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Dual-Wheel Drive of Government Subsidies and Technical Support: A Study on the Mechanism of Promoting Rural Residents' Green Production

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Abstract: It is of great significance to explore the effect of government subsidies and technical support on rural residents' green production for improving the level of agricultural green development in the context of the green and high-quality development. Based on the theory of rural residents' behavior, this paper empirically examined the impact of government subsidies and technical support on rural residents' green production by using the ordered logit model and household survey data of CLES2022. Additionally, it applied the mediating effects model to explore the transmission mechanism. The results indicate that: (1) Government subsidies and technical support have a significant positive influence on rural residents' green production. After controlling the characteristics of individuals, families, and cultivated land, the path coefficient is determined to be 0.032, which is significant at the 0.01 level; technical support significantly affects rural residents' green production, and the path coefficient is 0.390, which is statistically significant at the 0.05 level. The above results are still valid after a robustness test. (2) In terms of the mechanism, government subsidies and technical support promote rural residents' green production through service outsourcing and productive assets. On this basis, the paper proposed some policy suggestions, such as giving full play to the guiding role of government subsidies, increasing government technical support, establishing a service outsourcing platform, as well as strengthening supervision and evaluation.

Keywords: rural residents' green production; agricultural green development; government subsidies; technical support

1. Introduction

Green production is a crucial factor in promoting sustainable agricultural development, safeguarding food safety for consumers, and protecting the rural ecological environment [1]. The implementation of environmentally sustainable and efficient production techniques and methods, known as "green production", aims to reduce adverse environmental impacts and protect ecosystems [2]. The adoption of green production methods can enhance agricultural output efficiency, reduce resource waste and pollution, and make a positive contribution to maintaining agricultural competitiveness and economic vitality [3]. On the one hand, green subsidies, as a policy instrument, are aimed at encouraging enterprises and individuals to shift to more environmentally friendly production methods and consumption behaviors and at promoting the development of green industries. on the other hand, green development is a more macroscopic concept that encompasses a wide range of economic, social, and environmental aspects and aims to achieve coordinated development of economic growth, social progress, and ecological and environmental protection.

Agricultural green development has always been an important development issue in the world. It aims at protecting natural ecology and promoting green development. Comprehensively promoting rural residents' green production is also an important direction of agricultural rural development in China [4]. It is critical for any country to actively promote

agricultural green production and rural residents' green and sustainable production [5]. The report to the Party's 20th National Congress has clarified the overall requirements for promoting agricultural green development in the new era [6]. As an important way for the government to support rural residents' green production, government subsidies and technical support play a crucial role in promoting the structural reform of the agricultural supply side, protecting rural residents' green production and facilitating agricultural green development [7,8]. At present, residents in most rural areas of China have a weak awareness of green production, and the popularity of green production technology is low. Therefore, based on the significance of agricultural green development for high-quality development, to explore the effect of government subsidies and technical support on the implementation of rural residents' green production has far-reaching theoretical and practical significance for building effective and practical green production policies and promoting agricultural green development.

Domestic and foreign scholars have conducted a large number of studies on agricultural green development and rural residents' green production. Agriculture is the foundation of China's national economy, and green production in agriculture is an important factor in achieving sustainable social development [9]. Some scholars have found that adopting agricultural green production behaviors helps to increase wheat yields and sales prices, but the promotion of yields is more obvious [10]. Participation in e-commerce also plays a key role in improving the green production of agricultural products by rural residents [11]. At the same time, through participation in vertical integration and the driving role of cooperatives and leading enterprises, it is important for rural residents to adopt green production practices and achieve high-quality and sustainable development of agriculture [12,13].

Many scholars have evaluated the level of agricultural green development by measuring agricultural green development efficiency, agricultural green total factor productivity, and constructing agricultural green production index system or index [14–16]. Some scholars believe that government subsidies play a positive role in promoting rural residents' green production. In the comparison between government subsidies and social norms, it is found that subsidies are more appropriate to encourage large-scale rural residents' green production [17]. Moreover, both large and small agricultural production and operation entities are affected by government subsidies [18]. Local government subsidies for agricultural production can not only promote local agricultural green development, but also facilitate agricultural green development in neighboring areas [19]. In addition, it is essential for rural residents to achieve green production by using agricultural green production technology [20]. Technical training for members of cooperatives can significantly enhance their willingness to adopt green production [21], and the adoption and promotion of agricultural technology can effectively improve agricultural green development [22]. Some scholars have found that technical support cannot promote rural residents' green production, and that even government subsidies can inhibit it [23]. Existing studies provide an important theoretical basis for this study. Most of them mainly focus on the effect of subsidies and technical support on rural residents' green production. However, only a few studies comprehensively explore their comprehensive effects on rural residents' green production behavior under the perspective of the dual-wheel drive of government subsidies and technical support.

