

Digital Economy Enables Low-Carbon Agricultural Development in Liaoning Province under the "Double Carbon" Goal

Xiaodong Xu^{1, a} Nan Huang^{1, b} Shuo Wang^{1, c}

¹School of Management, Dalian Polytechnic University Dalian, Liaoning 116034

^agjmy2046@sina.com, ^b948346374@qq.com, ^c2826224522@qq.com

Abstract: This paper takes the agricultural in Liaoning Province as the research object, and combs through the current development status of digital economy and agricultural carbon emission in Liaoning Province, in which the problems of unsound policy system related to agricultural low-carbon development, the difficulty of small-scale cultivation in realizing the comprehensive promotion of carbon emission reduction, and the insufficient support of agricultural financial services limit the agricultural low-carbon development, and puts forward suggestions on this basis.

Keywords: carbon peaking and carbon neutrality; digital economy; agricultural carbon reduction; low-carbon agriculture

1. Introduction

Three views on the carbon reduction role of digital economy have been held in the literature: first, Haiying Pan et al. (2023) [1], Gangqiang Yang et al. (2023) [2], Xin Du (2023) [3], and Nanbo Li (2023) [4] all argue that the digital economy can contribute to carbon reduction. Second, Salahuddin and Alam (2015) [5] argue that the development of digital economy digital economy will increase carbon emissions. Third, Fei Wei et al. (2022) [6], Jin Fei et al. (2022) [7] and Hu Liusuo et al. (2023) [8] believe that there is a significant inverted U-shape relationship between carbon emissions and digital economy.

2. Status of Digital Economy Development in Liaoning Province

2.1 Digital financial inclusion has come a long way

According to statistics, the Digital Financial Inclusion Index of Liaoning Province has increased from 43.290 in 2011 to 357.235 in 2021, maintaining an overall upward trend.

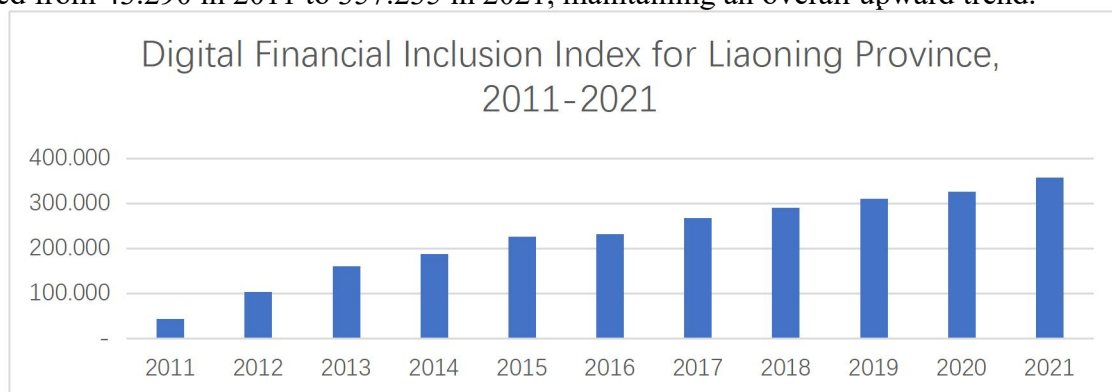


Figure 1 Digital Financial Inclusion Index for Liaoning Province 2011-2021

2.2 Steady increase in digital industrialization capacity

First, as of 2023, Liaoning Province has focused on cultivating 87 industrial Internet platforms, injecting the advantages of digital technology into traditional industries. Second, as of 2023, with the support of the provincial government, Dandong City has built the Yalu River Future Laboratory based on digital technology and put it into trial operation.

2.3 Significant achievements in industrial digitization

First, the environment for industrial development has been effectively improved. As of 2020, the provincial government has set up a special fund of 2 billion yuan to encourage and support the development of industrial Internet. Second, digital technology has promoted the gradual improvement of new infrastructure. As of 2023, Liaoning Province has built 81,000 5G base stations, powering the construction of smart cities in Liaoning Province.

3. Current status of low-carbon development in Liaoning agriculture

3.1 Agro-ecological development is in a better position

First, the Liaoning provincial government has reduced the use of agricultural chemicals by adhering to the requirements of "high yield, high quality, economy and environmental protection". Secondly, through the toilet revolution, the penetration rate of rural toilets in Liaoning Province has reached 85%. Besides, as of September 2023, the total number of effective green food enterprises in Liaoning Province has reached 596, with 1,078 products.

