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Study on the Willingness and Influencing Factors of Farmers to Adopt Low-Carbon Production Technologies under the Dual Carbon Goal

-- Anhui Province as an Example

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Abstract

Taking Anhui Province as an example, this paper studies the willingness of farmers to adopt low-carbon production technology under the "dual carbon" goal and its influencing factors. With the increasingly severe global climate change problem, my country proposed the "dual carbon" goal at the 75th United Nations General Assembly. Agriculture is an important part of the economic system, and its carbon emissions cannot be ignored. As an important agricultural province in my country, Anhui Province is of great significance in exploring the application of agricultural low-carbon technology. This paper first reviews the current research status of farmers' low-carbon production behavior and willingness in China and abroad, and then collects data from 980 farmers in Anhui Province through questionnaire surveys and field surveys. Based on the improved UTAUT model, a multi-factor logistics regression model was constructed to quantitatively analyze the key factors affecting farmers' adoption of low-carbon production technology. The results show that farmers' personal characteristics (such as gender, age, education level, health status and credit status), agricultural production factors (such as planting area, income level and health status), government factors (such as policy support, technology promotion and financial support) and social environment factors (such as environmental concern and skill learning ability) all have a significant impact on farmers' willingness to adopt low-carbon production technology. Based on this, this paper puts forward policy recommendations to promote the promotion and application of low-carbon agricultural technologies in rural areas of Anhui Province, including increasing financial subsidies, organizing technical training, helping market development and strengthening social publicity.

Keywords

"Dual Carbon" Goals; Low-Carbon Production Technology; Farmers' Willingness; Influencing Factors.

1. Introduction

1.1. Background and Purpose of the Study

With the rapid development of the global economy and the sharp increase in population, the emission of greenhouse gases such as carbon dioxide continues to rise, leading to increasingly serious global climate change issues. The destruction of the earth's ozone layer and the frequent occurrence of extreme climate events have posed a major threat to the natural environment on which human beings depend for survival, and have seriously affected human health and safety. To this end, my country proposed the "dual carbon" goal at the 75th United Nations General

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Assembly, that is, to strive to reach the peak of national carbon dioxide emissions before 2030 and strive to achieve the goal of carbon neutrality before 2060. Agriculture, as an important part of China's economic system, is often regarded as a passive recipient of climate change when discussing its relationship with climate change. However, the development of things is two-way, and inertial thinking makes us rarely consider the impact of agricultural production on climate change. The report "The Road to Agricultural Carbon Neutrality" shows that the total greenhouse gas emissions in agricultural and forestry production activities account for about 17% of the global total emissions.

At each stage of agricultural production, whether it is early preparation, mid-term management or late harvest and processing, there will be a certain degree of carbon emissions. Specifically, these emissions come from multiple aspects: first, the carbon emissions generated by planting crops themselves; second, the carbon footprint of agricultural films during production, use and waste disposal; third, the production and manufacturing of agricultural inputs such as fertilizers and pesticides will also release carbon; in addition, agricultural machinery and transportation tools used in agricultural production, as well as the subsequent processing and circulation of agricultural products, will also produce corresponding carbon emissions.

At present, the research trend in the global agricultural field clearly points to the application and development of low-carbon agricultural technologies. Many scholars at home and abroad have conducted in-depth and extensive discussions on this. It is worth noting that a policy brief issued by the Food and Agriculture Organization of the United Nations on the eve of the Copenhagen Conference pointed out that developing countries have up to 70% of emission reduction potential in the agricultural field.