Based on this research gap, this paper used Stata 18 software to make an empirical analysis of the data from the 2022 China Land Economic Survey (CLES), and discussed the effect of different levels of government subsidies and technical support on rural residents' green production and its mechanism. The innovations of this paper are as follows: Firstly, rural residents were selected as investigation objects; government subsidies, technical support, and rural residents' green production were integrated into the unified framework, and the effect of government subsidies and technical support on rural residents' green production under the background of agricultural green development was empirically tested; and the existing research was supplemented. Secondly, service outsourcing and productive

assets are closely related to rural residents' green production. To further explore whether there is a correlation between the two under the background of government subsidies and technical support, this paper combined them into the mediating effect model for research. Through this method, the influencing mechanism between them can be revealed more clearly, so as to provide a powerful reference for formulating more accurate and effective green production guidance policies for rural residents.

2. Theoretical Analysis and Research Hypothesis

2.1. Effect of Government Subsidies and Technical Support on Rural Residents' Green Production

Rural residents' green production is a behavioral choice of rural residents. The rural resident model originated from A. V. Chayanov's peasant model in Russia in the 1920s [24]. With the deepening of research on rural residents' behavior theory, the schools of rural residents' behavior theory can be roughly divided into three categories: real economics, formal economics, and history. As rational economic people, rural residents tend to pursue risk minimization and benefit maximization, and make decisions based on the two. These behaviors have a one-to-one correspondence with various schools [25]. In real economics, the purpose of rural residents' production is to meet the needs of life, avoid various risks in production and life, and minimize risks. In formal economics, rural residents are regarded as rational economic men [26] who use existing resources to make decisions in order to maximize benefits and achieve Pareto optimality. According to the historical school, rural residents can be affected by various internal and external uncertainties in decision-making, so that they cannot make completely rational decisions [27].

Based on rural residents' behavior theory, agricultural green development, and the actual situation of rural residents' peasant production in China, the majority of rural residents' production decisions take the maximization of benefit as the ultimate goal, and rural residents are more satisfied with the formal economic view when they carry out green production. Whether rural residents conduct agricultural green production is affected by the economic value brought by green production, which is the primary factor considered by them [28]. At the same time, rural residents' green production is not only affected by internal economic interests, but also driven by external resources, that is, the questions of "whether they want to do it" and "whether they can do it" [29]. Green production can increase the operation cost of rural residents, which is an important factor that makes them discouraged. After the intervention of the government through policy tools, such as subsidies, rural residents are encouraged to implement green production in accordance with the requirements of the government without reducing their income [30], which encourages rural residents to "want to do it". In addition, with the acceleration of legal society construction, the improvement of rural residents' reward and punishment mechanism for green production also provides a guarantee for promoting agricultural green development and protecting the ecological environment. In addition, agricultural green production is a modern agricultural technology with high capital and technical requirements [31], which aims to achieve the coordinated development of the economy and ecology. In this background, the agricultural technical services provided by the government are particularly important, and can significantly reduce the technical difficulty and financial pressure of rural residents in the process of promoting green production, so as to help rural residents "do it". Based on the above analysis, hypotheses H1 and H2 are proposed.

H1: *Government subsidies have a significant positive influence on rural residents' green production.*

H2: *Technical support has a significant positive influence on rural residents' green production.*

2.2. Functional Mechanism of Government Subsidies and Technical Support on Rural Residents' Green Production

Firstly, government subsidies promote rural residents' green production by increasing service outsourcing. Government subsidies, as a policy tool to encourage rural residents' green

production, play a crucial role in the process of agricultural green development. As a new agricultural production mode, agricultural outsourcing services can provide technical support and professional knowledge to rural residents, help them improve production technology and management methods, and promote agricultural green production. Government subsidies can directly solve rural residents' economic difficulties in using outsourcing services, so that outsourcing services can put green production factors into rural residents' production [32].

Secondly, government subsidies enhance it by adding productive assets. On the one hand, government subsidies, as a direct incentive policy for rural residents, can effectively increase the number of productive assets of rural residents. On the other hand, as the number of productive assets of rural residents increases, green production can be carried out more efficiently and the adoption of green production technology can be promoted. Government subsidies lower the cost of rural residents' green production, reduce production obstacles caused by insufficient funds, indirectly improve rural residents' profits, and help improve rural residents' awareness of green production [33].

