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Qiming Zheng

Nanjing Polytechnic Institute, Nanjing, China, 13813038069@163.com

Mingxuan Zheng

Southwest Jiaotong University, China, 13813038069@163.com

Yaqin Dou

Nanjing Institute of Technology, Nanjing, China, douyq@njit.edu.cn

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Research on agricultural supply chain finance supporting sustainable poverty reduction under the background of digital technology

Qiming Zheng ¹
Mingxuan Zheng ²
Yaqin Dou ^{3,*}

*Corresponding author

¹ Associate professor, Nanjing Polytechnic Institute, Nanjing, China, 13813038069@163.com

² Master degree candidate, Southwest Jiaotong University, Chengdu, China, zhengmx1999@126.com

³ Professor, Nanjing Institute of Technology, Nanjing, China, douyq@njit.edu.cn

ABSTRACT

From the perspective of financial services, management services and coordination services, this paper analyzes the internal mechanism of agricultural supply chain finance (ASCF) to help sustainable poverty reduction (SPR). The internal and external driving forces of ASCF for SPR are also explored. Among them, the internal driving forces include industrial upgrading and financial transformation; External driving forces include technological change, policy guidance and market drive. Based on the background of digital technology, the green agricultural supply chain finance (GASCF) model has been innovatively proposed. We mainly analyze the core elements and platform structure of GASCF, and focus on the process design and key points of the three modules of the GASCF platform: risk control port, credit port and capital port. Finally, we analyze the practical difficulties of green agricultural supply chain finance in helping sustainable poverty reduction, such as the lack of comprehensive management ability of the organization, the insufficient application of digital technology, the imperfect institutional environment and the lack of compound talents. And we put forward accordingly a four in one path of GASCF helping SPR, which is "Government standardizing and leading, assistance from financial institutions, driven by industry subjects and Co governance of Social Service".

Keywords: Agricultural supply chain finance, Green development, Sustainable poverty reduction, Digital technology.

INTRODUCTION

Since the reform and opening up, with the continuous improvement of China's agricultural support policy system and the continuous increase of the policy of strengthening agriculture, benefiting agriculture and enriching agriculture, the comprehensive agricultural production capacity has achieved great development. However, compared with industry and manufacturing, the growth rate of agricultural added value is still low, and its proportion in GDP has decreased significantly. This is not only related to the adjustment, optimization and upgrading of national industrial structure, but also reflects the relatively low agricultural labor productivity in China, which makes the development of agricultural economy slow and lag for a long time, and has become an important weakness restricting the goal of building a moderately prosperous society in an all-round way. Agricultural development is subject to many factors, among which credit constraints are one of the key factors that restrict the development of rural economy, the upgrading of agricultural industrial structure and the increase of farmers' income, while the lack of qualified collateral and high credit risk uncertainty are the important reasons for agricultural credit constraints. The important purpose of ASCF operation is to rely on the reputation of the focus enterprises in the agricultural supply chain (ASCF) to help agricultural small and medium-sized enterprises or farmers obtain financial services. As an important mode of combining industry and finance, ASCF, with its unique advantages of being close to the agricultural chain, effectively makes up for the defects of traditional agricultural finance by using the pledge of movable assets such as means of production and grain embedded in the agricultural chain trading network and the credit guarantee of agricultural focus enterprises.

However, cofas' 2022 China enterprise payment survey shows that the credit period of China's agricultural enterprises in 2021 was as high as 88 days, and the number of days of overdue payment increased by 43 days compared with 2020. The number of agricultural enterprises with ultra-long overdue payment (more than 6 months) accounting for more than 10% of turnover increased from 27% in 2020 to 40% in 2021, Whether the number of days of overdue payment or the proportion of ultra-long overdue payment is more worrying in many industries. This shows that there is a wide structural gap in the financial supply pattern of the ASC, and there are still a large number of long tail small agricultural enterprises and farmers. At this stage, the implementation of ASCF has also begun to expose some difficulties and pain points, such as the lack of agricultural focus enterprises, weak agricultural credit system, low degree of standardization of agricultural products, weak ASC (Xu & Zhang, 2020; Shi *et al.*, 2020), which restrict the effective operation of ASCF, leading to the unsatisfactory effect of agricultural poverty alleviation in some regions, and the return to poverty phenomenon of "financial poverty alleviation without poverty reduction" is still emerging. The ASCF operation mode relying on the endowment advantages of different leading parties has heterogeneity, and there are great differences in poverty reduction mechanism and poverty reduction effect (Shen *et al.*, 2020), which limits the universality and promotion value. At present, there is an urgent need to innovate the ASCF service model,

provide more small-scale agricultural enterprises and farmers with efficient, accurate and cheap financial services, and improve the sustainability of financial poverty reduction.

ASCF is the application of supply chain finance (SCF) in the agricultural field. Relying on the advantageous resources of core enterprises, it breaks through the weak credit of small and medium-sized agricultural enterprises and farmers in the agricultural chain and solves the financial constraints of the agricultural chain. In recent years, the operation mechanism, operation mode and poverty reduction effect of ASCF have attracted scholars' attention. On the operation mechanism of ASCF. The earliest prototype of ASCF can be traced back to the "grain warehouse receipts" that appeared in Mesopotamia in 2400 BC (Breckwoldt, 1995). Modern ASCF mainly relies on various financial platforms, with core enterprises as the leading role, to provide financing services for members of the ASC. Shen *et al.* (2019) took cooperatives as the research object, used the double difference method to design the model, deeply compared and analyzed the operation mechanism of ASCF models in different regions and different core agricultural entities, and deeply explored the multi-party cooperation mechanism between entities.