Anhui Province is an important agricultural province in my country and one of the five provinces with the largest net grain output in the country. In 2023, Anhui's total grain output will reach 83.02 billion jin, achieving "twenty consecutive bumper harvests". At present, the protected areas of cultivated land and permanent basic farmland in Anhui Province are not less than 81.15 million mu and 71.4356 million mu respectively, ensuring that the grain planting area is more than 100 million mu, and the planting area of regenerated rice has grown from less than 20,000 mu in 2012 to more than 2.2 million mu in 2024. As an important birthplace of rural reform, it has a profound historical heritage and rich practical experience in agricultural and rural development. Although Anhui Province has broad development prospects for agricultural low-carbon technology, the current research on farmers' adoption behavior, willingness and the influencing factors behind agricultural low-carbon production technology is still relatively limited. Based on this, this paper aims to solve the unreasonable and irregular production behaviors in the current agricultural production process in Anhui Province and promote the benefits of adopting green and low-carbon production technologies. By further exploring the behavioral patterns and influencing factors of farmers in adopting low-carbon production technologies, this paper provides a scientific basis for the government to formulate more precise and effective policy measures, thereby guiding farmers to actively adopt low-carbon production technologies, promoting the sustainable development of agriculture in Anhui Province and even the whole country, and providing reference experience for the low-carbon development of agriculture in other parts of the country.

This study intends to collect agricultural production information of farmers in Anhui Province under the "dual carbon" goals through surveys. Starting from the farmers' willingness to adopt low-carbon production technologies and the factors involved in carbon emissions in the farmers' agricultural production process, this study uses relevant scientific models to identify and quantify the five key factors that affect farmers' adoption of low-carbon production technologies. This study explores how to promote the promotion and application of agricultural low-carbon technologies in rural areas, and finally puts forward strategies for the further development of agricultural low-carbon production technologies in Anhui Province.

1.2. Literature Review

Under the background of the "dual carbon" goal, the study of farmers' adoption of low-carbon production behavior has become the focus of academic attention. Domestic and foreign scholars have conducted in-depth discussions on the motivation, influencing factors and implementation effects of farmers' adoption of low-carbon production behavior from different angles and levels. Based on the extended theory of planned behavior (TPB) model, Hou and Hou (2019) conducted an in-depth survey of 442 rice farmers in Jiangsu Province, China, and revealed the significant influence of factors such as attitude, subjective norm, perceived behavioral control and participation in contract farming on farmers' low-carbon production willingness and behavior [1]. They found that the more positive the farmers' attitude towards low-carbon agriculture, the stronger their subjective norm, the higher their perceived behavioral control, and the deeper their participation in contract farming, the stronger their willingness to adopt low-carbon production behavior. Zheng et al. (2022) used survey data from 688 farmers in Jiangsu Province and combined with social embeddedness theory to further analyze the role of government support, farmers' cognition, social capital and other factors in farmers' adoption of low-carbon agricultural technology [2]. They pointed out that effective government support, farmers' correct cognition of low-carbon agricultural technology and abundant social capital can significantly promote farmers' adoption of low-carbon agricultural technology.

With the rapid development of digital technology, its application in the agricultural field is becoming increasingly widespread. The research of Huang et al. (2022) shows that the application of digital technology has a significant positive impact on farmers' low-carbon production behavior. They found that the application of digital technology can not only improve agricultural production efficiency, but also indirectly promote farmers' adoption of low-carbon production behavior by affecting their risk perception [3]. This finding provides new ideas and methods for promoting the green and low-carbon transformation of agriculture. In terms of the relationship between farmers' livelihoods, technological constraints and low-carbon agricultural technology choices, Zhao and Zhou (2021) constructed a theoretical model of farmers' technology choices considering capital constraints and conducted empirical tests using micro-survey data of farmers in Jiangsu Province. They found that there were significant differences among different types of farmers in choosing low-carbon agricultural technologies, which mainly depended on their livelihood conditions and technological constraints [4]. This study provides a scientific basis for formulating differentiated agricultural carbon emission reduction policies. In addition to the above studies, some scholars have conducted in-depth research on farmers' low-carbon production behavior from the perspective of specific regions or specific crops. For example, Sun Jie (2023) conducted an empirical analysis of the green production behavior of watermelon growers in Changle County, revealing the various factors that affect farmers' green production behavior[5]. Jing Hanjiao (2019) conducted an in-depth study on the low-carbon production behavior of rice growers in Jingzhou City, Hubei Province based on the perspective of family endowment, and put forward corresponding policy recommendations[6].