Thirdly, technical support strengthens it by improving service outsourcing. The government, as the leading force to promote rural residents' green production, strengthens rural residents' green production ability by providing technical support. In addition, it enhances the efficiency of service outsourcing by providing technical support, thus improving the efficiency of rural residents' green production [34]. There is a certain technical threshold for agricultural green production. The government provides technical guidance to rural residents through outsourcing to service organizations to improve service quality, broaden service scope, and reduce service cost, so as to enable rural residents to break through technical barriers to agricultural green production and enhance their awareness of green production.

Fourthly, technical support also reinforces it by raising productive assets. The modern production technology provided by the government can help rural residents reduce environmental pollution, improve the quality of agricultural products, and achieve sustainable agricultural development. Meanwhile, it can significantly improve the efficiency of the use of productive assets, so that rural residents can obtain more abundant returns with the same input in the green production process, thus increasing their income [35]. Through technical guidance and training, rural residents can not only use advanced production tools and methods, but also better understand the importance of green agricultural development.

Based on the above analysis, hypotheses H3, H4, H5, and H6 are put forward.

H3: *Government subsidies have a significant positive influence on rural residents' green production by increasing service outsourcing.*

H4: *Government subsidies have a significant positive influence on rural residents' green production by increasing rural residents' productive assets.*

H5: *Technical support has a significant positive influence on rural residents' green production by increasing service outsourcing.*

H6: *Technical support has a significant positive influence on rural residents' green production by increasing their productive assets.*

The analysis framework of government subsidies and technical support for improving rural residents' green production is shown in Figure 1.
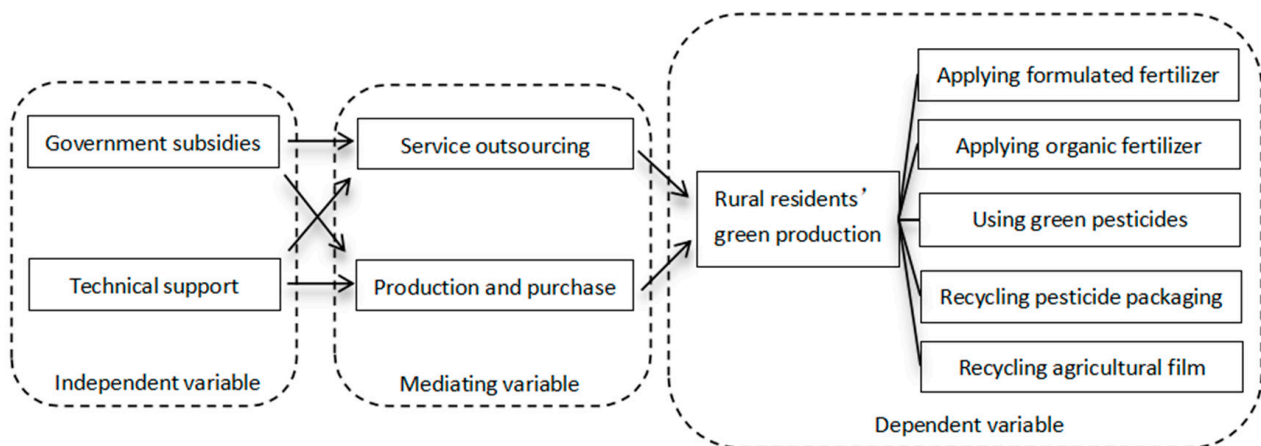
Figure 1. Analysis framework of government subsidies and technical support for improving rural residents' green production.

3. Study Area and Data Source, Variable Selection, and Model Setting

3.1. Study Area and Data Source

The survey was carried out in Jiangsu Province, a region with a developed economy and distinctive agricultural characteristics, where land economy issues are more prominent and of high research value. It aimed to explore the issues related to land economy in depth, and to provide solid data support for academic research and policy formulation in related fields. The CLES database covers detailed data on government subsidies, technical support, agricultural production, ecological environment, etc. The content, quality, and characteristics of these data are highly compatible with the research topic, providing rich materials and a basis for analyzing the effect of government subsidies and technical support on rural residents' green production. It provided strong data support for the in-depth development of the study, so this database was selected. In order to ensure the comprehensiveness and representativeness of the data, the research team used the PPS sampling method for data collection, with targeted sampling based on the characteristics of different regions or groups in Jiangsu Province. The survey objects were involved in 13 prefecture-level cities in Jiangsu Province, a total of 104 villages, and 2600 households. The data used in this paper were collected from the CLES conducted by Nanjing Agricultural University in Jiangsu Province in 2022, as shown in Figure 2. Stata 18.0 was used to analyze the data, which is widely used in the field of social sciences. To ensure the quality and reliability of the data, the missing values and outliers in the survey data were eliminated by cleaning the data, and the relevant data were merged. After screening and sorting, 1079 valid questionnaires were obtained.