On the development of digital technology and SCF mode. The development of SCF in China has roughly experienced the evolution process of financial orientation, supply chain orientation and network ecological orientation (Song, 2020). The SCF mode at different stages has played an important role in solving the financing difficulties of industrial enterprises by relying on the inherent resources or comparative advantages of the organization in financial professional services, controlling the supply chain business links or controlling the transaction information of the system. Under the influence of the new generation technology, SCF has developed to the digital stage. Based on information technology, innovative models such as Internet SCF (Song & Chen, 2016), smart SCF (Song & Yang, 2019) digital SCF (Dou *et al.*, 2020), blockchain +SCF (Gong *et al.*, 2021) and Internet of things +SCF (Gong *et al.*, 2017) have emerged. The integration support of technology provides a huge opportunity for the innovative development of SCF model.

Research and Practice on the financial operation mode of ASC. Foreign mainstream ASCF models mainly include: ASC enterprises and P2P cooperation model represented by the cooperation between Danish food retailer coop and P2P platform myc4; Farmers' public welfare P2P lending represented by Kiva in the United States; Commercial lending represented by Zopa in the UK, prosper in the US and lending club (Xu, 2015). Wang *et al.* (2013) Pointed out that agricultural product supply chain enterprises can obtain funds through pledge financing of orders, accounts receivable and prepayments. In recent years, with the implementation of the targeted poverty alleviation policy and the development of Inclusive Finance, Chinese scholars have carried out research on ASCF, and put forward ASCF service models led by rural commercial banks (Guan, 2011), farmers' cooperatives (Shen *et al.*, 2019), insurance institutions (Liu & Cheng, 2013) agricultural parks and trust institutions (Guo *et al.*, 2020). The operation of this kind of mode mainly relies on the resource endowment or comparative advantages of the organization in financial professional services, control of agricultural chain business links, improvement of credit guarantee or panoramic control of supply chain transaction process, which played an important role in promoting the early poverty alleviation. At present, many domestic scholars mostly use the case analysis method to study the typical ASCF models in different regions, such as the "wuliming" model of Heilongjiang Longjiang bank (Guan, 2011) and the financing model of Zhejiang agricultural whole industry chain (Tian, 2018). Shaoxian took the SCF of Mawangdui vegetable wholesale market as the research object, and proposed different modes to meet the capital needs of production links and private brokers and market merchants (Shao, 2013). Ma Yingjie and others took the SCF of the traditional Chinese medicine industry in Anguo as the research object, and proposed the ASCF model with professional cooperatives, traditional Chinese medicine trade centers, and retail investors in the cultivation of traditional Chinese medicine as the financing subjects (Ma & Wu, 2017). Guo Jienian analyzed the typical models of ASCF such as "agricultural enterprises + financial institutions + farmers, agricultural enterprises + cooperatives + financial institutions + farmers, agricultural enterprises + agricultural parks + financial institutions + farmers (Guo *et al.*, 2020).

There are few studies on the poverty reduction effect of ASCF, and most of the existing studies focus on financial poverty reduction. As an important poverty reduction and enrichment mechanism in China, the improvement of the index of digital finance can significantly reduce the probability of poverty in families (Zhang & Li, 2022). At the same time, digital finance can improve the efficiency of economic growth, promote fair income distribution, and continue to play the effect of poverty reduction and income increase (Li & Peng, 2022). The poverty reduction of ASCF is a specific implementation measure of financial poverty reduction. As a new financing mode, ASCF plays an important role in actively promoting financial poverty alleviation, connecting small farmers with large markets, and supporting rural revitalization and development (Shen *et al.*, 2019). Dai *et al.* (2022) proposed that ASCF can promote the increase of farmers' income and the decrease of Engel's coefficient, and the poverty reduction effect in the central and western regions is more obvious than that in the eastern region; The intermediary effect of production scale and urbanization rate in improving farmers' income level in ASCF is obvious, while only the intermediary effect of urbanization rate in reducing Engel's coefficient in ASCF is obvious.

From the financing difficulties of agricultural enterprises, the defects of traditional agricultural finance, the difficulties in promoting the three rural policies, and then to the innovative application of SCF in the agricultural field, the research on solving the problem of agricultural financing has been extended in breadth. However, the SPR effect of ASCF has not attracted widespread attention. At present, there is an urgent need to conduct in-depth research from the following aspects: first, analyze the internal mechanism of ASCF to help SPR, and study the dynamic mechanism of ASCF to help SPR from the perspective of external power and internal power, which is a relatively scarce aspect of existing research; Secondly, combined with the digital

ecology theory and the deployment of double carbon strategy, innovate the GASCF model based on SPR; Third, starting with the practical dilemma that restricts the SPR of ASCF, we should seek a feasible path to solve the dilemma, which is a powerful supplement to the existing research.

Therefore, based on the analysis of the internal mechanism and dynamic mechanism of ASCF to promote SPR, this study puts forward the model innovation of GASCF to promote SPR, further analyzes the possible challenges of ASCF innovation model to promote SPR at this stage, and then constructs the path of ASCF to promote SPR.

THE INTERNAL MECHANISM OF ASCF SUPPORTING SPR

Based on the integration and application of digital technology, this section analyzes the internal mechanism of SPR in ASCF from the perspective of financial services, management services and coordination services. First, with the strong support of the digital service system, we should give full play to the financial service function of ASCF to provide more dragon tail enterprises with accurate, efficient and cheap financial services. Secondly, based on the forced mechanism and the introduction mechanism, the management function of ASCF is applied to guide the investment projects of agricultural industry chain towards low-carbon and environmental protection, and more low-carbon agricultural enterprises with good development potential are brought into the ASCF ecosystem to promote the low-carbon transformation of agricultural enterprises. Third, introduce digital ecology, build a digital financing platform, realize the coordinated operation of material flow and capital flow in the low-carbon supply chain through data information sharing, give full play to the comprehensive coordination function of ASCF, and maximize the overall income of the ASC.

