

Development of Circulation Mechanism and Mode of Ecological Products and Its Enlightenment to Ecological Industry of Rocky Desertification Control

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Abstract: With the policy support, technological innovation and financial guarantee of rocky desertification control from the ninth five year plan to the thirteenth five year plan, the ecological industry and ecological products of rocky desertification control came into being, and the ecological industry of rocky desertification control is moving towards industrialization. Through the statistical analysis of 225 relevant literatures at home and abroad, the results show that: (1) the number of published literatures in the time series is as follows: the number of published literatures in 2001 and before moved forward in a wavy manner, and then rose in a ladder shape after 2006, indicating that the research has gradually become a hot academic topic. (2) The research content is mainly theoretical research. Based on the karst ecological environment and regional resource endowment, the feasibility of controlling rocky desertification through the development of ecological industry is discussed. (3) Domestic literatures are mainly distributed in Southwest China and Jiangsu and Zhejiang provinces, which shows that there is obvious coupling between ecological industry, ecological products and ecological environment conservation, and areas with advanced ecological concepts. It also reveals the frontier theory of the research on the ecological industry market model of rocky desertification control in karst areas from five aspects: theoretical research, technology research and development, model construction, experimental demonstration, monitoring and evaluation. Finally, it is found that the current research on rocky desertification control has been relatively mature, forming a unique system of theoretical research, technology research and development, technology demonstration, monitoring and evaluation, but the research on the circulation mode of ecological derivative industry products is relatively weak. Therefore, it is of great significance to study the current situation and problems of the circulation of ecological products, especially *Rosa roxburghii* Tratt products, clarify the direction of the reform of the circulation mechanism, and build a new mode of *Rosa roxburghii* Tratt products circulation in karst rocky desertification areas, so as to promote the development of local economy and the development of ecological derivative industries of rocky desertification management.

1. Introduction

Due to the prominent problem of rocky desertification in the karst area of southern China, the land lost productivity and the ecological environment was destroyed, which seriously affected the development of agriculture, forestry and animal husbandry in this area. Therefore, the development of ecological derivative industry has become an important measure to restore the ecological environment and promote the local economic development in the karst area of Southwest China. In the circulation process of agricultural products, the circulation mode refers to the system formed by these products participating in the circulation process. The choice of different circulation modes has a certain impact on the circulation efficiency of agricultural products. Circulation mechanism refers to the internal organic connection form of mutual restriction and influence established by various aspects within the product market organism in the market exchange activities. Different circulation modes have different circulation mechanisms, which run through the whole circulation mode and affect the circulation efficiency of products. Therefore, studying the circulation mechanism of each link under different circulation modes, taking feasible measures to solve the problems existing in the current circulation mechanism of agricultural products, and clarifying the direction and policy adjustment mode of the reform of the circulation mechanism of agricultural products play an important role in the smooth circulation of agricultural products and improving the circulation efficiency.

2. Acquisition and Demonstration of Documents

This study is based on the digital library of Guizhou Normal University (<http://lib.gznu.edu.cn/>) Based on the CNKI full text database (including all 13 sub databases), Chinese literature search was conducted. The foreign language data collection database of Guizhou Normal University (including dozens of retrieval platforms such as SpringerLink and CALIS Foreign Language Journal Network) is used to search foreign language literature. At the same time, the National Digital Library and SCI, EI, CPCI and other databases are used to conduct auxiliary retrieval. First of all, in CNKI database, the "circulation mechanism" and "circulation mode" were input into the key words of the search item for the first search, and the "full text" of the search item was used for the second search with "agricultural products". The retrieval time range is the maximum retrieval time range of CNKI. The scope of literature covers 7 items, including all journals, master's thesis, doctoral thesis, Chinese conferences, international conferences, newspapers and patents. Then, the "agricultural products", "circulation mechanism" and "circulation mode" were retrieved in the web of science and Google Scholar foreign language databases. The deadline for retrieval was June 1, 2022. After manual screening, a total of 225 Chinese and foreign literatures related to the circulation mechanism and mode of agricultural products were retrieved, including 68 foreign literatures, 157 Chinese literatures, 95 journal literatures, 52 doctoral dissertations, 7 conference papers and 3 newspapers. According to the relevant research contents, according to the principles of suitability, relevance and assistance, 121 Chinese and foreign literatures were cited in this study, including 18 foreign literatures and 103 Chinese literatures.

