourism industry chains. The "Internet+" stage can be understood as the application of information technology to assist production and connect the various business segments, bridging the "blocks" of production and consumption into a chain through the Internet. The digital economy stage can be understood as the use of technology to create production and integrate the various segments of business, all of which are brought together in a network in the form of data and information, with a more blurred sense of boundaries between the various segments. In agriculture, for example, the "internet+" stage technology does not change the growth itself, it is additional and complementary, such as real-time monitoring and information management through the internet of things, and only provides a bridge to e-commerce, allowing consumers to buy the products produced online. Digital stage technologies, on the other hand, are integrated into production and control the direction of production, and are integrated and convergent, such as the more advanced smart agriculture currently available, which is able to collect and analyze big data and build models of the agricultural production process, which in turn generates decision judgements and makes automatic adjustments. In the context of the digital economy, Figure 2 presents the full path of the industry chain of China's rural digital economy constructed in this section from the upstream, midstream and downstream segments as well as the village council segment. As can be visualized in Figure 2, the agricultural digital economy chain is more like having a digital network that incorporates multiple links, with the consumption link being more closely linked to the production link. For example, in the production process, there are multiple devices to detect farmers' crops in the production process, which are gathered in the government data center and form a traceability code, allowing consumers to not only buy the product, but also to "see" the production within the digital network and have a digital mirror image.

4.1.1. Upstream construction path of the industry chain

The upstream of the industry chain is digital technology and its enabling infrastructure construction. The upstream R&D innovation results are eventually transmitted to the midstream in the form of digital products and technical methods, which are not only the source of industrial digital technology innovation, but also the continuous driving force for the change and development of the whole industrial chain under the form of digital economy. In order to promote more efficient transmission of upstream R&D innovation results to the midstream, the upstream construction of the industrial chain should pay more attention to the following three aspects.

4.1.1.1. Concerned about the effectiveness of publicity and popularization

Since information in rural areas inevitably has certain deficiencies and deviations from urban areas, sellers of upstream digital technology equipment should strengthen the promotion of their products.

Considering the low level of knowledge and skills per capita in rural areas, it should also be noted that the content of the promotion should be easy to understand, so that people in rural areas can intuitively feel the usefulness of the product.

4.1.1.2. Produce suitable products that meet actual needs

The upstream should understand the production and operation of the midstream, clarify the actual demand of the midstream market, and produce digital technology equipment suitable for the midstream. The upstream can prepare diversified solutions in advance and provide personalized and customized solutions to meet the needs of different customers.

4.1.1.3. Provide full-cycle technical services

The upstream seller should provide technical guidance on the use in the early stage, and focus on the effectiveness of teaching, otherwise we might see that the midstream obtains the equipment, but the lack of operability leads to idle equipment, resulting in a waste of resources. In the medium term, the midstream should actively provide effective after-sales service to solve various practical problems arising in the process of use. In the later stage, in order to understand the future technical needs of the midstream in advance, the upstream seller should negotiate the future adoption of digital technology equipment, which can also help the upstream to improve customer viscosity and continue to provide technical support.

4.1.2. Midstream construction path of the industry chain

The midstream is the production or service side. The production subjects in agricultural production are farmers, the production subjects in township industry are farmers' collectives, and the subjects providing services in rural tourism are villagers. These subjects play the role of connecting upstream and downstream in the rural digital economy industry chain: as the midstream of the industry chain, on the one hand, it can introduce upstream digital products and technical methods into rural agriculture, industry, tourism and other industries, injecting power into traditional economic development. On the other hand, it can construct digital bridges through digital logistics, digital platforms and other intermediate links to transport relevant products and services to the downstream, provide better quality, richer and more innovative products and services for the downstream, and increase the number of beneficiaries of rural digital economy development. In addition, the development of the midstream can also promote the process of industrial digitalization, make the development mode of "digitalization + rural" generate economic benefits, and gradually achieve scale benefits of digital economy development, helping rural economic revitalization. Therefore, for the construction of the midstream path of the industrial chain, we need to pay attention to the following three aspects.