Innovate financial services and promote the stable development of ASC

ASCF can make up for the financing gap of agricultural green development by gathering capital advantages, promoting the reconstruction of traditional models and the innovation of new models. With the application and development of digital technology, ASCF can innovate the traditional ASCF modes such as prepayments, accounts receivable and inventory pledge under the support of the integration of new generation technologies such as big data, blockchain, Internet of things and artificial intelligence, and use digital technology to improve the payment and settlement in the SCF trading platform in combination with the advantageous resource status of different node institutions in the ASCF platform. The design of core modules such as credit management and fund management innovates and reconstructs the operation process of the ASCF model under different application scenarios, as well as the layout of key points such as the estimation of the value of the pledge of enterprises with insufficient funds, the credit evaluation of participants, and the release and recovery of funds from the supply chain platform. At the same time, according to the service orientation of the industrial system of the national financial supply side structural reform, aiming at the characteristics of "asset light, capital light and technology heavy" of the industrial system such as agricultural science and technology-based small and micro enterprises or agricultural low-carbon small and micro enterprises, combined with the penetration and application of digital technology, innovative designs are made for the key control points such as the value evaluation of intangible assets, the pledge of the usufruct of intangible assets, and the self-repayment of intangible asset transfer fees. Build a digital SCF innovation model based on the pledge of intangible assets such as intellectual property rights or carbon rights. Through the reconstruction of traditional mode and the development of new mode, we can give full play to the financial service function of ASCF and promote the stable development of ASC.

Play a management role and promote the low-carbon transformation of ASC

For the first time, China made a strong declaration of the "double carbon" goal, describing a blueprint for achieving green, low-carbon and high-quality development in the future. Accelerating the green development of agriculture is of great significance to promote China to achieve the double carbon goal. At this stage, ASCF should rely on the advantages of close connection with the industrial chain, maximize the application of agricultural new infrastructure dividends, gather all kinds of risk control, credit enhancement and capital advantage resources or capabilities, give full play to the management function, promote the low-carbon transformation of ASC, shape the green competitiveness of agricultural chain, and promote the sustainable development of ASC. The function of ASCF management can form an effective "forced mechanism", gradually eliminate heavy industry, non-low-carbon agricultural projects or enterprises from the system, and guide agricultural investment projects towards low-carbon and environmental protection. In addition, the ASCF management function can also be used as an incentive means to introduce more agricultural science and technology enterprises and agricultural low-carbon enterprises with good development potential into the system through a good introduction mechanism, stimulate the driving force of industrial chain upgrading, enhance the tension of agricultural enterprise development, force a new turning point in energy conservation, environmental protection and circular economy, enhance the initiative of agriculture to get rid of poverty and promote SPR.

Optimize the coordination function and improve the comprehensive performance of ASC

At present, the problem of "small scattered" and the contradiction and conflict between the old and new production capacity conversion are common in China's agriculture. Market transactions have caused high transaction costs in the whole agricultural chain. Among them, the capital squeeze of leading enterprises in the supply chain on the upstream and downstream small and medium-sized agricultural enterprises or farmers based on their own interests maximization is an important reason for the high transaction cost of the industrial chain, which intensifies the turbulence and danger of the operation of the supply chain industrial chain. In 2020, eight ministries and commissions jointly issued the opinions on standardizing the development of SCF to support the stable circulation, optimization and upgrading of the supply chain industry chain, which made it clear that

we should promote the scenario and ecology of SCF, improve the online and digital level, and improve the operation efficiency of the supply chain industry chain, fully indicating that the state attaches great importance to the normative solution of industrial structural investment and financing conflicts at this stage. Therefore, it is very urgent and important to give full play to the comprehensive coordination function of SCF and optimize the transaction cost of agricultural chain. Striving to create an open, healthy and safe digital ecosystem is an important strategic task for China to accelerate the construction of a network power and a digital China in the "14th five year plan" and the medium and long term, and to promote high-quality economic and social development. With the accelerated penetration of new technologies, new formats and new models in the field of ASCF, a large number of heterogeneous organizations such as agricultural enterprises, producer services and government agencies will form a value cycle system of symbiosis, build an industrial integration mechanism of data connectivity, and different economic entities will enter the ASCF ecosystem platform across regions and systems. Based on the overall thinking of the industrial chain, the platform integrates the Internet, big data, artificial intelligence and other new generation technologies, and based on the symbiosis theory in ecology, considers the symbiosis needs of collaborative subjects, optimizes the relationship of multi-agent symbiosis, improves operation efficiency, reduces financial costs, improves the comprehensive income of ASC, and promotes the SPR of ASC.

DYNAMIC MECHANISM OF ASCF supporting SPR

According to the internal logic of "motivation behavior", the driving mechanism of SPR in ASCF includes two systems: external driving force and internal driving force.

