

Development Potential and Realization Path of Low-carbon Agriculture in Jilin Province under the Target of "Double Carbon"

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Abstract: As a big agricultural province in China, Jilin Province produces a large amount of carbon emissions in the process of agricultural production. This paper mainly discusses the potential, opportunities, paths and measures of developing Low-carbon (LC) agriculture in Jilin Province under the goal of "Double Carbon" (namely, peak carbon dioxide emissions and carbon neutrality). Through the analysis of the present situation of agricultural development in Jilin Province, it is found that Jilin Province has the advantages of scale effect and long-term planning of ecological construction in developing LC agriculture, but it also faces some challenges. On this basis, a series of paths and measures to realize the growth of LC agriculture are put forward, including policy support, technology promotion and industrial upgrading. As a big agricultural province in China, Jilin Province has great potential to develop LC agriculture. By adopting advanced LC agricultural technology, agricultural production efficiency can be significantly improved and carbon emissions can be reduced. In addition, Jilin Province can also improve the added value and market competitiveness of agricultural products by developing organic agriculture and expanding agricultural industrial chain.

1. Introduction

LC agriculture refers to adopting advanced agricultural production technology, improving energy efficiency, promoting renewable energy and other ways to reduce carbon emissions in the process of agricultural production, while reducing agricultural pollution to the environment and realizing the sustainable growth of agriculture [1]. Under the goal of "Double Carbon", the growth of LC agriculture in Jilin Province is of great significance. As a big agricultural province in China, Jilin Province produces a large amount of carbon emissions during agricultural production [2]. By promoting LC agricultural technology and improving agricultural production efficiency, agricultural production can be guaranteed and carbon emissions can be effectively reduced. Under the background of globalization, the competition of agricultural production in various countries is becoming more and more fierce. By developing LC agriculture, we can reduce the cost of agricultural production, improve the quality of agricultural products and enhance the market competitiveness of agricultural products in Jilin Province [3]. With the improvement of people's living standards, consumers' demand for green, organic and healthy food is increasing. Developing LC agriculture can reduce the use of chemical fertilizers and pesticides, improve the quality and safety of agricultural products, meet consumers' demand for healthy food, and promote the sustainable growth of agriculture in Jilin Province [4].

With the increasingly severe global climate change, the goal of "Double Carbon" has become the direction of joint efforts of governments all over the world. As a major agricultural province in China, Jilin Province has abundant agricultural resources and broad space for agricultural development. How to promote the growth of LC agriculture under the goal of "Double Carbon" and realize the benign interaction between agricultural economic growth and carbon emission control has become an important issue facing Jilin Province [5]. Although Jilin Province has great potential in the growth of LC agriculture, it also faces some challenges. For example, the agricultural production mode in some areas is still relatively traditional, with backward technical level and low agricultural production efficiency; At the same time, the government's support for LC agriculture is also insufficient [6-7]. Therefore, in order to realize the growth of LC agriculture in Jilin province

under the goal of "Double Carbon", it is necessary to explore the realization path and measures. This paper will study from the following aspects: First, analyze the inevitability of developing LC agriculture in Jilin Province. Secondly, it discusses the potential and opportunities for the growth of LC agriculture in Jilin Province under the goal of "Double Carbon". Finally, the realization path and measures of LC agriculture development in Jilin province under the goal of "Double Carbon" are put forward.

2. The inevitability of developing LC agriculture in Jilin Province

2.1. Have the advantage of scale effect

As a big agricultural province in China, Jilin Province has the advantage of scale effect in developing LC agriculture. First of all, Jilin Province has vast arable land and abundant agricultural resources, which provides sufficient material basis for the growth of LC agriculture. Secondly, the agricultural industrial system in Jilin Province is relatively perfect, and the scale and specialization of agricultural production are high, which is conducive to reducing production costs and improving production efficiency. In addition, Jilin Province's agricultural science and technology innovation ability is strong, which provides strong support for the development and application of LC agricultural technology. These advantages provide a good foundation and conditions for the growth of LC agriculture in Jilin Province, and help to promote the process of agricultural modernization and achieve the goal of "Double Carbon". Figure 1 shows the environmental factors that affect the efficiency of agricultural investment.

