Research on Market Access Issues for Agricultural Management Entities of Different Scales in Heilongjiang Province in the Development of Digital Agriculture

Ruihan Xia, Quanfu Pan*

College of Economics and Management, Heilongjiang Bayi Agricultural University, Daqing, Heilongjiang, China
*Corresponding Author.

Abstract: Globally, the rapid development of digital economy in the agricultural field has attracted widespread attention. Digital agriculture in Heilongjiang Province is developing rapidly, but the issues of market access and equal opportunities involved have a great impact on the healthy and sustainable development of digital agriculture. Digital technology in the development of digital agriculture has great potential in improving agricultural efficiency and promoting rural development. However, the development of digital agriculture in different regions of Heilongjiang Province is unbalanced, resulting in different problems faced by business entities of different sizes. Among them, the digital divide, farmers' insufficient digital literacy, imperfect digital infrastructure and policy-level constraints are the main obstacles. Inequality in market access is an important component of the digital divide and affects farmers' adoption of digital technologies. Based on this, the problems in business entities of different sizes in the promotion of digital agriculture should be solved from several aspects: government role and policy support, promotion of the popularization of digital technology and training plans, optimization of guidance market access policies, and construction of social participation cooperation mechanisms.

Keywords: Digital Agriculture; Market Access; Equal Opportunities; Digital Divide; Information Asymmetry

1. Introduction

With the rapid development of information technology, cloud computing, Internet of Things, big data, artificial intelligence and other technologies, agricultural production and management methods are undergoing profound changes. Challenges such as global climate warming, resource shortages and food security have put traditional agricultural models under tremendous pressure, and all countries need more efficient and sustainable agricultural production methods. In addition, consumers have increasingly higher requirements for food quality, safety and traceability, which requires agricultural producers to adopt more advanced technical means to improve product quality and management efficiency [1]. In this context, digital agriculture has developed rapidly with the development of the digital economy. Based on the research of domestic and foreign scholars, it can be found that digital agriculture can improve agricultural production efficiency, that is, through digital technology, agricultural production can be automated, precise and Intelligence improves the yield and quality of agricultural products. Resource allocation can be optimized, that is, through data analysis and prediction, agricultural resources can be reasonably allocated, production costs can be reduced, and resource utilization efficiency can be improved. The quality and safety of agricultural products can be enhanced, that is, through digital means, the monitoring and management of the production, processing, storage and circulation of agricultural products can be strengthened to ensure the quality and safety of agricultural products. Digital agriculture can help agricultural producers adopt more environmentally friendly and sustainable production methods, reduce the impact on the environment, and promote sustainable agricultural development. In terms of increasing farmers' income, by increasing

the yield and quality of agricultural products and reducing production costs, we help farmers increase their income and improve rural economic development. Strengthen the management of the production and circulation of agricultural products, effectively improve food safety, and protect the health rights and interests of consumers. In the development process of digital agriculture, with the continuous advancement of technology, digital agriculture will be more deeply integrated with biotechnology, new materials, robotics and other fields to form a more complete agricultural ecosystem. In the future, agriculture will be more intelligent [2]. Through technologies such as artificial intelligence, drones, and robots, agricultural production, management, and decision-making will be intelligent, and the accuracy and efficiency of agricultural production will be improved. The "2022 Agricultural Digital Industry Research Report" shows that compared with other domestic industries, my country's agricultural digitalization process clearly lags behind the secondary and tertiary industries. As of 2020, the penetration rate of the digital economy in the tertiary industry has reached more than 40%, while in agriculture it is only 8.9%. Compared with other high-income countries, there is still a certain gap in the penetration rate of agricultural digitalization in my country. Although my country's total digital economy leads the world, reaching 39.2 trillion yuan in 2020, accounting for 38.6% of GDP, the penetration rate of the agricultural digital economy is only slightly higher than the average level of middle- and high-income countries, and is far from the average level of high-income countries. There is still a big gap at 12.5%. From production to circulation to sales, the productivity and efficiency of the entire agricultural industry chain still need to be further improved. Therefore, our country still faces great challenges and opportunities in agricultural digitalization, and needs to further increase investment and promotion efforts to improve the digitalization level and supply chain efficiency of agriculture. Overall, digital agriculture is an inevitable trend in agricultural development, with far-reaching significance and broad prospects. By strengthening technology research and development, policy support and industrial cooperation, digital

agriculture can be promoted to a higher level and make greater contributions to human food security and rural economic development [3].