Farmers' willingness to adopt low-carbon production technologies is a complex process that is influenced by many factors. Domestic and foreign scholars have conducted extensive and in-depth research on this issue, focusing on aspects such as farmers' own characteristics, agricultural production conditions, government policies, and social environmental factors. In terms of farmers' own characteristics, factors such as gender, age, and education level are generally considered to have a significant impact on farmers' willingness to adopt low-carbon production technologies. Some studies have found that male farmers may be more inclined to adopt new technologies because they usually have stronger adventurous spirit and innovation ability. However, some studies have pointed out that older farmers may have a lower degree of

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acceptance of new technologies due to habits and traditions. Farmers with higher education levels are more likely to understand and accept the value and significance of low-carbon production technologies because they usually have stronger learning and information acquisition abilities, and are therefore more inclined to adopt these technologies. Agricultural production conditions are also one of the important factors affecting farmers' willingness to adopt low-carbon production technologies. Farmers with large planting areas and high income levels may be more capable and willing to adopt new technologies to improve production efficiency and quality. This is because they usually have more resources and funds to invest in the research and development and application of new technologies [7]-[10]. (Huang et al., 2022) found that farmers in good health may be more able to withstand the risks and uncertainties brought about by the application of new technologies because they usually have stronger physical fitness and stress resistance. Xie et al. (2022) found that government policies play a vital role in promoting farmers to adopt low-carbon production technologies. Policy measures such as policy support, technology promotion and financial support can significantly reduce the cost and risk of farmers adopting new technologies and increase their willingness and enthusiasm for adoption [11]. For example, the government can encourage farmers to adopt low-carbon production technologies by providing technical training, financial subsidies and tax incentives (such as Hou and Hou, 2019). These policies can not only help farmers better understand and master new technologies, but also reduce their economic burden of applying new technologies. Social environmental factors also have a significant impact on farmers' willingness to adopt low-carbon production technologies. Social environmental factors such as environmental concern and skill learning ability have an important impact on farmers' adoption decisions. Wu and Zhang (2020) found that farmers with high environmental concern may be more inclined to adopt low-carbon production technologies to reduce negative impacts on the environment because they usually have stronger environmental awareness and social responsibility [12]. Farmers with strong skill learning ability may find it easier to master and apply new technologies (e.g. Zheng et al., 2022) because they usually have stronger learning ability and practical experience. Liu and Zheng (2021) found that social networks and neighborhood effects may also indirectly affect farmers' adoption decisions by affecting their information acquisition and communication methods. For example, communication and cooperation between farmers can promote the dissemination and application of new technologies, thereby increasing farmers' willingness and enthusiasm to adopt low-carbon production technologies. Social networks and neighborhood effects may also indirectly affect farmers' adoption decisions by affecting their information acquisition and communication methods. For example, communication and cooperation between farmers can promote the dissemination and application of new technologies, thereby increasing farmers' willingness and enthusiasm to adopt low-carbon production technologies[13]