4.1.2.1. Jointly enhance internal and external attractiveness

The key correlation factor between midstream and downstream is flow, here we mainly refer to business volume and passenger flow. In order to consolidate and strengthen this part of the flow, on the one hand, production and service subjects in the middle reaches, namely farmers engaged in agricultural production or tourism operators, should make use of the influence of the new media to carry out diversified online promotion. On the other hand, the acquisition of continuous flow not only depends on downstream consumers passively accepting the promotion content output by the midstream, but also depends on improving the internal strength of the midstream to realize the transformation of downstream consumers from being publicized to active publicity, so as to achieve long-term development. In the production and operation link of the midstream, the improvement of infrastructure and supporting facilities is the basic requirement and guarantee of development. On this basis, digital technology and equipment should be used to improve production efficiency, strengthen compliance supervision, achieve efficient and high-quality production and operation, and enhance internal attractiveness. In addition, with the underlying guarantee brought by high efficiency and high quality, we can build brand effect with the help of external attraction to drive demand and obtain brand premium. Furthermore, with the help of external and accumulated capital, the scale can be expanded, and economies of scale can be obtained, thus forming the synergistic development of internal and external.

4.1.2.2. Horizontal and vertical extension to improve stability

A single type of business will increase the risk of uncertainty and increase the income volatility of production subjects. Therefore, the midstream should expand their business horizontally to realize multiple operations, and extend the industrial chain vertically to carry out deep processing and increase the added value of products. On the one hand, horizontal and vertical extension can increase the amount of income, on the other hand, it can improve the stability of income and reduce the risk brought by

uncertain factors.

4.1.2.3. Actively strengthen the awareness of upstream

The endogenous motivation of midstream subjects is a key factor in rural development, and the popularization education of digital technology equipment for the midstream should be carried out. Only when they realize the value of digital technology equipment to themselves will they be more willing to use upstream products and take the initiative to use new media for product marketing.

4.1.3. The downstream construction path of the industry chain

The downstream is the customer market, as the demand side, its demand determines the market supply. Since the degree of social division of labor and the degree of market transactions determine the degree of development of the industry chain, the downstream part will influence the vitality of the whole chain. Taking rural tourism as an example, changes in the demand preference of downstream passengers will affect the type, quality and form of services provided by midstream service providers, which in turn will indirectly influence the production and updating of upstream digital technologies and products. For example, in the past two years, people's travel has been greatly affected by the epidemic, making it difficult to carry out offline tourism. The downstream travel demand has led to the promotion of new tourism modes such as "cloud tourism" and "cloud exhibition" in many rural scenic spots across the country. Further, the basic digital technology in related fields has been innovated with more attention and investment from the market. In addition, based on the background of the current development of China's rural areas, the most important problem in the downstream is the deviation of people's understanding of rural areas under the long-term stereotype. Some urban residents inevitably have the impression that rural areas are dirty, messy and poor, but many new rural areas have changed their appearance and have made great progress in construction. Therefore, downstream customers should reacquaint the "new countryside" through multiple channels to enhance their trust in the midstream.

4.1.4. External guarantee of industrial chain construction --Village committee

In view of the current situation of grassroots self-governance development in rural areas, we also add the village committee to the construction of the industrial chain, which leads all links. The members of village committees include village cadres and resident cadres, who are responsible for planning rural production, life, ecology, and culture, which form the part of digitalization of governance in the rural digital economy. In order to play a greater role in the industrial chain of rural digital economy, village committees should focus on the following two aspects.

4.1.4.1. Enhance the understanding of various financial instruments

At present, there are many loans and special bonds for rural revitalization, whose costs are lower than the general situation, but little known. However, the development of rural areas, such as the expansion of production scale and the extension of industrial chain, requires capital investment. Village committees should actively understand new models and new forms of business, actively strive for various subsidies, and learn to use online financial apps, so as to make better use of capital to promote development.