2.1. Annual Distribution of Literature

The research on the circulation mode and mechanism of agricultural products was carried out relatively early abroad, which began in the early 20th century, while the domestic research on it was relatively late, which began in the early 1980s. Through the analysis of Figure 1-1, it can be seen that from 1978 to 2020, the research on "circulation mode and circulation mechanism of agricultural products" at home and abroad can be roughly divided into three stages: the first stage is from 1978 to

1991, and the research changes at home and abroad tend to be consistent as a whole. The total number of relevant literatures is only 31 and the number of literatures in a single year is no more than 5, which is in the embryonic stage. The second stage was from 1992 to 2007. The number of literatures showed an overall upward trend, but fluctuated greatly, and was in a period of slow development. The third stage is from 2008 to 2020. The number of literatures surged and entered a period of rapid development (Figure 1).

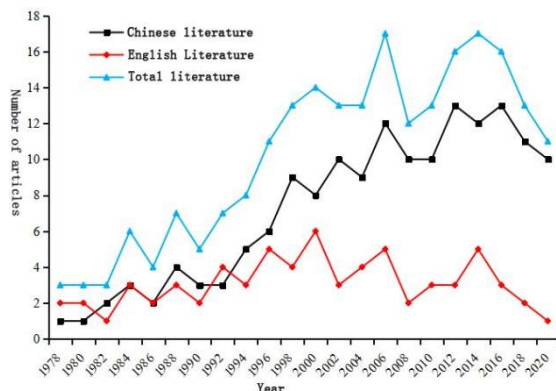


Figure 1: Annual distribution of literature research.

2.2. Content Distribution of Documents

All the literatures consulted are classified and summarized according to the research contents, including theoretical research, circulation efficiency, circulation mode, application demonstration and other relevant researches. Among them, theoretical research literature accounted for 45.79%, circulation efficiency literature accounted for 16.90%, circulation mode literature accounted for 22.50%, application demonstration literature accounted for 10.23%, and other types of literature accounted for 4.58%. At the early stage of the research on the circulation mode and circulation mechanism of agricultural products, theoretical research articles dominated, focusing on the concept and theoretical research of the circulation mechanism and circulation mode, but it was only a simple concept and theoretical research, and the circulation efficiency of agricultural products had not been studied too much. With the deepening of research, theoretical research and circulation efficiency research literature began to increase, and the research on the construction of circulation mode and the improvement of circulation system increased. In recent years, application demonstration research has begun to rise, focusing on various new circulation modes for demonstration and the design technology of agricultural products e-commerce sales platform. The research content has enriched the relevant research on the circulation mechanism and mode of agricultural products from experience introduction to theoretical research, technology research and development, and then to the changes of monitoring and evaluation and application demonstration.

2.3. Regional Distribution of Literature

Among the 225 consulted documents, the realm of foreign language literature is primarily found in Europe, North America, Asia, and Oceania. Notably, the United States boasts the highest number of papers, a staggering 11, amounting to 16.17% of the total. Following suit, Japan and China each contribute 8 papers, accounting for 11.76% of the aggregate. Furthermore, Germany, the United Kingdom, Russia, Denmark, France, South Korea, and Thailand have each produced a commendable collection of 3 or more papers. Conversely, countries such as the Netherlands, Canada, Australia, Poland, Portugal, Sweden, and Vietnam have generated fewer than 3 papers works in the dataset (Figure 2). Jilin (16), Shandong (13), Beijing (13), Hebei (12) and Henan (11) are the top five

3. Division of Research Stages

Table 1: Research stage division of agricultural products circulation mechanism and circulation mode.