3.2. Variable Selection

3.2.1. Dependent Variable

The dependent variable of this paper is rural residents' green production, which means that rural residents adopt green environmental protection and sustainable development methods in the production process [36]. It is included in the whole process of production, so the following five behaviors were determined during the process: before production: whether to apply formula fertilizer; in production: whether to apply organic fertilizer, whether to use high-efficiency, low-toxicity, and low-residue pesticides; after production: whether the pesticide packaging and agricultural film are recycled [37]. Each indicator was calculated in the form of a binary variable, where "yes" and "no" are assigned a value of 1 and 0, respectively. Then, an ordered variable with a value range between 0 and 5 was obtained to measure the rural residents' green production degree.

Figure 2. Map of Jiangsu Province, China.

3.2.2. Independent Variable

The independent variable in this paper includes government subsidies and technical support. The specific questions "Revenue of government subsidies income/thousand yuan" and "whether the government provides agricultural technology services" were selected. These two variables were chosen to more comprehensively measure the driving factors of rural residents' green production. The former reflects the government's direct drive to rural residents' green production, while the latter, assigned a value of 1 or 0, reveals the government's indirect drive to it.

3.2.3. Mediating Variable

The mediation variable in this paper includes service outsourcing and productive assets. According to the previous theory and mechanism analysis of government subsidies and technical support to promote rural residents' green production, service outsourcing is measured by the quantity of outsourcing services purchased by rural residents in the production link. Productive assets are measured by the number of productive assets owned by rural residents.

3.2.4. Other Control Variables

Based on existing studies [38], this paper comprehensively considers the characteristics of individuals, families, and cultivated land, etc., and accordingly controls the variables that may affect the green production of rural residents. Specifically, individual characteristics include factors such as gender, age, education level, health status, and political identity. Family characteristics are mainly concerned with the degree of part-time employment. The characteristics of cultivated land include management scale and land quality. The specific meanings and assignments of variables are shown in Table 1.

Table 1. Meaning and assignment of variables.

Variable Type	Variable Name	Variable Definition and Assignment	Mean	STD
Dependent variable	Green production	Number of rural residents' green production behaviors/piece	0.737	0.918
Core independent variable	Government subsidies	Revenue of government subsidies/CNY thousand	2.224	11.146
	Technical support	Whether the government provides agricultural technical services: yes = 1, no = 0	0.149	0.356
Mediating variable	Service outsourcing	Number of projects involved in service outsourcing/piece	1.275	2.190
Control variable	Production assets	Number of productive assets/unit	0.644	1.921
	Gender	Respondent gender: male = 1, female = 0	0.746	0.435
	Age	Respondent age: years old	62.766	10.960
	Education	Number of years in school/year	7.072	4.161
	Health status	Self-identified health status: incapacity to work = 1, poor = 2, medium = 3, good = 4, excellent = 5	3.939	1.082
	Degree of part-time employment	How many family members are engaged in non-agricultural work/household	1.375	1.126
	Political identity	Whether respondents are party members: yes = 1, no = 0	0.309	0.462
	Operation scale	Contracted land area/mu	10.034	41.180
	Land quality	Fertility of managed land: poor = 1, medium = 2, good = 3	2.371	0.634

3.3. Model Setting

3.3.1. Orderly Logit Model

Rural residents' green production behaviors in this article are not a simple binary variable. It has varying degrees of behavioral performance, including two independent variables and multiple dependent variables with various degrees of effect on rural residents' green production behaviors. The ologit model can handle such variables and analyze their effect on it. Therefore, the dependent variables of the ologit model constructed in this paper are rural residents' green production behavior [39], and the independent variables are revenue of government subsidies and whether the government provides agricultural technical services. At the same time, the gender, age, education, health status, degree of part-time employment, political identity, operation scale, and land quality of the respondents were used as control variables of the model. The specific model is as follows:

$$p_k = \theta_k + \delta_1 \text{subsidy} + \delta_2 \text{technology} + \delta_3 \text{gender} + \delta_4 \text{age} + \delta_5 \text{education} \\ + \delta_6 \text{health} + \delta_7 \text{part-time} + \delta_8 \text{politics} + \delta_9 \text{scale} + \delta_{10} \text{quality} + \mu \tag{1}$$

where P_k represents the probability when the number of green production behaviors of rural residents is y = k; δ is the parameter variable to be estimated; and θ_k is the intercept when y = k.