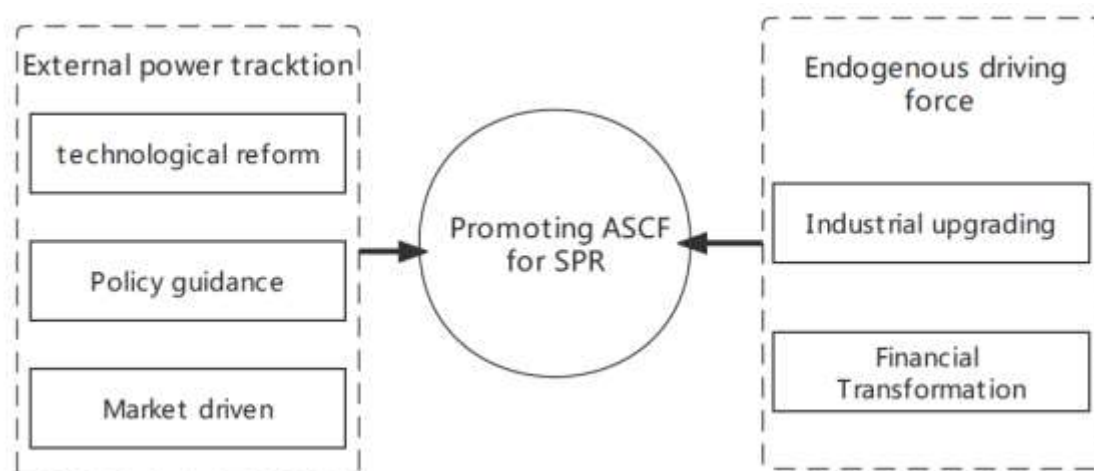


Figure 1: Dynamic mechanism of ASCF for SPR

Exogenous power

New opportunities: technological change reshaping the development mode of ASCF

In the past, ASCF has been in the traditional "extensive" development for a long time, with imperfect credit evaluation system, weak risk control mechanism, scattered collateral of small agricultural enterprises and farmers and lack of collateral types, leading to financial institutions unwilling to develop corresponding financial products and services for ASC; Logistics companies that control the operation of ASC lack digital platforms, which limits the financial assistance of the ASC to SPR. With the development of digital technology, Internet, big data, artificial intelligence and other technologies have promoted the formation and development of the digital ASCF platform, promoted the data sharing and commonality among the participants in the ASC, exchanged data for credit, improved the digital credit and risk control system, and integrated third-party service institutions such as logistics companies, asset evaluation institutions, public service institutions into the ASCF platform, Undertake the social responsibility of low-carbon emission reduction, reduce the operation cost of ASC, improve the economic benefits of the participants in ASC, and promote ASCF to help SPR.

New policy: policy guidance to ensure the stable development of ASCF

Since the 19th CPC National Congress, the issue of "agriculture, rural areas and farmers" has been the top priority of the work of the whole party, and it is also an urgent problem to be solved in the implementation of Rural Revitalization and poverty eradication. The State Council issued the national agricultural modernization plan (2016-2020), which pointed out that we should continue to innovate financial policies to support agriculture and strive to improve the level of sustainable agricultural development. The 14th five-year plan mentioned that we should give priority to the development of agriculture and rural areas and comprehensively promote rural revitalization. In combination with the spirit of the central economic work conference and the central rural work conference, the central bank proposed in the "opinions on doing a good job of financial support in 2022 and comprehensively promoting the key work of Rural Revitalization" that we should effectively increase financial support in the "three rural" areas, optimize the allocation of credit resources, continue to increase credit investment, and standardize the development of ASCF services. To ensure the stable development of ASCF, the guidance of policies should not be ignored. Reasonable ASC policies, give full play to the social responsibility of government departments, grasp the operation of ASCF

platform macroscopically, monitor the credit risk and moral hazard it can encounter, and force the development of ASC to move towards a green and low-carbon development path with policies.

New requirements: ASCF for SPR being market-driven

With the rapid development of China's economy and the increasing improvement of people's living standards, we are in the era of consumption upgrading. Consumers gradually begin to pay more attention to the quality of products and ignore the price of products. The upgrading of consumer demand has promoted the rapid development of the agricultural market. The digital ASCF platform integrates various public services including finance, logistics, communication, etc. on the one hand, it can efficiently provide fresh agricultural products for consumers and agricultural product processing enterprises, on the other hand, it can also ensure that agricultural products with short shelf life can flow into the market in a timely and intact manner. The agricultural products processing enterprises in the upstream of the supply chain are not all agricultural leading enterprises with strong economic strength. Most small agricultural enterprises are still the main force in the ASC, and these small and medium-sized agricultural enterprises lack sufficient funds to meet the consumption upgrading of the agricultural products market. Through the ASCF platform, we can efficiently realize resource allocation, specifically meet their personalized capital needs, and help them follow the tide of agricultural consumption upgrading.

Endogenous dynamics

Establish advantages: industrial upgrading breaking the bottleneck of agricultural development

In recent years, driven by a series of national policies, China's agriculture has developed rapidly. However, at this stage, there are still problems such as "small, scattered, chaotic and weak" in agricultural development. "Small" refers to the small scale, small input and small output of the participants in the agricultural industrial chain, and even some small farmers have only a few acres of cultivated land; "Scattered" means that in the agricultural industry, there are few links between small farmers and agricultural enterprises, financial institutions serving agriculture and other subjects, so it is difficult to play a synergistic role; "Chaos" means that the disorderly competition in the agricultural industry is serious, and the party with information and capital advantages in the agricultural industrial chain has malicious behavior of raising, lowering and disturbing market prices, resulting in the damage to the rights and interests of small farmers and small and medium-sized agricultural enterprises; "Weak" refers to the weak overall ability and low competitiveness of the agricultural industry. The upgrading of agricultural industry is a sharp sword to solve the problems of "small, scattered, chaotic and weak" in China's agricultural development. With the support of the digital ecological theory, agricultural enterprises will be introduced into the digital SCF platform to promote the digital transformation of agricultural industry, integrate the agricultural industry chain, strengthen the connection between the participants of the agricultural industry chain, give play to industrial synergy, and enhance the overall competitiveness of the agricultural industry. The development of ASCF can further enhance the development strength of vulnerable enterprises in the ASC, break the "starry sky pattern" and "Matthew effect" in industrial upgrading, and promote the realization of SPR.

Strong effect: Financial transformation promoting SPR in agriculture

Financial institutions' mastery of the information of supply chain participants determines the effect of financing and the size of financing risks. Most of the traditional offline SCF guarantees are based on the inventory and claims of supply chain enterprises. Financial institutions cannot accurately judge the quantity, quality and value dynamics of assets, increasing financing risks. With the application of big data, Internet of things, blockchain, artificial intelligence and other technologies, the data in the ASC is fully circulated, and the credit is evaluated based on the data to reduce the operational risk of financial institutions. For example, strengthen the combination of traditional agricultural industry and financial technology, achieve in-depth scenario data risk control, and strive to create a new financial model of "scenario + technology + finance" [21]. At the same time, in the GASCF platform established based on the double carbon policy, financial institutions can give priority to financing low-carbon enterprises and increase the loan interest of polluting enterprises, so as to force agricultural enterprises to move towards the path of scientific and technological emission reduction and promote the SPR of ASCF.