Research phase	Main features	Development background
Budding stage (1978-1991)	The relevant research literature at home and abroad that can be consulted is very few, and even blank in some years. The research content is mostly focused on the traditional research on the circulation of agricultural products, which is specifically manifested in the research on the agricultural market and wholesale market of agricultural products, and the content involved in the circulation mechanism is less.	This stage is in the early stage of China's reform and opening-up, and the circulation of agricultural products is still in the transition period from planned type to market type, which is still in the initial stage of market-oriented development. Although the circulation efficiency is still at the primary level as a whole, the difficulty of selling agricultural products is serious, and the problems in the circulation mechanism of agricultural products have not been paid attention to.
Slow development period (1992-2007)	The number of papers published annually is gradually increasing. Except for a few years, the number of papers is basically less than 10. The content of the study gradually involves the relationship between the circulation mode, circulation mechanism and circulation efficiency. The circulation mode is gradually developing towards diversification, and the circulation system is gradually improving.	At this stage, China's economic and social reform was deepened, and the economic development was based on the market allocation of resources, and the comprehensive marketization was implemented. In order to improve the circulation efficiency of agricultural products, solve the problem of difficult selling, and protect the economic benefits of farmers, the circulation mode of agricultural products gradually developed to diversification, and constantly adapted to international demand.
High growth period (since 2008)	The number of publications has increased sharply, and the proportion of research involving the development of agricultural products circulation mode to informatization has increased greatly, especially in the aspects of methods and technology. With the increase of the literature on the new mode of agricultural products circulation, the research process and methods are becoming more and more scientific, standardized and information-based.	At this stage, with the rise of China's information economy, new infrastructure, new elements and new organizational division of labor force the upgrading of agricultural products circulation. In particular, the research on exploring new modes of agricultural products circulation has attracted more and more attention, especially the new circulation mode represented by e-commerce, which has brought new opportunities and changes to the circulation of agricultural products.

According to the annual distribution chart of research literature (Figure1), the research on the circulation of agricultural products began in the 1980s and has developed for more than 40 years. Combined with the research background of the stage changes in the causes, countermeasures and technology of the circulation mechanism and mode of agricultural products during this period, the research on the circulation mechanism and mode of agricultural products for rocky desertification control is divided into three stages, namely, the initial stage Slow development period and high growth period (Table1).

4. Main Progress and Landmark Achievements

4.1. Theoretical Research

(1) The choice of different circulation modes will affect the circulation efficiency of agricultural products. Through the evaluation and comparison of different circulation modes, choose the appropriate circulation mode, so as to improve the circulation efficiency of agricultural products.

The self-selling mode of agricultural trade cannot effectively promote the high-speed operation of agricultural products, and cannot meet the distribution division of modern agricultural products. It is a primary form of agricultural product circulation^[1]. From the perspective of its circulation efficiency, compared with the agricultural market mode and e-commerce mode, the self-selling mode of farmers and the docking mode of agricultural supermarkets are the most efficient and should be vigorously developed^[2]. From the perspective of consumers, the self-selling mode of farmers is reasonable in price, and consumers are often able to purchase agricultural products with good quality at a reasonable price, which is also one of the reasons for its continued existence^[3]. The agricultural market model is mainly the agricultural product supply chain model dominated by the wholesale market, which occupies a dominant position in the current agricultural product circulation model^[4]. From the

perspective of its evolution process, at the end of the 1980s, the farmers' market came into being. In the early 1990s, the transaction volume of the farmers' market accounted for more than 50% ^[5]. From the perspective of circulation efficiency, Zhang used AHP to evaluate the efficiency of the circulation mode of fruit and vegetable agricultural products in Beijing, and drew lessons from the development mode of Japanese wholesale market, and proposed that the circulation quality of fruit and vegetable agricultural products in other cities should be improved by strengthening the function of the primary wholesale market ^[6].

(2) Based on the research of agricultural products supply chain management, agricultural products logistics, and the connection mode of "small farmers" and "big market", analyzing the circulation problems of agricultural products from different perspectives is helpful to understand the advantages and disadvantages of agricultural products in the circulation process.