2 Current Status of Digital Agriculture Development in Heilongjiang Province

2.1 Application of Digital Technology in Agriculture in Heilongjiang Province

In Heilongjiang Province, the application of digital economy in the agricultural field shows a growing trend. First of all, modern technologies in the agricultural production process have been widely used, including intelligent agricultural machinery, drone inspections, intelligent irrigation systems, etc. The introduction of these technologies has improved agricultural production efficiency and enabled farmers to manage farmland more efficiently. Secondly, the promotion of digital agricultural platforms in Heilongjiang Province also provides convenience to agricultural producers. Through digital platforms, farmers can obtain real-time market information, meteorological data and agricultural technical guidance to better make decisions and plan agricultural production and sales activities [4]. The rise of agricultural e-commerce and other platforms has provided online sales channels for agricultural products and promoted the marketization of agricultural products. Since 2020, Heilongjiang Province has vigorously improved rural digital infrastructure. Among them, 4G network and optical fiber broadband have achieved full coverage in all administrative villages, 5G coverages in towns has reached 100%, and administrative village coverage has reached more than 95%. At the same time, Heilongjiang Province is vigorously building a three-level smart logistics system in counties and villages. In 2022, the province will achieve online retail sales of agricultural products of 20.42 billion yuan, an increase of 17.2% over 2021. The key element of digital agriculture is data. In the first half of 2023, Heilongjiang Province has realized the sharing of 19 types of agricultural-related data resources, including land, agricultural machinery, and new agricultural business entities. On this basis, Heilongjiang Province has launched farmers' digital skills improvement activities to enable farmers to learn to use data element resources to serve

various aspects of agricultural production. In addition, digital technology is also closely integrated with the construction of digital villages in Heilongjiang Province, serving agricultural production while comprehensively promoting the province's digital development process [5].

2.2 Level of Digital Adoption by Agricultural Producers

In the development of digital agriculture, the level of digital adoption by agricultural producers is a key influencing factor. After vigorous publicity and guidance, Heilongjiang Province has used typical counties and villages to develop digital agriculture to promote the development of digital agriculture. Agricultural business entities have gradually realized the importance of digital technology, and some farmers have adopted digital agricultural tools. Overall, however, there are still some differences in the level of digital adoption. On the one hand, some large agricultural enterprises and cooperatives are at the forefront of digital agriculture, using advanced technologies to improve production efficiency. On the other hand, small-scale farmers are relatively lagging behind in digital adoption due to the cost and usage threshold of digital technology. This has resulted in the existence of a digital divide, which requires further training and policy support to promote the popularization of digital technology at the grassroots level.

2.3 Current Status of Market Access Policies

Market access policies and practices directly affect the development of digital agriculture in Heilongjiang Province. The Heilongjiang Provincial Government actively promotes the development of digital agriculture and adopts a series of supporting policies, including financial subsidies and tax incentives. These policies aim to reduce the cost of using digital technology and promote agricultural producers to better integrate into the digital agricultural system. In fact, the implementation of market access policies is also related to the region and the size of agricultural producers. Some places have been relatively active in implementing policies on digital agriculture, but in some remote areas or among small-scale farmers, there may be a certain lag in policy

implementation. Therefore, it is necessary to further improve market access policies to ensure that the policies can fully cover the needs of different regions and agricultural producers, thereby promoting the wider application of the digital economy in agriculture. Overall, the current situation of digital agriculture in Heilongjiang Province shows a positive development trend, and the digital economy is playing an increasingly important role in improving agricultural production efficiency and improving market access. However, differences in digital adoption levels and implementation issues of market access policies still need to be addressed through more in-depth research and targeted policy measures [6].