4.1.4.2. Effectively collect and utilize data resources

In terms of governance, the use of data information can achieve efficient management, such as collecting public opinion online to solve villagers' problems in a timely manner, carrying out online legal education to improve villagers' safety awareness, collecting family information regularly to help low-income, disabled, elderly villagers living alone accurately, etc.

In terms of production and operation, firstly, the use of data information can monitor the crop situation and automatically process abnormal conditions. Secondly, it can count passenger flow information and analyze the data to find annual change rule, which is helpful to the resources allocation. Thirdly, it can also manage the whole process information, optimize the process and improve the safety and traceability of production.

The realization of all the above functions depends on data resources and a complete data collection standard and system, which is also the key to the effective operation of the industrial chain of rural digital economy.

4.2. Study on the reliability of practice in building a industry chain of China's rural digital economy

Based on the above theoretical construction of the industrial chain, a model of the industry chain of China's rural digital economy has been initially formed. The reliability of the industrial chain structure

we have built will be further demonstrated by the following examples of several representative industrial chains.

4.2.1. Rural tourism industry chain - taking the B&B industry chain as an example

The Baihuashan Society in Beijing's Mentougou District has combined the B&B with several functional areas along the "classic red tourism route" to form a special rural tourism project. In the B&B industry chain in which the community is involved, upstream enterprises and the government provide the infrastructure for the chain, including rural environmental management, public services and village roads, providing the foundation for the chain's formation. In the middle of the chain, local villagers rely on natural resources and the basic conditions created by the upstream to operate and build the B&B, providing "B&B +" services, forming a distinctive rural tourism project and attracting downstream customers. Downstream customers book B&Bs and purchase local agricultural products through digital bridges such as e-commerce platforms and online travel platforms, forming the consumption link in the industry chain.

4.2.2. Planting chain - taking the Phalaenopsis orchid chain as an example

The Yuxi Municipal Government has guided the city-wide research and promotion of digital technology demonstrations around the flower and vegetable industries. In the Phalaenopsis industry chain, the systems provided upstream such as mobile histologic intelligent quality management, fresh-cut flower planting operation guidance and sorting mobile operation meet the needs of digital management and production and help midstream production units to achieve efficient digital production and management. At the same time, the online order system for Phalaenopsis seedlings applied locally is involved in forming a digital bridge linking midstream producers with downstream customers. With the support of such digital technology, the upstream, midstream and downstream of the Phalaenopsis industry chain can successfully form a sustainable and modernized industrial chain.

4.2.3. The farming chain - the hog chain as an example

In the pig industry chain, the three platforms built by the Great Northern Agriculture Group, namely "Internet + breeding", "Internet + trading" and "Internet + finance", constitute the upstream of the industry chain and provide digital technology support. The three platforms, "Internet + Farming", "Internet + Trading" and "Internet + Finance", form the upstream of the industry chain and provide a digital bridge to support the industry chain. The pig farms in the midstream are provided with diversified production materials and financial systems by the platforms, which to a certain extent reduce financing costs and improve the availability of credit funds. At the same time, in the trading chain, the pig farms publish their buying and selling information through the platform, increasing the transparency of the transaction and realizing a convenient connection with downstream customers. The village committee, on the other hand, promotes the whole industry chain by introducing a corporate platform and monitoring sales.

4.2.4. "Agriculture + tourism" composite industrial chain - taking the flower and tree industry chain as an example

On the basis of some agricultural chains, the "agriculture + tourism" complex has been developed, relying on the marketing and ornamental value of the agricultural products at the same time. In the case of the flower and tree industry chain, the basic planting, processing and marketing of flowers and trees has the general composition and characteristics of the planting industry chain, while the tourism of the flower and tree industry chain derived from it has the general composition and characteristics of the rural tourism industry chain. In turn, they participate in constituting the diversity and complexity of the industry chain of China's rural digital economy.