At the end of the 1990s, the research on supply chain management and logistics management of agricultural products has gradually become a research hotspot ^[7]. Ouden et al. first proposed the concept of agricultural product supply chain, and believed that agricultural product supply chain was a vertical integration coordination mode implemented by agricultural product circulation organizations to improve the performance of the overall agricultural product circulation system ^[8]. Reardon and Berdegue made a comparative study of supermarkets and fresh food supply chain in Argentina. They believed that the development of fresh food supermarkets would crowd out the living space of wholesale markets and small farmers, and then came to the conclusion that supermarkets would become the main channel for the circulation of fresh agricultural products. Jane used the "commodity chain" method to study the relationship between various links in the whole chain of agricultural products from producers to consumers ^[9].

Based on the survey data, Hobbs studied the two different market choices of British beef cattle farmers in selling and auctioning beef cattle in vivo and selling to meat processing enterprises from the perspective of transaction costs ^[10]. The research conclusion showed that different transaction cost dimensions had different effects on Farmers' choice of transaction methods. Zhu and He studied the effect of transaction costs on Farmers' choice of transaction methods through the survey data of farmers in Fanshi, Nanjing, China Through the influence of local farmers' market sales and supermarkets' purchase through the wholesale market, it is found that the transaction cost is the highest in the short-term market ^[11]. Some scholars have divided the mode of farmers' market connection into Farmers' domestic traders, farmers' retailers, farmers' leading enterprises, farmers' cooperative organizations, farmers' food distributors, farmers' foreign traders, contract agriculture, etc. Thus, the influencing factors of the success of these models are discussed in detail ^[12]. Transportation, trust, packaging, certification, infrastructure investment, contract flexibility, transaction costs, timeliness, farmer scale and other factors are all factors that cause farmers to choose different market entry modes ^[13].

4.2. Circulation Efficiency

(1) By comparing the efficiency of different circulation modes, the circulation mode with the highest circulation efficiency is obtained.

Different circulation modes have different circulation efficiency. Therefore, the comparison of different circulation modes is of great significance to optimize the circulation mode and improve the circulation efficiency. Andreas et al. carried out the research on the circulation efficiency of agricultural products. They selected peas as agricultural products samples, collected and analyzed the costs and benefits of the main participants under three different circulation modes, obtained the circulation efficiency of the three circulation modes through data analysis, and then compared the circulation mode with the highest circulation efficiency, which has practical significance for the

circulation industry of pea agricultural products ^[14]. Kumari et al. also conducted a comparative study on the circulation efficiency of agricultural products. They selected kumquat as a sample to investigate its production, wholesale, retail and other prices ^[15]. Tu analyzed the influencing factors of farmers' participation in high value-added circulation by studying the profit rate of each link in the circulation of agricultural products, and suggested that farmers should reasonably intervene in the links with high profit value in circulation and increase the value-added benefits of circulation in addition to being just producers ^[16].

(2) From different dimensions, this paper gives the measurement indicators and evaluation methods to evaluate the circulation efficiency.

On the measurement and evaluation of the circulation efficiency of agricultural products, on the basis of theoretical analysis, scholars such as Kou and Tan have given measurement indicators and analysis methods from different dimensions, including cointegration test and correlation coefficient method, game theory method, data envelopment analysis method, factor analysis method, output distance function, AHP analytic hierarchy process, etc. Of course, some scholars also stressed that the loss rate of agricultural products in China is high in the circulation process, and all regions continue to pay more attention to it ^[17]. Pang took the mountainous area of Jingyuan County as an example, analyzed the problems of difficult circulation of agricultural products and low economic benefits, and put forward suggestions to promote the development of mountainous areas ^[18]. Ju clarified the relationship between the circulation efficiency of agricultural products and agricultural economic benefits, farmers' income increase and the interests of consumers of agricultural products ^[19].

4.3. Circulation Mode

(1) According to the circulation status and characteristics of agricultural products in different regions, different circulation systems should be constructed or optimized to improve the circulation efficiency of agricultural products from the perspective of reducing circulation costs, reducing circulation links and other factors.