3. Types of Market Access Barriers Faced by Agricultural Business Entities

Market entry barriers refer to various conditions and factors that prevent enterprises or individuals from entering the market and participating in competition. In the field of digital agriculture, market entry barriers can be divided into many types, and the reasons are multi-faceted. Here are some common types and causes of market entry barriers:

3.1 Technical Barriers

The main reasons for technical barriers are the lack of digital technology infrastructure, the high cost of digital agricultural tools, and the unfamiliarity with digital technology. This technical barrier is particularly obvious among small-scale farmers. There are 2.732 million small farmers in Heilongjiang Province, accounting for more than 80% of the total number of agricultural business entities. It can be said that agricultural development in Heilongjiang Province is still an agricultural development model in which small farmers account for the majority. With the development of aging, most small farmers engaged in agricultural production and management are older and have limited ability to accept, digest and absorb new things and new technologies. , some even resist the use of new technologies. This makes the promotion and application of digital agricultural technology more difficult. The digital literacy of this part of agricultural business entities is generally low. Without digital technology training, technical obstacles have become an

almost insurmountable gap, and a digital divide has inevitably arisen.

3.2 Obstacles at the Information Level

Obstacles at this level are mainly manifested in the fact that agricultural business entities lack information about digital agriculture and do not understand market demand and the actual benefits of digital technology, making it difficult for them to make informed decisions. Among them, small farmers have obstacles in recognizing and accepting digital agricultural information due to cultural differences or low education levels. In addition, digital agricultural extension also has information asymmetry between extension entities and farmers. For example, agricultural technology extension personnel are more familiar with digital agricultural technology than farmers, and it is difficult for farmers to achieve the goal without training or even after training. The expected level of digital technology application has further led to farmers' resistance to digital agricultural technology. Finally, small farmers have insufficient understanding of the risks and uncertainties of whether to adopt digital technology. For example, whether the application of drone technology in agricultural production can achieve the expected results, and whether such high-cost investment is proportional to its expected benefits. This Small farmers and even cooperatives are hesitant and difficult to make decisions due to the asymmetry of information in the application of digital agricultural technology.

3.3 Obstacles at the Investment Level

The capital required to invest in digital agriculture is relatively large, and small farmers and small-scale agricultural enterprises may have difficulty obtaining sufficient loans or financial support, limiting their level of digital adoption. In addition to the outstanding level of modern agricultural development in reclamation areas in Heilongjiang Province, the majority of small farmers are in a dilemma in the development of digital agriculture. On the one hand, current small farmers have basically realized the mechanization of agricultural production. Although the level of mechanization in the entire process is not high, the mechanization of agricultural production is progressing rapidly

[7]. However, the subsequent digitization will require higher capital investment. Under the strong advocacy of the government, small farmers cannot afford this investment. Moreover, small farmers are satisfied with the efficiency and output benefits of mechanization and have a respectful attitude towards the application of digital technology. On the other hand, even if there are successful examples of digital agricultural technology application, small farmers generally have doubts after making comparisons, especially those who are older agricultural production and management entities. Lack of understanding of technology, uncertainty about the stability of technology and worries about input-output ratio have all caused obstacles for small farmers to invest.

In summary, the types and causes of these market access barriers are intertwined and jointly affect the extent to which agricultural producers participate in digital agriculture. Solving these obstacles requires the joint efforts of governments, enterprises and all social parties to create a more inclusive and equitable digital agricultural development environment through policy support, technical training, market information transparency and other means.

4. Market Access Problems and Causes Faced by Agricultural Business Entities of Different Scales in Heilongjiang Province

Agricultural producers of different sizes may face different challenges when facing market access issues. Agricultural production and management entities in Heilongjiang Province can basically be divided into two categories, namely small farmers and large-scale agricultural enterprises.