In recent years, as the global climate change problem becomes increasingly serious, the development status of green and low-carbon agriculture as an important way to cope with climate change and achieve sustainable agricultural development has received widespread attention. Domestic and foreign scholars have conducted in-depth and comprehensive research on the development of green and low-carbon agriculture and achieved fruitful results. In China, the development of green and low-carbon agriculture has made significant progress. In China, Gao Ming and Zhang Zhexi (2022) pointed out that my country has made significant progress in the development of green and low-carbon agriculture, but it still faces key issues such as great pressure on the quantity and quality of cultivated land, the need to strengthen the reduction and efficiency of factors, the need to release the potential for scientific and technological innovation, the need to transform production and operation methods, and the urgent need to improve relevant institutional norms [14]. Wang Xueting and Zhang Junbiao (2022) further elaborated on the basic path of green and low-carbon development of agriculture, including strengthening the conservation and utilization of agricultural resources, improving resource utilization efficiency, increasing the comprehensive treatment of agricultural non-point source pollution, and cultivating and expanding the agricultural green and low-carbon industry [15]. Internationally, the development of green and low-carbon agriculture is also booming. The report of the United Nations Intergovernmental Panel on Climate Change (IPCC) emphasizes that greenhouse gas emissions from land use sectors such as agriculture and forestry account for about 1/4 of net anthropogenic greenhouse gas emissions and are important sources of greenhouse gas emissions [16]. Therefore, promoting green and low-carbon development in the agricultural sector is of great significance to achieving the global carbon neutrality goal. Governments and international organizations have introduced relevant policies to encourage and support the research and development and promotion of green and low-carbon agricultural technologies to promote the sustainable development of agriculture.

From the perspective of research content, research on the current development status of green and low-carbon agriculture mainly focuses on the following aspects: First, the accounting and evaluation of agricultural carbon emissions, including the measurement of carbon emissions in different agricultural production links, carbon emission trend analysis and discussion of influencing factors; Second, the research and development and promotion of green and low-carbon agricultural technologies, such as low-carbon planting technology, breeding technology, waste resource utilization technology, etc. The research and application of these technologies are of great significance to reducing agricultural carbon emissions and improving agricultural production efficiency; Third, policy and institutional innovation for green and low-carbon development of agriculture, such as the construction of carbon trading markets, agricultural subsidy policies, carbon tax policies, etc. The formulation and implementation of these policies and systems provide strong guarantees for the development of green and low-carbon agriculture.

In promoting the development of green and low-carbon agriculture, the Chinese government has formulated a series of policies and systems, which have had a profound impact on farmers' low-carbon production behavior. Policy support and financial subsidies are important means to encourage farmers to adopt low-carbon production technologies. The government has reduced the cost and risk of farmers adopting new technologies and increased their willingness and enthusiasm for adoption by providing technical training, financial subsidies, tax incentives and other measures. For example, Cao Yuqi (2023) found in his study on the influencing factors of farmers' low-carbon production behavior in Santai County, Sichuan Province that government subsidies had a significant positive impact on farmers' low-carbon production behavior [17]. Chang Xiaoyao (2019) found in his study that formal lending can effectively promote the increase of agricultural income, the reduction of agricultural carbon emissions and the improvement of agricultural carbon economic efficiency, while the impact of private lending is not significant. This shows that the government can effectively promote farmers' adoption of low-carbon production technologies by providing financial support to farmers through formal lending channels [18]. The government can also demonstrate the actual effects and economic benefits of low-carbon production technologies to farmers by establishing low-carbon agricultural technology demonstration areas, and further stimulate their willingness to adopt them. Policy publicity and education guidance are also important ways to promote low-carbon production among farmers. The government can improve farmers' awareness and acceptance of low-carbon production technology by strengthening the publicity and promotion of low-carbon agricultural technology. For example, the government can organize experts and scholars to conduct low-carbon agricultural technology lectures and training activities in rural areas to popularize the knowledge and operation methods of low-carbon production technology to farmers. In addition, the government can also expand the influence of low-carbon agricultural

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technology through media publicity, network communication and other means, and create a good atmosphere for the whole society to pay attention to and support the development of green and low-carbon agriculture. Policies and systems can also indirectly promote farmers' low-carbon production behavior by influencing their social networks and neighborhood effects. Pan Hesi and Lan Xiting (2024) found that social trust cognition and social responsibility cognition can significantly and positively affect farmers' adoption willingness when studying the impact of farmers' multi-dimensional cognition on their willingness to adopt low-carbon production technology, while policy promotion plays a moderating role in these cognitions [19]. This shows that the government can shape farmers' social cognition and behavioral norms by formulating and implementing relevant policies and systems, thereby promoting their low-carbon production behavior. For example, the government can encourage farmers to participate in low-carbon agricultural cooperatives and other organizational forms to reduce low-carbon production costs and improve production efficiency through collective action, and in the process create a good atmosphere of mutual learning and mutual assistance.