The circulation efficiency of agricultural products is an index to evaluate the operation quality of the circulation link of agricultural products. The operation efficiency of each subject in the circulation link and the cooperation efficiency between them affect the efficiency of the overall circulation system ^[20]. Wang and Zhang believe that the circulation system of agricultural products includes the intermediate links from production to sales, such as circulation subject, circulation carrier, circulation channel and circulation system ^[21]. The circulation efficiency can be judged by the lowest cost or the largest achievement, and put forward that different business entities have different efficiency evaluation standards. The overall circulation system of agricultural products in China is still in the early stage of development, and the system arrangement, mechanism design, facility construction, management measures and other aspects need to be further improved. Some analysts believe that China's agricultural product market organization is undergoing profound changes, and accelerating the construction of modern agricultural product circulation system is a breakthrough to deepen the reform of circulation system and promote the development of modern agriculture in the new era ^[22].

(2) According to the problems existing in the current circulation mode, this paper analyzes different circulation mechanisms and explores the innovation of circulation mode.

The operation of the circulation mechanism of agricultural products has its own characteristics because of the level of economic development, policy direction and the position of agriculture in the national economy. But the international circulation of agricultural products also shows some common ground. Generally speaking, agricultural marketization, industrialization of agricultural products production, informatization of agricultural products circulation and urban-rural integration have

gradually become the common characteristics of international agricultural products circulation. However, it must be acknowledged that the formation and development of each mode are based on the actual situation of the local agricultural products circulation industry. The research on circulation mechanism usually explains the classification of the mechanism, mainly including the classification according to the marketing channel and the classification according to the circulation subject. According to the marketing channels, Chang divided the circulation mechanism of agricultural products in Beijing into direct selling mechanism, agency mechanism, self-support mechanism, peddler circulation mechanism and market operation mechanism ^[23].

(3) Constructing different circulation modes plays an important role in improving the circulation efficiency of agricultural products.

How to optimize the circulation mode of agricultural products, effectively improve the income of each link and ensure the circulation efficiency of agricultural products has become a hot spot in the study of agricultural products circulation. The circulation process of agricultural products involves production, acquisition, wholesale, retail and other links, and there are great differences in the circulation links involved in different circulation modes. Different circulation modes have a certain impact on the circulation efficiency of agricultural products, so it is necessary to build different circulation modes

The construction of the "Internet+agricultural products circulation mode" has greatly improved the utilization rate of technology in the logistics and transportation process of agricultural products, and can effectively use information technology to build a modern agricultural products circulation system, and give full play to the basic role of the market in resource allocation ^[24]. The innovation of circulation mode of agricultural products in the e-commerce environment is a new circulation mode in recent years ^[25]. On the basis of analyzing the current situation of the circulation and operation of agricultural products in Guangdong Province, Fan proposed a supply chain model centered on the wholesale market and a supply chain model centered on the third party ^[26]. Wang proposed to implement the circulation mode of "quasi corporatization" operation with the wholesale market of agricultural products as the main carrier at the present stage and the emerging e-commerce network as the supplementary carrier, in collaboration with the three major circulation entities of source agricultural cooperatives, intermediate leading enterprises and terminal retail enterprises ^[27].

4.4. Application Demonstration

The optimized or improved circulation system has been demonstrated in different regions, which reduces many factors affecting the circulation of agricultural products and improves the circulation efficiency of agricultural products.

Gong used e-commerce to build a new vegetable circulation system and applies it to the vegetable circulation in Beijing, which not only improves the vegetable supply level in Beijing market, reduces the vegetable price, but also improves the circulation efficiency ^[28]. From a strategic perspective, Meng has established a modern logistics system radiating urban and rural areas in combination with the development level of urban and rural industrialization and the service ability of logistics subjects ^[29]. It has been popularized and applied. It has been found that the system is of great significance to improve circulation efficiency, reduce circulation costs, expand domestic demand and promote the development of national economy. Li used the CSA circulation system of agricultural products to conduct an empirical study on 50 large-scale CSA mode farm cooperatives in the suburbs of Beijing. It was found that under this system, the sales price of agricultural products was significantly lower than the market price, the circulation cost was significantly reduced, and producers, consumers, cooperatives and other participants could benefit from it to promote the development of related industries ^[30].