4.1 Market Access Problems Faced by Small Farmers and Their Causes

For small farmers in Heilongjiang Province, one of the market access problems facing digital agriculture participation is the high technical threshold, and there are high barriers to both the introduction and application of technology. Digital agriculture involves advanced technologies such as big data, the Internet of Things, and artificial intelligence. Small farmers lack relevant technical knowledge and professional talents, so they face the problem of high technical thresholds.

The main reason can be summarized as small farmers usually lack the funds to invest in advanced digital agricultural technologies and cannot easily cope with the high cost of digital agricultural tools, which leads to restrictions on their adoption and application of digital technologies. The second problem is the digital divide. The main reason can be summarized as small farmers may lack digital literacy and have less understanding of digital technology. Therefore, they may encounter technical obstacles in the adoption process of digital agriculture, which also directly causes small farmers to face Difficulties in market access, including challenges in product promotion, sales channels, brand building, etc., make it difficult for digital agricultural products and services to integrate into the market. The third is the problem of market information asymmetry. Small farmers have insufficient understanding of digital agriculture information, lack of relevant training and guidance, insufficient awareness of the application and benefits of digital agriculture, and lack of relevant information support. The reason can be summarized as small farmers may not be able to obtain and analyze market information due to their small scale, resulting in a lack of sufficient information support in decision-making. The last problem is financing. Digital agriculture requires a large investment in purchasing equipment, software, data services, etc. Small farmers usually lack sufficient financial support and cannot afford the high costs required for the transformation of digital agriculture. The main reason is that small farmers often have difficulty obtaining adequate financing support, which makes it difficult for them to purchase digital agricultural tools or participate in digital agriculture projects.

4.2 Market Access Problems Faced by Large-scale Agricultural Enterprises and Their Causes

Large-scale agricultural enterprises in Heilongjiang Province are mainly leading enterprises in agricultural industrialization. Although these enterprises have strong financial strength and are highly motivated to apply new technologies, they still face many problems in accessing the digital agricultural market. The first is the issue of market monopoly and competition. The main reason is that large-scale agricultural enterprises may face competition problems in the market, especially in the field of digital agriculture. Some large enterprises may monopolize market resources, making it difficult for other agricultural producers to enter the market or obtain fair market competition opportunities. Secondly, there are regulatory and policy restrictions. The reason is that large-scale agricultural enterprises may be subject to more stringent regulations and policies, which may make their operations in digital agriculture subject to more restrictions and requirements, especially at this stage when food safety issues occur frequently and consumer food safety In the context of the awakening of consciousness, the government has become more stringent in supervising large-scale agricultural product production enterprises. Third, there is the issue of technical application complexity. The reason is that large-scale agricultural enterprises usually require more complex digital agricultural solutions due to their numerous internal departments and intricate relationships between different links, and the application of these solutions may involve more technical complexity and system integration issues. , enterprises not only have to pay higher costs for the introduction of digital technologies, but also bear the costs and expenses of technology application. Finally, there is the cost management challenge. The reason is that large-scale agricultural enterprises have a large investment scale in digital agriculture and may face more challenges in cost management and budget arrangements. For example, Beidahuang Group in Heilongjiang Province has many subsidiaries, resulting in digital technology that cannot GM needs to pay more technology introduction or research and development costs. In summary, small-scale agricultural producers and large-scale agricultural enterprises face different challenges when facing market access issues, which are mainly affected by factors such as their scale, resources, technological level, and market competition environment. Addressing these issues requires targeted policies and support measures to ensure the development of digital agriculture is more equitable and inclusive.

5. Problems and Solutions Faced by Business Entities of Different Scales in the

Advancement of Digital Agriculture
Based on the above analysis, it can be found that the problems faced by agricultural business entities of different sizes in the development process of digital agriculture in Heilongjiang Province not only exist among small farmers, but also large-scale agricultural enterprises also face various obstacles. Therefore, solving the problems faced by these two agricultural business entities is the key to promoting the rapid and healthy development of digital agriculture in Heilongjiang Province.