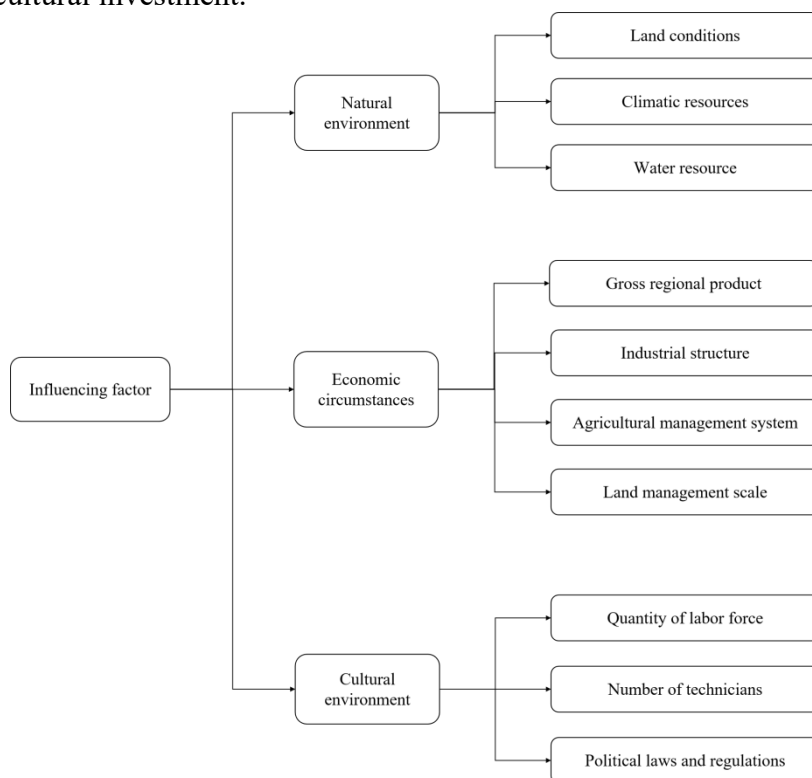


Figure 1 Environmental factors affecting the benefit of agricultural investment

2.2. Requirements of long-term planning of ecological construction

Jilin Province, as one of the old industrial bases in Northeast China, has been destroyed to some extent by the long-term industrialization process. In order to achieve sustainable development, the Jilin provincial government has put forward a long-term plan for ecological construction, emphasizing the coordination and unity of economic development and environmental protection. As an agricultural development model under the concept of environmental protection, LC agriculture is highly compatible with the requirements of long-term planning of ecological construction [8]. Developing LC agriculture can reduce the environmental pollution caused by agricultural

production, improve soil quality, improve the efficiency of water resources utilization, and promote the transformation of agriculture to a green, organic and sustainable direction. At the same time, LC agriculture can also promote the prosperity and growth of rural economy, improve farmers' income level and help rural revitalization. Therefore, developing LC agriculture is an inevitable requirement and an important measure for the long-term planning of ecological construction in Jilin Province. Table 1 describes the advantages and challenges of LC agriculture development in Jilin Province.

Table 1 Advantages and challenges of LC agriculture development in Jilin Province

Superiority	Describe
Scale effect	Jilin province, as a big agricultural province, has the scale effect advantage of developing LC agriculture.
Long-term planning of ecological construction	The growth of LC agriculture is helpful to promote ecological construction and sustainable development.
Technological innovation ability	Jilin province has a strong ability of agricultural technology innovation, which is conducive to the research and development and application of LC agricultural technology.
Perfection of agricultural industrial chain	The agricultural industrial chain in Jilin Province is relatively perfect, which is conducive to expanding the agricultural industrial chain.
challenge	
Traditional agricultural production mode	Traditional agricultural production methods have hindered the growth of LC agriculture, so it is necessary to strengthen the training and education of farmers.
Difficulty of technology popularization	Some LC agricultural technologies are difficult to popularize, so it is necessary to strengthen technology popularization and training.
Insufficient capital investment	The growth of LC agriculture needs a lot of capital investment and the support and guarantee from the government and enterprises.

3. The potential and opportunities for the growth of LC agriculture

This section will discuss the potential and opportunities for the growth of LC agriculture in Jilin Province. With the increasing global climate change and environmental problems, LC agriculture has become the trend of global agricultural development. In this context, Jilin Province has great potential and opportunities to develop LC agriculture.

3.1. Realize green and sustainable development

With consumers' attention to healthy diet and increasing demand for organic and green food, Jilin Province can seize this market trend, develop organic agriculture, and produce green, organic and healthy agricultural products to meet consumers' needs. Through the growth of organic agriculture, we can reduce the use of chemical fertilizers and pesticides, reduce carbon emissions, and realize the sustainable growth of agriculture. At the same time, the growth of organic agriculture is also in line with the current international consumption trend of green and organic food, which is conducive to improving the market competitiveness of agricultural products in Jilin Province.

3.2. Improve agricultural production efficiency

Jilin province has a strong ability of agricultural science and technology innovation and a high level of agricultural technology. In the future, Jilin Province can further utilize advanced agricultural technologies, such as intelligent agricultural technology and precision agricultural technology, to improve agricultural production efficiency, reduce production costs and reduce carbon emissions. For example, through precision agriculture technology, precise fertilization, irrigation and pesticide use can be realized, the yield and quality of crops can be improved, and at the same time, the use of chemical fertilizers and pesticides can be reduced, thus reducing

environmental pollution. In addition, advanced agricultural technology can also improve soil quality, improve soil environment, improve the disease and insect resistance of crops, and reduce the use of pesticides.