4.5. Others Reserach

The application of network technology in the construction of agricultural products circulation network platform makes the combination of online and offline sales of agricultural products, reduces the circulation path of agricultural products, reduces the transaction cost, and improves the circulation efficiency.

With the rapid development of China's economy and the improvement of Internet infrastructure, mobile network technology has also been widely used in China, almost reaching the level of one smart phone per capita. Under the background of the new normal economy, China's Internet economy has risen against the trend, which is not only due to the policy dividend of the national economic structure adjustment and supply side reform, but also due to the rapid change of China's Internet application technology ^[31]. Network technology is an imported product for China. Network technology was first invented and used by the United States, but the application innovation of Internet technology has made great progress in China, especially in the commercial application of Internet technology, China can be said to be in the forefront of the world. The large-scale commercial application of network technology in China has directly promoted the upgrading of network technology to network economy, which will become a new global economic growth point in the new era. Under the background of the optimization and adjustment of China's economic structure, the network economy will also become a new engine of China's economic growth ^[32].

With the continuous improvement of Internet infrastructure, the commercial application of Internet technology in China is also changing rapidly. Mobile Internet technology makes online shopping more convenient and efficient. Big data realizes e-commerce precision marketing, biometrics solves the risk management of payment risk and consumer finance, AI reduces the labor cost of e-commerce, and cloud computing reduces the hardware cost and maintenance cost of e-commerce ^[33]. All these Internet technologies can greatly improve efficiency and reduce costs. Qin believed that with the rapid development of computer network technology, the rise of mobile clients and online shopping platforms has greatly promoted the vigorous development of e-commerce in the network era, and China's retail industry has also begun to pay attention to the integrated development mode of e-commerce ^[34]. Wang believed that driven by information technology, consumption upgrading, competition and other factors, China's retail industry is ushering in a new transformation opportunity, that is, the "new retail" with the deep integration of "Online+offline+logistics" ^[35]. Wang and Chen retrieved the product circulation data from the cross-border e-commerce platform and analyzed the circulation efficiency and improvement path of *Hericium erinaceus* processed products under the cross-border e-commerce platform ^[36]. China's circulation enterprises should strengthen the strategic cooperation with such external new technology solutions companies, and actively apply various new technologies and related business models such as Internet of things, artificial intelligence, blockchain, big data, cloud computing, augmented reality/virtual reality (AR/VR) around the needs of consumers, so as to build an internal technology innovation system and transform to the direction of digitalization and intelligence ^[37].

5. Conclusions

(1) In view of the imperfect scientific problems in the embodiment of the institutional environment of the circulation of ecological products, strengthening the government led establishment of institutional legitimacy and other institutional arrangements plays an important role in the emergence and development of the circulation of ecological products.

(2) In view of the scientific problems such as the low development level of the main body of ecological product circulation and the backward service system, the establishment of a sound ecological product circulation system plays an important role in the circulation of ecological products.

(3) In view of the low circulation efficiency of ecological products in karst rocky desertification areas and the lag of traditional circulation mode, a new mode of ecological products circulation in karst rocky desertification areas is constructed, so as to reduce circulation links, reduce circulation costs and improve circulation efficiency.

(4) The construction of ecological product circulation platform is not complete, so the construction of e-commerce circulation platform can combine the online and offline circulation of ecological products, meet the different needs of consumers, and increase the benefits of producers.

(5) In the process of circulation of ecological products, the infrastructure is weak and the trading place is not perfect. Efforts should be made to improve the infrastructure construction and trading place, so as to ensure the smooth circulation of ecological products.

(6) In view of the shortage of circulation professionals in the process of ecological product circulation, we should speed up the cultivation of modern ecological product circulation talents.

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