5.1 Financial Support and Policy Support
The government plays a key role in solving market access issues in agricultural digitalization. The first is that the government can provide financial support. The government can support small farmers and agricultural enterprises to participate in digital agriculture and reduce their financial pressure by providing financial subsidies, low-interest loans, etc. For small farmers, financial pressure is almost the biggest problem. If small farmers can have certain opportunities for trial and error, the advancement of digital agriculture will be greatly accelerated. The government can set up special funds to encourage small farmers to participate in digital agriculture, and provide financial subsidies or subsidies to help small farmers purchase digital agricultural equipment and services. For agricultural enterprises, although they have certain financial strength, they are also hesitant in the face of uncertain investment risks. With the support of financial funds, the risks and costs of the enterprise can be shared. The increased participation of agricultural enterprises in digital agriculture can also drive small farmers to participate in digital agriculture, forming a good virtuous cycle of mutual promotion. Secondly, the government should formulate clear policies to support the development of digital agriculture. Policy formulation here refers to market access regulations, digital technology standards and quality supervision to ensure fair competition in the market and reduce inequality. The government's role in this part has become a supervisor, ensuring that all business entities involved in digital agriculture can act in accordance with the rules and avoid unnecessary cost waste. Third, build digital infrastructure. Invest in digital infrastructure, including network coverage and information technology facilities in rural areas, to increase the availability of digital technologies in rural areas. In addition, the government can also encourage small farmers to form cooperatives or agricultural cooperatives, pool funds and resources, and jointly invest in digital agriculture projects to reduce the financial pressure on individual farmers.

5.2 Promote Digital Technology Dissemination and Training Programs
The key to the promotion of digital agriculture is the application of digital technology. There are many problems involved in this link. In order to solve the problems of digital technology popularization and training, the following measures can be taken. First, develop a training program. Training for farmers or farmers can easily become a mere formality. The main reason is that farmers are not very clear about the actual benefits of training to them. Therefore, new agricultural business entities such as government departments and cooperatives, and digital technology providers can jointly carry out digital technology training, focusing on small farmers to improve their understanding and application capabilities of digital technology. Small farmers in Heilongjiang Province are different from small farmers in other provinces. The main difference is that the average land per household is more and the level of mechanization is higher. The income that the land can bring is higher than that in other grain-producing provinces. This makes it difficult to a certain extent. Many small farmers have developed a consciousness of being content with the status quo and are resistant to new technologies and high investment. Therefore, joint training can more intuitively allow small farmers to feel the high efficiency and high returns that digital technology can bring, and it is easy to form the mentality of small farmers, demonstration effect. Secondly, establish digital agriculture demonstration projects. Establish digital agriculture demonstration projects in rural areas to allow farmers to experience the benefits of digital technology first-hand and stimulate their interest and participation. Third, develop simple tools and applications. Develop simple and easy-to-use digital agricultural tools and applications to lower the

technical threshold for small farmers, such as simplified data collection tools, easy-to-operate agricultural APPs, etc.

5.3 Guide the Optimization of Market Access Policies

Policy formulation must take into account different business entities. Digital agriculture is not a patent of large companies, nor is it digitalization for the sake of digitalization. Therefore, in order to ensure fairness and transparency in market access, access standards must first be established. Develop clear market access standards for digital agriculture to ensure that the access process is fair and transparent, and to prevent large enterprises from squeezing out small farmers through monopoly means. In the context of government financial support, it is difficult for small farmers to better protect their own interests during policy implementation due to their own weakness. Therefore, policy tilt and protection are particularly important. Heilongjiang Province is a major agricultural province and a province with a high proportion of small farmers engaged in agricultural production. The vital interests of small farmers are related to the quality and level of the province's construction of a strong agricultural province. Second, promote information transparency. Improve the transparency of market information and deliver market demand, price information, etc. to agricultural producers through digital means, so that they can better participate in market competition. Especially in the sales process during the implementation of digital agriculture, market information is related to the sales price of agricultural products and affects the income of farmers and agricultural enterprises. Third, promote agricultural science. Carry out digital agriculture knowledge popularization activities to improve small farmers' understanding and awareness of digital agriculture and enhance their confidence in the application of digital agriculture. Provide technical consulting and support services to small farmers to solve problems they encounter in the application of digital agriculture.