INNOVATION OF GASCF MODEL UNDER THE BACKGROUND OF DIGITAL TECHNOLOGY

Core elements of GASCF model

GASCF platform

The digital platform is the hub of the ASCF ecosystem, which integrates Internet, big data, artificial intelligence and other technologies to provide agricultural enterprises with various public services, including finance. With the help of big data and Internet technology, heterogeneous organizations such as agricultural enterprises, financial institutions and other production-oriented service subjects operate in the ASCF ecosystem platform. On the premise of maintaining the ownership of the subject property rights, they realize cross industry business reengineering through data fusion based on the ecological contract, form an organic whole of different subjects with high efficiency and low cost, and realize the multi-agent joint operation of the ecological platform, Innovate the new ecological mode of digital restructuring industry. It is with the digital platform of GASCF that the financial ecosystem of the whole ASC shows integrity and the data has the possibility of convergence and integration.

Agricultural enterprises

Agricultural enterprises refer to the upstream and downstream enterprises that participate in transactions on the ASCF platform, and are also the main objects of the ASCF platform. With the support of the digital platform, agricultural enterprises form a

number of horizontal cluster chains and vertical industrial chains, which are organically coupled with the service chain in the platform, coordinate and cooperate with each other, form a complex ASCF network, expand the service objects and information source channels of the ASCF platform, and provide massive data and more markets for the development of ASCF.

Productive service institutions

Producer services refers to the institutions that provide public services such as capital, logistics and communication on the ASCF platform. Among them, financial institutions are capital providers in digital platforms, including commercial banks, P2P, trust companies and small loan companies; With the help of digital platform, logistics enterprises reduce transportation costs, improve logistics timeliness, timely provide warehousing, transportation, storage and other services for agricultural enterprises that adopt mortgage financing, timely and dynamically update the value of collateral, and provide credit basis for financial institutions to agricultural enterprises; Communication companies and trading centers provide strong technical support and various transaction guarantees for the operation of digital platforms. The participation of these producer services institutions can help improve the overall competitiveness of the ASC.

Construction of GASCF platform

The GASCF platform plays the role of information intermediary service platform, mainly serving the ASC, and providing an equal and open trading platform for investors and farmers' borrowers. The GASCF platform includes three core ports: risk control, credit enhancement and capital settlement. The core port reveals how farmers and small and micro enterprises can solve the problems of credit investigation and financing in the ASCF platform under the guidance of advantages. As shown in Figure 2, the GASCF platform relies on information processing and technology empowerment, fully considers various potential risks that may exist, and puts forward measures to solve the problem of risk control. Secondly, at the credit enhancement port, the risks of agricultural financing institutions are further dispersed through risk guarantee measures such as structured credit, guarantee and social credit investigation. Finally, at the capital settlement port, reduce the fund contact of the platform and further reduce the financing risk.

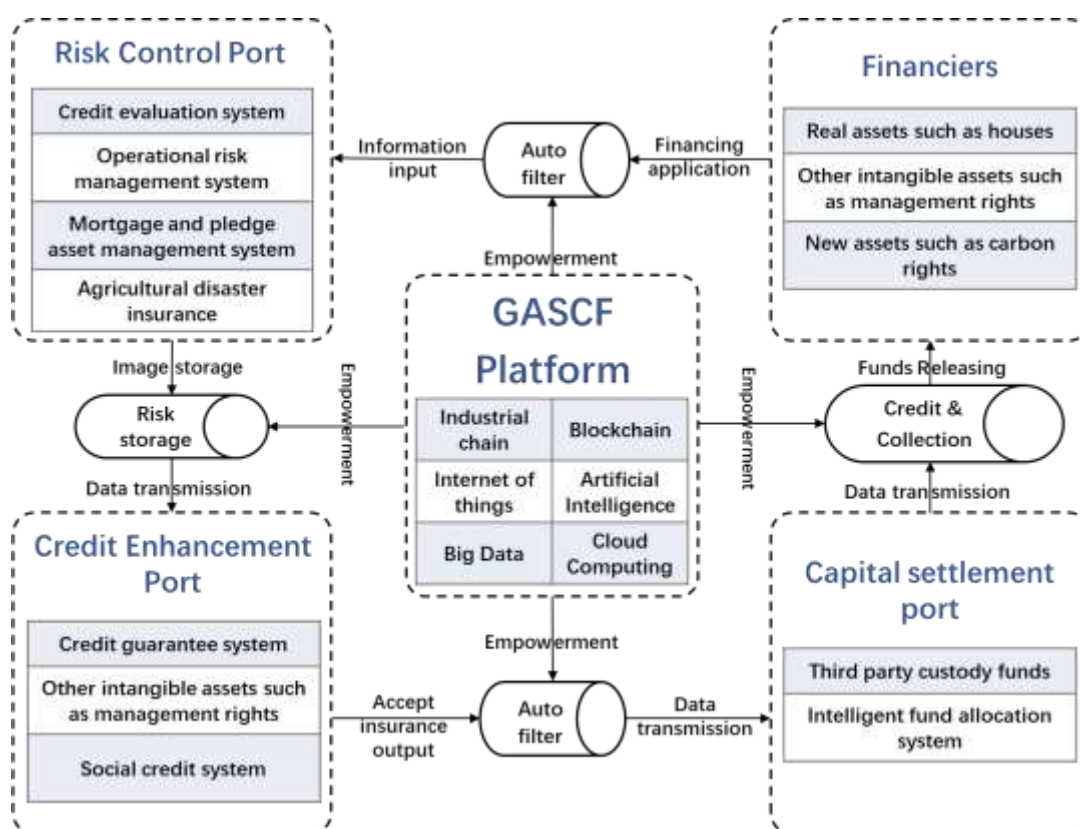


Figure 2: Construction of GASCF platform

Design of core modules and key control points

The core module of the GASCF model mainly includes three ports: risk control, credit enhancement and capital settlement. Each core port should have the functions of receiving information, enabling technology, filtering output, etc. This section will analyze the operation design of the three core ports of the GASCF model from the construction of core modules and key control points.