2. An empirical Analysis of Farmers' Willingness to Adopt Low-carbon Production Technologies and Influencing Factors

2.1. Multivariate Logistic Regression Analysis and UTAUT Model

In the empirical analysis stage, in order to further explore the factors affecting farmers' willingness to adopt low-carbon production technologies, this study constructed a multivariate logistics regression model. The specific formula of the model is:

$$\log it(P) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$$

Table 1. Model variables

Variable representation	Variable Name	Variable Assignment
Y	Current agricultural low-carbon production technology behaviors adopted	0 = None; The number of low-carbon agricultural production methods used (reducing the use of chemical fertilizers, pesticides, and agricultural films; soil testing and formula fertilization; using biological pesticides; returning straw to the field; water-saving irrigation, etc.) is accumulated based on 0.
X_1	gender	0 = female; 1 = male
X_2	age	0 = 19 years old and below; 1 = 20-29 years old; 2 = 30-39 years old; 3 = 40-49 years old; 4 = 50 years old and above
X_3	Education	0 = high school and below; 1 = junior college students; 2 = undergraduate students; 3 = postgraduate students and above
X_4	Planting area	Specific amount (mu)
X_5	Total income level	Specific amount (RMB)
X_6	Health status	(1 = Loss of ability to work; 2 = Poor; 3 = Fair; 4 = Good; 5 = Excellent)
X_7	Credit situation	1=yes; 0=no
X_8	Environmental Concern	1 = follow; 2 = don't follow
X_9	Skill learning ability	1 = very good; 2 = good; 3 = average; 4 = poor; 5 = very poor

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Among them, P represents the probability of farmers adopting low-carbon production technology, β0 is a constant term, β1 to βnare the regression coefficients of their respective variables, and X1 to Xn represent different independent variables. These independent variables cover multiple dimensions such as farmers' personal characteristics (age, gender, household registration, etc.), agricultural production conditions (planting area, income level, etc.), government policies (credit lending) and social environment (environmental awareness, etc.). The specific table is as follows:

Table2 shows the descriptive statistics of continuous variables. It can be seen that the mean of the explained variable low-carbon behavior (lowc) is 1.871, the standard deviation is 1.391, the maximum and minimum values are 7 and 0 respectively, and there are large differences between individuals in carpet behavior; the explanatory variable age (age) has a mean of 57.620 and a standard deviation of 11.290. Overall, the respondents fluctuate between 23 and 85; the educational level (edu) has a mean of 5.480 and a standard deviation of 3.686. The minimum and maximum values are The maximum values are 0 and 18 respectively; the mean of total planted area (tpa) is -0.453, the standard deviation is 1.334, the minimum and maximum values are -2.808 and 3.694 respectively; the mean of income index (income) is 8.951, the standard deviation is 1.682, the minimum and maximum values are 5.927 and 13.570 respectively; the mean of distance from the county seat (dist) is 3.047, the standard deviation is 0.641, the minimum and maximum values are 0 and 4.317 respectively.

Table 2. Descriptive statistics

variable	Mean	Standard Deviation	Minimum	Maximum
lowc	1.871	1.391	0.000	7.000
age	57.620	11.290	23.000	85.000
edu	5.480	3.686	0.000	18.000
tpa	-0.453	1.334	-2.808	3.694
income	8.951	1.682	5.927	13.570
dist	3.047	0.641	0.000	4.317

The UTAUT model is a comprehensive technology acceptance model that covers four core dimensions that affect individual acceptance and use of technology: performance expectations, effort expectations, social influences, and enabling factors. On this basis, combined with the characteristics of farmers' low-carbon production technology, this paper further refines and expands the model to comprehensively analyze farmers' willingness to adopt low-carbon production technology and its influencing factors. In the constructed model, performance expectations reflect farmers' expectations of the economic and ecological benefits brought by low-carbon production technology; effort expectations reflect farmers' subjective feelings about the difficulty of learning and using low-carbon production technology; social influences include the influence of farmers' attitudes towards low-carbon production technology by people around them (such as relatives, friends, neighbors, etc.); enabling factors refer to the various resources and conditions required for farmers to adopt low-carbon production technology, such as policy support and technical training.