3.3.2. Verifying the Oprobit Model

To ensure the accuracy and reliability of the model, it is necessary to compare and test different models. The oprobit model is another commonly used model for handling ordered variables. Since dependent variables are ordered variables 0, 1, 2, 3, 4, and 5 when rural residents engage in green production, it is used to test them. If the ologit and oprobit models draw similar or consistent conclusions in analyzing rural residents' green

production behavior, it can increase the credibility of research results. The test model is set as follows:

$$y_i = \alpha_0 + \alpha_1 \text{subsidyy}_i + \alpha_2 \text{technologyy}_i + \alpha_3 x_i + \mu_i \tag{2}$$

where subsidyy_i represents revenue of government subsidies; technologyy_i means whether the government provides agricultural technical services; x_i refers to the control variable, including individual, family, cultivated land characteristics, etc.; and μ_i is a random interference term.

3.3.3. Mediating Effect Model

The mediating effect model can more specifically explain how government subsidies and technological support affect rural residents' green production behavior, identify and quantify potential factors that may affect rural residents' green production, and help improve the effectiveness and targeting of policies. To study whether outsourcing services and productive assets can promote rural residents' green production, and to further test whether service outsourcing and productive assets can play an mediating effect among government subsidies, technical support, and rural residents' green production, this paper drew on previous research results [40] and conducted empirical analysis by using the method of testing regression coefficients in turn, as shown in Equations (3)–(6).

$$\text{outsourcing} = \beta_0 + \beta_1 \text{subsidy} + \beta_2 \text{technology} + \beta_3 x_i + e_i \tag{3}$$

$$y_i = \mu_0 + \mu_1 \text{subsidy} + \mu_2 \text{technology} + \mu_3 \text{outsourcing} + \mu_4 x_i + e_i \tag{4}$$

$$\text{property} = \beta_0 + \beta_1 \text{subsidy} + \beta_2 \text{technology} + \beta_3 x_i + e_i \tag{5}$$

$$y_i = \mu_0 + \mu_1 \text{subsidy} + \mu_2 \text{technology} + \mu_3 \text{property} + \mu_4 x_i + e_i \tag{6}$$

where outsourcing represents the service outsourcing variable; property means the productive asset variable; β_0, β_1, β_2, β_3, μ_0, μ_1, μ_2, μ_3, and μ_4 are the coefficients to be estimated; and e_i refers to the random error term of each equation. Equations (3) and (5) estimate the mediating factor allocation effect of government subsidies and technical support on rural residents' green production through service outsourcing and productive assets β_1 and β_2. Equations (4) and (6) estimate the effect of service outsourcing and productive assets on rural residents' green production μ_3. The indirect effects of government subsidies and technical support on rural residents' green production through service outsourcing and productive assets can be estimated by β_1, β_2, and μ_3.

4. Results and Analysis

4.1. Main Effect Analysis

4.1.1. Effect of Government Subsidies on Rural Residents' Green Production

Model (1) in Table 2 only adds the variable of government subsidies. The results show that the coefficient is 0.041, in which government subsidies has a positive influence on rural residents' green production and is significant at the 0.01 level, indicating that rural residents receiving higher government subsidies are more likely to perform green production. Based on Model (1), Model (2) in Table 2 further includes individual characteristics of rural residents, family background, and cultivated land attributes as control variables. It can be seen that government subsidies still have a significant positive influence on rural residents' green production. The possible explanation is that compared with those with lower government subsidies, rural residents with higher government subsidies have enough money to employ green production, and they do not have to worry about reducing their own production and operation profits due to the high cost of green production, or it even increases rural residents' profits and stimulates them to "want to do it". In addition, the gender and operation scale control variables also significantly affect rural residents' green production. Hypothesis H1 is supported.

Table 2. Effect of government subsidies and technical support on rural residents' green production.