3.2 Government Policies Enabling Green Development

The Liaoning Provincial Carbon Peak Implementation Program released in September 2022 provides strategic support for the province's carbon reduction efforts. At the same time, Liaoning Province has accelerated the improvement of talent introduction policies to provide technical support for green agriculture by creating a team of talents with green technologies.

3.3 Carbon emissions from agriculture declining year by year

The data show that carbon emissions in Liaoning province decreased from 3.16 million tons in 2011 to 2.84 million tons in 2020, and despite the increase in carbon emissions in 2014 and 2015, it still shows a downward trend as a whole.

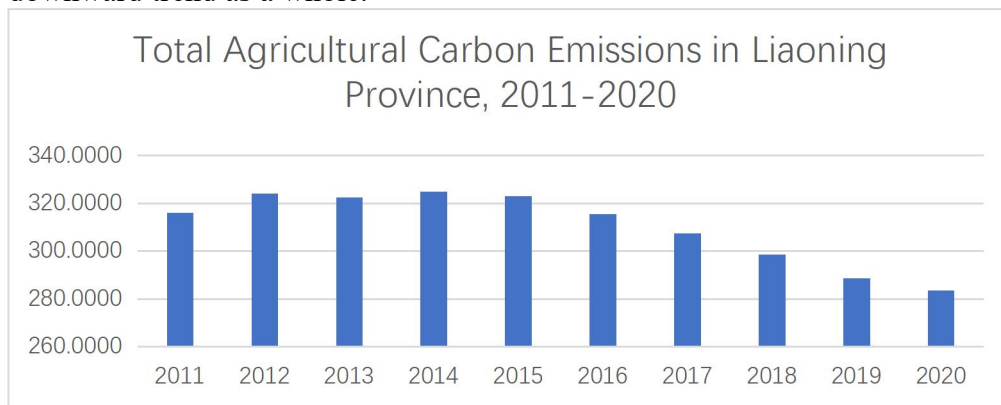


Figure 2 Carbon Emissions from Agriculture in Liaoning Province 2011-2020

3.4 The digital economy has yet to play a full role in reducing carbon emissions in agriculture

First, existing studies have not included the digital economy in the perspective of agricultural carbon reduction. Second, the digital economy is still in the exploratory stage of development. Third, although China began to pay attention to carbon emission reduction at a very early stage, it is difficult to fully develop the digital economy in a short period of time because the "dual-carbon" goal is proposed in 2020.

4. Problems in the development of low-carbon agriculture in Liaoning Province

4.1 Inadequate policy regimes related to low-carbon development in agriculture

First, the relevant low-carbon agricultural system in Liaoning Province lacks operability and the relevant policy standards are not standardized. Second, the evaluation criteria for green agricultural products are not clear enough. Finally, the technologies adopted in Liaoning Province are constrained by many factors, such as the R&D team, which makes it difficult to promote the application and dissemination of low-carbon agricultural technologies.

4.2 Difficulty in realizing full-scale carbon reduction with small-scale cultivation

Smallholder farmers are the mainstay of agricultural operations, but at present it is difficult for them to take on the relevant responsibilities, mainly for the following reasons: first, rural areas are in more remote areas, making it difficult to convey information effectively. Secondly, the overall low quality and learning ability of farmers poses a challenge to carbon reduction efforts.

4.3 Inadequate support for agricultural financial services

First, the variety of agricultural financial products is small, which makes it difficult to support the development of agricultural production technology. Second, the financial service policy system in Liaoning Province is not perfect. Financial organizations such as rural credit unions are small in scale and insufficient to promote the development of green agriculture.

5. 4 Countermeasures for the development of low-carbon agriculture

5.1 Promote digital government to empower agricultural carbon reduction with digital governance

The Government of Liaoning Province should actively follow the trend of digital development and accelerate the integration of digital technology with agriculture. The agricultural production process can be supervised by means of ground monitoring and high-definition remote sensing of impacts, thereby regulating the use of agricultural chemicals and promoting scientific carbon reduction in agriculture.

5.2 Building a digital teaching platform to improve the overall quality of farmers

Liaoning Province can introduce a digital teaching platform to create a curriculum for agricultural production. In addition to this, digital learning incentive policies are formulated to address the problem of farmers' low motivation to participate in the courses. For example, a subsidy of 100 yuan per mu of land will be given to farmers who seriously study the whole course, as a way to increase farmers' participation.

5.3 Accelerating and improving the financing system for green agricultural development

First, financial support for green agriculture should be increased and credit channels should be actively expanded. Second, relevant rural banks can develop agricultural technology credit products as a way to promote progress in agricultural green technology innovation. Third, green finance is encouraged to open reform pilot zones to accumulate experience in building a province-wide green financial system.

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