2.2. Research Assumptions

2.2.1. Personal Characteristics of Farmers

Gender (X1): It is assumed that there are differences in the willingness of male and female farmers to adopt low-carbon production technologies; Age (X2): It is assumed that older farmers may have a lower degree of acceptance of new technologies due to habits and traditional factors; Education level (X3): It is assumed that farmers with higher education levels

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are more likely to understand and accept low-carbon production technologies. Specific assumptions: β1 and β2 are negative, and β3 is positive.

2.2.2. Agricultural Production Factors

Planting area (X4): It is assumed that farmers with larger planting areas are more motivated to adopt new technologies to improve production efficiency; income level (X5): It is assumed that farmers with higher income levels are more able to bear the cost of adopting new technologies; health status (X6): It is assumed that farmers with good health are more capable and energetic to learn and apply new technologies; credit status (X7): It is assumed that farmers with good credit status are more likely to obtain financial support to implement low-carbon production technologies. Specific assumptions: β4, β5, β6 and β7 are positive.

2.2.3. Social Environmental Factors

Environmental concern (X8): It is assumed that farmers with high environmental concern are more inclined to adopt low-carbon production technologies. Skill learning ability (X9): It is assumed that farmers with strong skill learning ability are more likely to master and apply new technologies. Specific assumptions: β8 and β9 are positive.

3. Model Estimation

3.1. Correlation Analysis

Table 3 shows the calculation results of the correlation coefficients between the variables, among which low-carbon behavior has a significant positive correlation with education level, health level, planting area, income level, credit borrowing, and skill learning ability at the 10% level, and has a significant negative correlation with household registration, age and environmental concern at least at the 5% level.

Table 3. Correlation analysis

	lowc	gender	age	edu	hukou	health	tpa	income	debt	dist	env	skill
lowc	1											
gender	0.0360	1										
age	-0.116*	-0.00200	1									
edu	0.258***	0.206***	-0.389***	1								
hukou	-0.147**	-0.106	0.0770	-0.166**	1							
health	0.153**	0.0610	-0.283***	0.293***	0.0310	1						
tpa	0.150**	0.139**	-0.341***	0.170**	-0.0780	0.126*	1					
income	0.126*	0.146**	-0.386***	0.202***	-0.0440	0.176**	0.909***	1				
debt	0.199***	0.0340	-0.293***	0.179**	-0.0530	0.00500	0.291***	0.306***	1			
dist	0.0210	-0.0300	0.0780	-0.00500	0.101	-0.118*	0.0240	-0.00500	0.119*	1		
env	-0.361***	-0.0420	0.172**	-0.353***	-0.0310	-0.279***	-0.157**	-0.190***	-0.112	-0.0660	1	
skill	0.324***	-0.00300	-0.205***	0.301***	-0.0740	0.324***	0.197***	0.187***	0.0980	0.0560	-0.433***	1

3.2. Variance Inflation Factor Test

In order to avoid possible col-linearity problems, this paper further calculates the variance inflation factor (VIF) of each indicator to discuss it, and the specific results are shown in Table 4. It can be seen that the VIF statistical values of each variable are less than 10, and there is no serious col-linearity problem.