3.3. Expand agricultural industrial chain

Jilin province can expand the agricultural industrial chain, develop deep processing and value-added services of agricultural products, increase the added value of agricultural products and raise the income level of farmers. For example, high-end agricultural products such as green food and organic food can be developed to increase the market price of agricultural products; New agricultural industries such as agricultural tourism and farmhouse music can be developed to increase farmers' non-agricultural income sources; It can promote the sales model of new agricultural products such as rural e-commerce, expand the sales channels of agricultural products and improve the income level of farmers.

3.4. Government support and policy promotion

The government can introduce relevant policies to support the growth of LC agriculture. For example: formulate agricultural carbon sink policies and implementation measures; Promote agricultural science and technology innovation and technology popularization; Give LC agriculture related tax incentives, financial subsidies and other support policies; At the same time, the government can increase capital investment in the growth of LC agriculture and promote technological innovation and industrial upgrading of LC agriculture. In addition, the government can promote the growth of LC agriculture by strengthening publicity and education on LC agriculture and cultivating farmers' LC awareness.

4. Ways and measures to realize the growth of LC agriculture

This section will discuss the path and measures to realize the growth of LC agriculture in Jilin Province under the goal of "Double Carbon". In order to realize the growth of LC agriculture, Jilin Province needs to take a series of measures, including policy support, technology promotion and industrial upgrading.

4.1. Policy support

Policy support is an important means to promote the growth of LC agriculture. Jilin provincial government can issue a series of policies to support the growth of LC agriculture.

4.1.1 Formulating agricultural carbon sequestration policies and implementing measures

Jilin provincial government can formulate agricultural carbon sequestration policies, encourage farmers to adopt LC agricultural technologies and reduce carbon emissions. For example, a carbon emissions trading mechanism can be established so that farmers can get economic benefits by participating in carbon emissions trading. At the same time, the government can also formulate implementation measures to ensure that the agricultural carbon sink policy takes root.

4.1.2 Promote agricultural science and technology innovation and technology popularization

The government can increase investment in agricultural science and technology innovation, encourage enterprises and scientific research institutions to develop LC agricultural technologies, improve agricultural production efficiency and reduce carbon emissions. At the same time, the government can also spread advanced LC agricultural technology to the vast rural areas through technology promotion to improve farmers' LC awareness and technical level.

4.2. Technology promotion and industrial upgrading

Technology popularization and industrial upgrading are key measures to promote the growth of LC agriculture. Jilin Province can take a series of measures, including promoting renewable energy technology and strengthening the utilization of waste resources to promote the growth of LC

agriculture.

4.2.1 Promote renewable energy technology

Jilin Province can popularize renewable energy technologies, such as solar energy and wind energy, so as to improve energy efficiency and reduce carbon emissions in agricultural production. For example, solar power generation technology can be popularized in rural areas, and solar energy resources can be used to provide electricity for agricultural production and reduce dependence on fossil fuels.

4.2.2 Strengthen the resource utilization of waste

Jilin Province can strengthen the resource utilization of agricultural wastes and reduce environmental pollution and carbon emissions. For example, waste resource utilization projects such as biogas engineering and organic fertilizer manufacturing can be built to turn agricultural waste into usable resources. In addition, it can also strengthen the comprehensive utilization of livestock manure, convert it into organic fertilizer and other resources, reduce the use of fertilizers and pesticides, and reduce carbon emissions.

5. Conclusions

Under the goal of "Double Carbon", the growth of LC agriculture in Jilin Province has far-reaching significance. This paper discusses the potential and opportunities for the growth of LC agriculture in Jilin Province, and puts forward the paths and measures to realize the growth of LC agriculture, aiming at providing reference for the sustainable growth of agriculture in Jilin Province. By adopting advanced LC agricultural technology, improving agricultural production efficiency, reducing carbon emissions in agricultural production process and strengthening the resource utilization of agricultural wastes, the benign interaction between agricultural economic growth and carbon emission control can be realized. Through the implementation of policy support, technology promotion and industrial upgrading, the potential of LC agriculture development can be further tapped. For example, the government can introduce relevant policies to encourage farmers to adopt LC agricultural technologies, improve agricultural production efficiency, reduce carbon emissions, and improve consumers' awareness and acceptance of LC agricultural products. The path and measures to realize the growth of LC agriculture need the joint efforts of all parties. The government needs to introduce relevant policies to strengthen technology promotion and industrial upgrading; Enterprises need to actively participate in the growth of LC agriculture and provide technical and financial support; Farmers need to actively adopt LC agricultural technology to improve agricultural production efficiency.

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