Risk control port

Risk control needs to make full use of technology agglomeration and system agglomeration, improve the risk prevention and control system, and consolidate the foundation of financial services. Financial institutions should do a good job in risk

prevention and control, and provide sustainable financial services for high-quality agricultural industry operators. First of all, we should establish a reasonable credit evaluation system, actively develop the credit rating system of the industrial chain, and establish an objective and scientific evaluation system of the credit level of the participants in the agricultural industrial chain on the basis of evaluating the market potential and trade authenticity of the whole industrial chain. Secondly, strengthen the internal control of business operational risk, improve the operational risk management system, and realize the effective control of the operational risk of each process. At the same time, it is also necessary to improve the dynamic management of mortgage and pledge assets, establish a real-time tracking system for the price of mortgage and pledge, and set a warning line for price fluctuations, so as to timely add margin or supplement mortgage and pledge assets, and effectively control the risk of changes in the value of mortgage and pledge assets. In addition, in order to better transfer and disperse agricultural natural disasters, epidemics and other self-owned risks, stabilize the agricultural economy, and increase investment in agricultural insurance is particularly necessary. According to the guidance of national policies, we need to strengthen the protection of policy insurance, increase the types of commercial insurance, improve the agricultural disaster risk transfer system, establish catastrophe insurance project funds, establish small-scale agricultural insurance, and support enterprises engaged in agricultural insurance through subsidies and reinsurance, so as to lay a good foundation for the development of GASCF.

Credit enhancement port

Credit enhancement ports include credit guarantee system, social credit investigation system and agricultural chain structured credit. The three cooperate with each other to jointly improve the credit rating of financing parties. Firstly, introduce a credit guarantee system. Through data analysis and resource retrieval, the Internet financial platform matches suitable guarantee companies for farmers and small and micro enterprises, and promotes the two-way choice between financing demanders and guarantors, so as to achieve an enhanced effect. The ASCF platform has moved the guarantee from offline to online, which not only expands the business scope of the guarantee company, but also makes the guarantee information more transparent. Farmers and small and micro enterprises can obtain the guarantee more quickly and conveniently, and improve the loan experience. The data shows that the ASC composed of small-scale farmers with limited funds and intermediary platforms, under the guarantee and direct financing, the production level of farmers can even be higher than the centralized decision-making. Therefore, China should give play to the advantages of agglomeration, refer to the advantages of foreign farmers' loan guarantee mechanism, and combine with its national conditions, increase government guarantee support, and appropriately adjust the supply chain guarantee requirements. Secured loans can effectively fill the credit gap, solve the financing difficulties of farmers and small and micro enterprises, and vigorously promote the development of ASCF. Secondly, it should be incorporated into the social credit reporting system. It can also play the role of credit enhancement. Through the big data, cloud computing and artificial intelligence technologies in the application platform, we can deeply mine and analyze the information from industry and commerce, taxation and other public services, and depict the credit status of financing subjects through user portraits [23], providing a reliable basis for financial decision-making in the ASC. Thirdly, the use of agricultural chain structured credit. As a financing provider, the core enterprise of the ASC is undoubtedly a high-quality borrowing enterprise, which can give full play to the agglomeration of capital advantages. Agricultural core enterprises have a better understanding of farmers' financing information and needs in their ASC. They can determine farmers' credit rating through transaction records and social credit investigation, so as to reduce financing costs and financing risks. This in itself is to enhance the credit of farmers. In addition, in the accounts receivable business, accounts receivable and industrial chain trade are guaranteed. The core enterprises providing financing are internal enterprises in the ASC, and the corresponding trade loans can also be frozen.

Capital settlement port

The GASCF platform introduces substantial linkage advantages of third-party custody companies. When investors recharge and invest, the funds will be directly remitted to the independent third-party custody account of the platform. When the standard is full, the platform cannot touch this loan, which fundamentally eliminates the online loan fund pool and reduces the liquidity risk of funds to the greatest extent. Secondly, the platform has established efficient and convenient financial clearing and payment services for the smooth implementation of ASCF and the financial transaction needs of farmers' production and life. For example, the Internet financial platform gives full play to its innovative advantages, absorbs the advanced achievements of other excellent supply chain platforms, opens the real name authentication of platform users, accounts collection system and allows the application of electronic signatures for signing. The GASCF platform makes the agricultural market system more standardized, farmers' awareness of reputation and environmental protection enhanced, and promotes the long-term development of agriculture. At the same time, the huge development space behind the GASCF can stimulate market innovation, gradually screen out the disadvantages of the traditional agricultural chain, abandon heavy industry, non-low-carbon projects, and turn to green finance. In addition, the systematic and scientific financing system of the GASCF model can make the ASCF develop better and more stably, actively guide the green transformation of the agricultural industry chain, and radiate the development of other industries while driving the development of agricultural economy. Therefore, the digital platform built by the GASCF model can give full play to the guiding role of agglomeration advantages, cooperate with the government guidance, and further promote the SPR work.

THE REALISTIC DILEMMA OF GASCF IN HELPING SPR

Lack of comprehensive management ability of the organization

GASCF ecosystem presents the structural characteristics of loose coupling. The system will not lose its core because its functions are scattered among different industrial subjects and service subjects, and each subject will not lose its original characteristics due to integration into the system. However, due to the lack of stickiness of different subjects in the loose

coupling structure and great differences in value orientation, it is difficult to find a high-level leader with strong influence to fully intervene (Li *et al.*, 2015). At present, the ASCF model led by different leaders has significant differences in solving the capital investment of agricultural enterprises, the demand for credit enhancement and risk control. Supply chain managers lack knowledge and information about SCF projects (Hofmann & Belin, 2011), which will restrict and restrict the introduction of agricultural low-carbon environmental protection projects, and cause the mismatch between finance and "high energy consumption, high emission" projects. The lack of coordination between different departments within the organization will not only weaken the platform's ability to control the depth of the ASC scenario and the comprehensive risk, but also increase the difficulty of building a collaborative network based on multi-agent professional division of labor (Fawcett *et al.* 2008). More importantly, it is difficult to form an intensive organization to achieve the continuous agglomeration and innovative development of the platform's advantageous resources and capabilities, affecting the benefits of the entire ASC system. In addition, the lack of comprehensive management ability of the organization is also reflected in the insufficient maintenance and development ability of the GASCF operation platform, the lack of the characteristics and potential of developing the ecological operation platform, and the inability to provide complete business guidance, production management, financial support and other services for agricultural enterprises, which affects the SPR effect of ASCF.