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Table 4. Collinearity test

	VIF	1/VIF
income	6.184	.162
tpa	5.922	.169
edu	1.463	.683
age	1.456	.687
skill	1.373	.728
env	1.371	.729
health	1.284	.779
debt	1.194	.838
gender	1.092	.916
hukou	1.079	.927
dist	1.07	.934
Mean_VIF	2.135	

3.3. Regression Results

Table 5 shows the results of the baseline regression, where (1) is the first regression result. It can be seen that the likelihood ratio is significant at the 1% level, and the model fitting effect is acceptable; (2) is listed as the model fitting degree is still high after removing the less significant variables, so this paper will analyze the results after removing irrelevant variables. It can be seen that the household registration variable coefficient is -1.125, which is significant at the 10% level, that is, agricultural households have lower low-carbon behavior; the credit loan index coefficient is 0.775, which is significant at the 1% level, that is, farmers with credit loans have higher low-carbon behavior; the environmental concern variable coefficient is -1.272, which is significant at the 1% level, that is, farmers with lower environmental concern have lower low-carbon behavior; the skill learning ability index coefficient is 0.385, which is significant at the 5% level, that is, farmers with higher skill learning ability have higher low-carbon behavior.

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Table 5. Benchmark regression

	(1)	(2)
VARIABLES	lowc	lowc
gender	-0.027	
	(0.326)	
age	0.013	0.013
	(0.013)	(0.012)
edu	0.050	0.050
	(0.044)	(0.042)
hukou	-1.056	-1.125*
	(0.688)	(0.674)
health	0.090	
	(0.152)	
tpa	0.306	
	(0.237)	
income	-0.261	
	(0.193)	
debt	0.848***	0.775***
	(0.294)	(0.280)
env	-1.276***	-1.272***
	(0.335)	(0.334)
skill	0.365**	0.385**
	(0.167)	(0.159)
dist	-0.063	
	(0.201)	
/cut1	-4.391*	-2.055
	(2.446)	(1.395)
/cut2	-2.757	-0.427
	(2.439)	(1.388)
/cut3	-1.426	0.896
	(2.439)	(1.399)
/cut4	-0.419	1.888
	(2.435)	(1.403)
/cut5	1.668	3.948***
	(2.449)	(1.450)
/cut6	2.621	4.902***
	(2.506)	(1.548)
/cut7	3.326	5.609***
	(2.604)	(1.701)
Log likelihood	-311.15***	-312.28***
Observations	204	204
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

3.4. Analysis of Influencing Factors

3.4.1. Farmers-Own Factors

Farmers' own factors are one of the important factors affecting their willingness to adopt low-carbon production technologies. Personal characteristics such as gender, age and education level have a significant impact on farmers' cognition and ability to accept new things. For

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example, farmers with higher education levels may be more likely to understand the value and significance of low-carbon production technologies and thus be more inclined to adopt these technologies. In addition, health status and credit status may also affect farmers' adoption decisions. Farmers in good health may have more ability and energy to learn and apply new technologies, while farmers with good credit status may be more likely to obtain financial support to implement low-carbon production technologies.

3.4.2. Agricultural Production Factors

Agricultural production factors are direct factors affecting farmers' willingness to adopt low-carbon production technologies. Agricultural production conditions such as planting area, income level and health status have a significant impact on farmers' adoption behavior. Farmers with large planting areas and high income levels may be more capable and willing to adopt new technologies to improve production efficiency and quality. At the same time, farmers in good health may be more able to withstand the risks and uncertainties brought about by the application of new technologies. In addition, credit conditions may also indirectly affect farmers' adoption decisions by affecting their ability to obtain funds.

3.4.3. Government Factors

Government factors play an important role in promoting farmers to adopt low-carbon production technologies. Policy measures such as policy support, technology promotion and financial support can significantly reduce the cost and risk of farmers adopting new technologies and increase their willingness and enthusiasm for adoption. For example, the government can encourage farmers to adopt low-carbon production technologies by providing technical training, financial subsidies and tax incentives. The implementation effect of these policy measures will directly affect farmers' adoption behavior and the effectiveness of technology promotion.