5.4 Construction of Social Participation and Cooperation Mechanism

Building social participation and cooperation mechanisms can promote equitable and sustainable digital agricultural development. The development of agricultural industrialization in Heilongjiang Province started early, and its development level and quality are at the forefront of the country. Therefore, there is a good foundation for promoting social participation and cooperation mechanisms in the process of promoting digital agriculture. First, establish agricultural cooperatives. Encourage and support the development of agricultural cooperatives, reduce costs and improve negotiation power through scale effects, so that small-scale farmers can better participate in digital agriculture. Jointly promote digital agricultural products and services to improve their voice and competitiveness in the market. Second, encourage community participation. Develop community participation plans to encourage rural communities to actively participate in the development of digital agriculture, so that digital technology can better serve grassroots farmers. The implementation of these solutions and policy recommendations requires the collaborative efforts of all parties. Cooperation between governments, businesses, social organizations, and agricultural producers will be the key to promoting equal and sustainable development of digital agriculture.

To sum up, solving the problems faced by small farmers participating in digital agriculture requires the joint efforts of the government, enterprises and all sectors of society. The government can increase policy support and provide financial support and technical training; enterprises can carry out technical support and cooperative promotion; social organizations can carry out publicity and information popularization. Only through the cooperation of all parties can we help small farmers successfully participate in digital agriculture and promote the process of agricultural modernization.

6. Conclusions

The rapid development of the digital economy, with a wide range of radiation and deep impact, promotes profound changes in social production and lifestyle. The penetration of digital economy in the field of agriculture has promoted the development of digital agriculture. Digital agriculture is a modern agriculture that uses data as a factor of agricultural production and modern

information technology to visualize, design, and manage the environment and processes of agricultural production. Small farmers are a form of business that is based on the household contract system, with the family as the basic operating organization, individual labor as the basis, and labor results belonging to the individual workers. For a long time to come, small farmers will continue to be the mainstay of agricultural production in China and the organizational foundation for the development of digital agriculture. In the era of digital economy, promoting the organic connection between small farmers and digital agriculture has become one of the important measures to promote the supply side structural reform of agriculture and the modernization of agriculture.

References

[1] Chen Xiaoling, Nie Zhiping. The dilemma and path of empty-nest smallholder farmers participating in green agricultural production under the background of rural revitalization. Contemporary Rural Finance and Economics, 2023, (12): 46-51.

[2] Dong Xinyue. Research on the Path of Connecting Small Farmers and Digital Agriculture Development in Yunnan Province in the Digital Economy Era. Shanxi Agricultural Economics, 2023, (20): 50-52.

[3] Li Yaxian, Wei Qianqing. Research on the Path of Digital Enabling Agricultural Green Development in Heilongjiang Province. Industrial Innovation Research, 2023, (19): 90-92.

[4] Li Jianjun, Xu Xiaodi, Yang Yu. Research on the Development Path of Digital Agriculture in Heilongjiang Province under the Background of Comprehensively Promoting Rural Revitalization. Northern Horticulture, 2023, (19): 150-156.

[5] Bai Jinghan, Yu Zihan. Exploring the Current Status and Countermeasures of Digital Agriculture Development in Heilongjiang Province. Northern Economic and Trade, 2023, (07): 4-7.

[6] Zhu Xinru, Pan Quanfu. Research on the Development of Digital Agriculture in Heilongjiang Province under the Background of Small Farmer Households. Modern Commerce and Industry, 2023, 44 (13): 8-10.

[7] Zeng Bo. Research on Countermeasures to Promote the Digital Transformation and Development of Agriculture in Heilongjiang Province. Business Economics, 2023, (07): 3-5.