Insufficient application of digital technology

An important condition for the innovative construction of GASCF model is the application support of emerging technologies such as Internet, big data and artificial intelligence. However, due to the weak agricultural and rural infrastructure, the application of digital technology to build SCF platform is facing many challenges. Although ASCF has developed from the traditional manual process based on paper media to online, due to the lack of scientific and technological talents who understand finance and ASC management, the application of new generation technologies such as blockchain and Internet of things has not been popularized, especially the integration and application of multiple technologies is difficult to achieve, and it is difficult to comprehensively apply all kinds of emerging technologies to all modules of ASCF digital platform under current conditions. At the same time, the application cost of emerging technologies is high, especially the high labor cost and infrastructure construction cost. The organization cannot afford the technical cost required by the financing platform, so the comprehensive application of information technology in ASCF is not sufficient. In addition, China's SCF information platforms generally lack basic standards, resulting in inconsistent information system interfaces between the platform and various participants, the formulation of relevant technical standards is difficult to meet the needs of the operation of ASCF mode, and the participants are unable to achieve the entry of batch business data. At the same time, a large number of personalized interfaces reduce the operation efficiency of the platform, resulting in the upward operation cost of the platform. The insufficient application of digital technology limits the breadth, depth and accuracy of the digital transformation of GASCF, and restricts the service efficiency, quality and effect of GASCF in helping SPR.

Imperfect institutional environment

In recent years, the Chinese government has successively issued corresponding financial support policies around the development of "agriculture, rural areas and farmers", which provides a top-level design and institutional basis for promoting the standardized operation and innovative development of ASCF. However, from the regulatory perspective, although there are many regulatory systems related to agricultural finance and SCF, these regulatory policies, ideas and rules are mainly aimed at the ASCF business carried out by commercial banks, and do not fully consider the relatively complex risk-taking and professional division of labor led by other organizations. Therefore, the ASCF model dominated by agricultural core enterprises or fintech platforms is difficult to be incorporated into the current prudential regulatory framework with institutions as the main body. At the same time, due to the influence of China's "separate operation and separate control" system, it is difficult to issue unified supervision rules across industries in the short term. From a legal perspective, there is a gap in China's laws and regulations related to ASCF, which leads to the lack of proper order, norms and legal protection in the financial market, and increases the financing difficulty of agricultural enterprises. At the same time, the particularity of enterprises in the ASC, scattered origin, long transportation time and distance, non-standard or even lack of financial information, makes the relevant departments lack effective supervision and supervision over small-scale agricultural enterprises and farmers. In addition, the diversification of financial entities and services in the ASC puts forward higher requirements for the coverage of laws and regulations, especially with the application of digital technology, the current laws and regulations such as the insurance law, the securities law, the guarantee law and the electronic signature law have not set legal standards for the digital business qualification, algorithm mechanism and information security components of the operation platform institutions, The legal environment lagging behind the business development increases the operational risk of the ASCF model. The imperfection of the legal and regulatory system has led to the operational risk of ASCF, which is not conducive to the realization of sustainable poverty reduction in ASCF. At the same time, the lack of relevant guiding policies such as green supply chain and green integration of industry and finance also restricts the innovative development of green SCF.

Lack of compound talents

Talent support is one of the key factors for ASCF to achieve sustainable poverty reduction. In recent years, the number of SCF business companies has shown a blowout growth. At the same time, the application of digital technology in SCF has led to a large shortage of related compound human resources. The market urgently needs compound talents who master ASC management, understand finance and master digital technology. According to the statistics of the Research Report on the employment impact of the digital economy issued by the China Academy of information and communications, with the digital transformation of the whole society and the whole industry, the gap of digital talents in China is very large, and the imbalance

in the distribution of digital talents in agriculture and remote areas also has a negative impact on the sustainable development of China's digital agricultural economy. Facing the strengthening of digital trend, the innovative development of GASCF depends on the green concept, innovative thinking and innovative ability of financial science and technology talents. At present, from the government, society to colleges and universities, there is a lack of comprehensive talent training system for ASCF. The government has not put forward a strategic plan for the training of SCF technology talents from the top-level design, the training of SCF composite talents by social training institutions is not systematic, the training of SCF talents by colleges and universities seriously lags behind the market demand, many new technologies seriously lag behind the practical needs in theory, and the level of teachers cannot keep up. The serious lack of compound talents is an important bottleneck restricting the digital transformation of ASCF, which objectively hinders the efficiency and effect of sustainable poverty reduction in ASCF.

THE PATH OF GASCF TO HELP SPR

In view of the practical difficulties of GASCF in supporting sustainable poverty reduction, such as the lack of comprehensive management ability of the organization, the insufficient application of digital technology, the imperfect institutional environment and the lack of compound talents, we should formulate a four in one path of ASCF for sustainable poverty reduction, which is "government standardized guidance, financial institutions' assistance, industrial main body drive and Social Service Co governance".