4.2.5. Industrial chains in townships - the example of the construction products chain

The government of Guzhen County in Bengbu City has accelerated the deployment and construction of "new infrastructure" to promote the digital development of the county's manufacturing industry, not only covering rural areas with 5G signals, but also enabling more industrial enterprises to upgrade their intranets with new network technologies such as 5G and IPV6. Benefiting from better IoT infrastructure support, a number of rural industries, represented by Yuan Ding Construction Industry Co Ltd, have applied digital technology to two major aspects, namely material management and intelligent engineering, so that digital technology represented by 5G is deeply integrated into all aspects of construction product manufacturing, driving the improvement in quality, quantity and efficiency of the construction product manufacturing industry in Guzhen County. In the sales of construction products, Guzhen County has actively developed new e-commerce retail to promote the transformation of the

traditional retail model and further tap into the demand market for construction products. In addition, Guzhen County has strengthened its digital government governance capabilities by optimizing online government service halls, building a market supervision big data resource system and improving the ecological environment monitoring network, which not only provides more efficient government services for the local construction products industry, but also implements more vigorous regulation and supervision of the industry and promotes the healthy and healthy development of the construction products industry.

4.3. Realization of the objectives of the construction of the industry chain of China's rural digital economy

When the links of the rural digital economy chain are connected without hindrance, each link in the industrial chain will exert a "multiplier effect" that it does not have in isolation and contribute to rural revitalization together with other links. To construct the industrial chain of the rural digital economy, we will elaborate on the objectives and outlook from the following three perspectives.

4.3.1. Perspectives of production agents for planting and farming - agricultural specialization

With the application of digital production tools and testing tools, the structural stability of agricultural products is constantly strengthened. In the future, the advantages of local planting will be gradually brought into play. Through real-time data monitoring and prediction, automatic decision-making and response will be made to reduce uncertain factors in quantity and quality, such as: Due to the impact of extreme weather, diseases and pests, agricultural production is constantly developing towards lean. In the future, more attention will be paid to cultivating high-quality seeds for agricultural products and applying organic fertilizer to promote the high-quality development of rural revitalization.

In addition, under the background of the opening up of the industrial chain, farmers will enjoy the sharing dividends of production factors brought by professional science and technology and talents in the industrial chain, which makes it easier for growers and farmers to find out what factors cause the problems in planting and breeding production, solve the problems faced comprehensively, and promote the professional development of agricultural production.

4.3.2. The main perspective of rural management -- scientific management

Under the background of the continuous improvement of information completeness, symmetry, timeliness, effectiveness, and relativity due to the use of digital products, management subjects, such as village committees and town government, are more likely to become a single link or a single subject as the operation management unit, break the original time and space restrictions on management, and achieve efficiency optimization and scientific decision-making.

4.3.3. Consumer perspective -- consumption diversification

When big data is applied to agricultural consumption, the online and safe visualization of agricultural products on major e-commerce platforms in the future will enrich every consumer's shopping choices, and the choices will become more diversified. When consumers' personalized needs are easier to be met, people's yearning for a better life will be increasingly realized. In addition, promoting the development of a rural digital economy through the industrial chain can also make the countryside more modernized, better establish a beautiful image of the new countryside in the new era, improve consumers' trust in the finished products in rural areas, change consumption habits, and broaden consumption channels.

5. Conclusion

Through the construction of industry chain of China's rural digital economy from the perspective of industrial chain, we can see that rural digital economy has broad prospects for development in the future, and has strong potential to become a new engine of rural economic development. The creating of the whole industrial chain of rural digital economy can further strengthen the links between upstream digital technology suppliers, midstream rural production and operation parties, downstream demand consumers and village committee digital governance parties. So that it can better serve the rural revitalization strategy in the collaboration of all parties. However, the development of the rural digital economy industry chain is facing many obstacles. The operation of the industry chain requires not only the efforts of all links in the industry chain that this paper focuses on, but also the guarantee and support from the external government in terms of funds, systems, policies, etc. Therefore, in the process of the development of the rural digital economy industry chain in the future, we should combine the endogenous

power with external support, accelerate the integration and development of digital economy and rural industry, and promote the sustainable development of rural revitalization science.

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