3.4.4. Social Environmental Factors

Social environmental factors are also one of the important factors affecting farmers' willingness to adopt low-carbon production technologies. Social environmental factors such as environmental concern and skill learning ability have a significant impact on farmers' adoption decisions. Farmers with high environmental concern may be more inclined to adopt low-carbon production technologies to reduce the negative impact on the environment, while farmers with strong skill learning ability may be more likely to master and apply new technologies. In addition, social networks and neighborhood effects may also indirectly affect farmers' adoption decisions by affecting their information acquisition and communication methods. Therefore, in the process of promoting the adoption of low-carbon production technologies, we should focus on creating a good social atmosphere and providing necessary learning support.

4. Conclusion and Recommendations

4.1. Research Conclusions

This study found that farmers' willingness to adopt low-carbon production technologies is affected by many factors. Gender, age, education level, health status and credit status significantly affect farmers' willingness to adopt low-carbon production technologies. Specifically, farmers with higher education levels are more likely to understand and accept low-carbon production technologies; farmers with good health status are more capable and energetic to learn and apply new technologies; and farmers with good credit status are more likely to obtain financial support to implement low-carbon production technologies. Agricultural production conditions such as planting area, income level and health status have a direct impact on farmers' willingness to adopt low-carbon production technologies. Farmers with large planting areas and high income levels are more capable and willing to adopt new

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technologies to improve production efficiency and quality. Policy measures such as policy support, technology promotion and financial support can significantly reduce the cost and risk of farmers adopting new technologies and increase their willingness and enthusiasm to adopt them. For example, technical training and financial subsidies provided by the government have a significant positive impact on farmers' adoption of low-carbon production technologies. Social environmental factors such as environmental concern and skill learning ability have a significant impact on farmers' willingness to adopt low-carbon production technologies. Farmers with high environmental concerns are more inclined to adopt low-carbon production technologies to reduce negative impacts on the environment; farmers with strong skill learning ability are more likely to master and apply new technologies.

4.2. Policy Recommendations

4.2.1. Policy Expenditure

The government should increase financial subsidies for farmers to adopt low-carbon production technologies and reduce the economic costs of farmers adopting new technologies. A special fund for the promotion of agricultural low-carbon production technologies should be established to support the research and development, demonstration and promotion of low-carbon production technologies.

4.2.2. Technical Training

Organize professional and technical personnel to carry out training and guidance on low-carbon production technology in rural areas to improve farmers' technical level and application ability. Establish low-carbon agricultural technology demonstration sites in Anhui Province to promote low-carbon production technology through actual demonstration and on-site teaching.

4.2.3. Market Development

The government should help farmers expand the sales channels of low-carbon agricultural products and improve the market competitiveness of low-carbon agricultural products. It should encourage and support farmers to establish low-carbon agricultural product brands and improve consumers' awareness and acceptance of low-carbon agricultural products.

4.2.4. Social Publicity

We will increase the publicity of low-carbon production technology through media publicity and network communication, and improve farmers' environmental awareness and low-carbon awareness. We will create a good social atmosphere and promote the popularization and application of low-carbon production technology by holding low-carbon agricultural technology exchange meetings and seminars.

4.3. Research Prospects

Although this study has achieved certain results in terms of farmers' willingness to adopt low-carbon production technologies and their influencing factors, there are still some shortcomings and issues that need further exploration. Future research can conduct detailed research on the willingness and influencing factors of farmers in different regions and different crop types to adopt low-carbon production technologies, and put forward more targeted policy recommendations. Conduct long-term follow-up research on farmers' behavior in adopting low-carbon production technologies to explore its dynamic change patterns and the long-term effects of influencing factors. Combining theories and methods from multiple disciplines such as economics, sociology, and psychology, conduct a comprehensive analysis of farmers' behavior in adopting low-carbon production technologies to reveal the deep-seated reasons and mechanisms behind them. Conduct a scientific evaluation of the policy effects of the government in promoting farmers to adopt low-carbon production technologies, and provide a basis for policy optimization and adjustment.

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