Government standardizing and leading

Government departments should play a macro guiding role in the sustainable poverty reduction of GASCF. First of all, the government needs to formulate a new regulatory system to adapt to the complex risk-taking and professional division of labor under the ASCF model dominated by agricultural core enterprises or fintech platforms, such as data regulation of ASCF platforms, potential risk regulation of supporting producer services, etc. Secondly, the government needs to formulate and implement the development strategy for the construction of ASCF talents from the top, formulate the training plan for leading talents in ASCF, build a perfect "supply chain management + Finance + technology" talent training system, and rely on universities and scientific research institutions to increase the training of professional and compound talents. At the same time, it is necessary to carry out or participate in international academic exchanges with an open attitude, actively learn from the advanced concepts of foreign ASCF development and the innovative experience of science and technology, and introduce high-level ASCF talents to the world. Thirdly, the legislative department needs to improve relevant laws and regulations to build a good legal environment for the development of ASCF. For example, the property law stipulates that only the items listed in the law can be used as collateral, while the types of collateral for small agricultural enterprises and farmers are complex, and agricultural products have non standardized attributes. Therefore, there are a large number of collateral not listed in the property law in ASCF. Therefore, based on the advanced chattel financing guarantee system in foreign countries, the scope of collateral can be expanded to further improve the types of collateral⁸. Finally, the government needs to create a policy atmosphere for the integrated development of green agriculture and green finance, establish and improve the agricultural green low-carbon investment and financing system, and promote agricultural low-carbon development.

Assistance from financial institutions

Financial institutions are the capital guarantee for the benign operation of the GASCF platform. However, there are still some problems in financial institutions, such as the insufficient application of digital technology, the lack of financial talents in agriculture related fields, especially the insufficient support for agricultural green finance. Therefore, in order to help achieve sustainable poverty reduction in ASCF, financial institutions need to adapt to the transformation of digital finance as soon as possible, introduce digital credit evaluation and risk control systems in the financing process, and realize the integration and application of various digital technologies in the financial field as soon as possible. At the same time, we should speed up the training and absorption of compound talents who are proficient in ASC management, finance and digital technology, give play to the important value of financial institutions themselves in the continuous training of talents, closely grasp the changes of relevant policies and regulations in the field of ASCF, and timely adjust the operation and management of financial institutions, so that they can better contribute to the sustainable poverty reduction development of ASCF. In addition, financial institutions should conscientiously implement the "double carbon" goal, adhere to green development to lead business operations, constantly improve the quality, efficiency and coverage of green financial services, vigorously develop green financial products, continue to accelerate the innovation of green financial products and services, and comprehensively help the green low-carbon transformation and high-quality development of the agricultural economy.

Driven by industrial subjects

Agricultural enterprises are the new force to promote GASCF to help sustainable poverty reduction, and play an important driving role in the development of sustainable poverty reduction in ASC. First of all, agricultural enterprises need to implement the concept of green development, fully understand the importance of ecological priority and green development, shift agricultural production from blindly pursuing output to paying equal attention to quantity and quality, cultivate green technology promotion talents, attract high-end talents, improve the scientific and technological level of the agricultural industry, introduce advanced agricultural mechanized farming technology, and improve the level of green production technology, Create conditions for promoting ASCF to help sustainable poverty reduction. Secondly, agricultural enterprises should take advantage of the policy dividends of the new agricultural infrastructure and use digital technology to improve agricultural production efficiency. Through the construction of infrastructure in the ASC, the digitization of ASC links, the digitization of production links, the digitization of orders, the digitization of supply and demand relations and other links, the

entire industrial link of agricultural products from the field to the table will be opened up, and the agricultural industry will be empowered by the technological advantages precipitated by big data, Promote the upgrading of the agricultural industrial chain. Therefore, with the empowerment of digital technology, green ASCF will be smoother. In the service of "agriculture, rural areas and farmers", precision poverty alleviation and other scenarios, we will continue to develop innovative financial services and products to provide financial services for long tail customers that are difficult to reach by traditional inclusive finance, so as to expand the availability, coverage and satisfaction of GASCF services.

Co governance of Social Service

Under the guarantee of social productive service institutions, the practical problems that restrict the sustainable poverty reduction development of ASCF, such as the lack of timeliness of agricultural logistics, the imperfect credit and risk control system, and the lack of agricultural compound talents, can be solved. First of all, logistics enterprises in the ASCF system, relying on the digital financing platform, establish a digital logistics system to ensure the timeliness of logistics in the ASC. At the same time, strengthen the infrastructure construction of the logistics industry, increase the investment in logistics hardware facilities, and then reduce logistics costs. Secondly, the participation of third-party evaluation institutions, environmental testing institutions and other service institutions has made the credit and asset evaluation of ASCF more professional, and accelerated the transformation of agricultural projects with "high energy consumption and high emissions". Finally, to explore the cooperative training mode of "industry university research" in GASCF, social training institutions need to strengthen the exchange and cooperation with enterprises and universities, so as to realize the effective docking between enterprises and universities and scientific research institutions. At the same time, the society cooperates with many parties to build a GASCF industry university research cooperation base, increase the opportunities for scientific and technological talents to practice, and improve the application and transformation ability of scientific research achievements in the practice of agricultural enterprises.

CONCLUSION

We explore the internal mechanism and dynamic mechanism of ASCF helping to reduce sustainable poverty in this paper, and based on the background of digital technology, innovate the ASCF model, analyze the practical difficulties restricting ASCF helping to reduce sustainable poverty, and then seek countermeasures and suggestions for ASCF helping to reduce sustainable poverty. First of all, from the perspective of financial services, management services and coordination services, this paper analyzes the internal mechanism of sustainable poverty reduction of ASCF, studies and puts forward innovative financial service functions of ASCF, and promotes the stable development of ASC; Give full play to the management role of ASCF and promote the low-carbon transformation of ASC; Optimize the coordination function of ASCF and improve the comprehensive income of ASC. Secondly, following the internal logic of "motivation behavior", this paper explores the internal and external driving forces of sustainable poverty reduction in ASCF, including industrial upgrading and financial transformation; External driving forces include technological change, policy guidance and market drive. Third, based on the background of digital technology, innovate the GASCF model, analyze the core elements and platform structure, and focus on the process design and key points of the three modules of the platform: risk control end, credit end and capital end. Finally, in view of the practical difficulties of the lack of comprehensive management ability of the organization, the insufficient application of digital technology, the imperfect institutional environment and the lack of compound talents of GASCF in helping sustainable poverty reduction, this paper puts forward a four in one construction path of GASCF helping sustainable poverty reduction, which is "government normative guidance, financial institution assistance, industry main body drive and Social Service Co governance".

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