Variable Name	Model (1) Ologit		Model (2) Ologit		Model (3) Oprobit	
Government subsidies	0.041 *** (0.008)		0.032 *** (0.008)		0.019 *** (0.000)	
Technical support		0.470 *** (0.162)		0.390 ** (0.170)		0.226 ** (0.026)
Gender			0.300 ** (0.151)	0.306 ** (0.151)	0.168 * (0.062)	0.173 * (0.055)
Operation scale			0.004 ** (0.002)	0.006 *** (0.001)	0.002 ** (0.016)	0.003 *** (0.000)
Age			Controlled			
Education			Controlled			
Healthy status			Controlled			
Degree of part-time employment			Controlled			
Political identity			Controlled			
Land quality			Controlled			
Number of samples	1079	1079	1079	1079	1079	1079

Note: *, **, and *** are significant at the significance levels of 0.10, 0.05, and 0.01, respectively; there are robust standard errors in brackets.

4.1.2. Effect of Technical Support on Rural Residents' Green Production

In Model (1) of Table 2, only the technical support variable is complementary. It is found that the coefficient is 0.470, in which technical support has a positive influence on residents' green production and is significant at the 0.01 level, indicating that rural residents with higher levels of technical support services provided by the government are more likely to carry out green production. In Model (2) of Table 2, control variables of individual, family, and cultivated land characteristics of rural residents are introduced on the basis of Model (1). At this time, the technical support variable still has a positive influence on rural residents' green production, but its statistical level decreases by 0.05. The main reason is that compared with rural residents with a lower degree of technical support provided by the government, rural residents with a higher degree of technical support provided by the government have more mature technology for green production. In the past, it may have been relatively difficult for rural residents to implement green production technically. The technical support provided by the government can help rural residents better understand and apply sustainable agricultural practices, and stimulate rural residents to conduct green production ("can do"). After adding control variables, some specific rural residents and data may be excluded, resulting in changes in sample composition. Control variables may play a regulating role between technical support and rural residents' green production, and such changes may affect the significance of results. In addition, the gender and operation scale control variables also have a significant influence on rural residents' green production. Hypothesis H2 is supported.

4.1.3. Effect of Controlling Variables on Rural Residents' Green Production

The effect of relevant control variables on rural residents' green production is modelled and its regression results are shown in Table 2. Among them, Model (2) shows that gender and scale of operation also have a significant positive influence on rural residents' green production. The possible explanation is that on the one hand, males dominate agricultural production in the majority of farm households, and greater involvement in agricultural production activities makes them more likely to be exposed to and adopt green agricultural technologies and management practices, so as to improve production efficiency and quality; on the other hand, the larger scale of operations may lead to a greater emphasis on environmental protection and sustainable development among rural residents, implying more resources and capacity to adopt and implement green production.

4.2. Robustness Test

To enhance the reliability and scientificity of estimation results of the model, the robustness of the main effect model was tested by replacing the model in this paper (Table 2). Considering that the dependent variables in this paper belong to discrete ordered variables with a progressive relationship, the oprobit model is also applicable. According to the test results, although the coefficient of the core independent variable in Model (3) decreases compared with that in Model (2), it still significantly positively affects rural residents' green production at the same statistical level, and the significance level of gender decreases. Other results are basically consistent with Model (2), which fully indicates that the results are robust.

4.3. Mechanism Test

According to the theoretical analysis above, government subsidies and technical support promote rural residents' green production through service outsourcing and technical support. On this basis, to accurately estimate the mediating role of service outsourcing and productive assets in government subsidies and technical support on rural residents' green production, relevant variables were introduced into the model successively, and the effect of these variables on rural residents' green production and its total utility coefficient was observed and analyzed.

4.3.1. Mediating Effect of Service Outsourcing

The left side of Model (4) in Table 3 shows the effect model of government subsidies on service outsourcing. The results show that the coefficient is 0.031, in which the degree of government subsidies accepted by rural residents has a positive influence on their service outsourcing and is significant at the 0.01 level. The possible reasons are as follows: the increase in government subsidies to rural residents has improved their economic level to a certain extent, enabling them to have the economic ability to outsource all aspects of their production. Service outsourcing may further improve the profits of rural residents while saving their time. Therefore, government subsidies increase the amount of service outsourcing by rural residents. On the left side of Model (5), both government subsidies and service outsourcing are included in the regression analysis. The results show that government subsidies still have a positive influence on rural residents' green production and is significant at the 0.05 level, with a coefficient of 0.017, and service outsourcing has a positive influence on rural residents' green production and is significant at the 0.01 level, with a coefficient of 0.463. The possible reasons are as follows: as a method of green production for rural residents, service outsourcing can provide rural residents with professional green technical support and use higher quality green agricultural materials and production equipment. Service outsourcing can make more effective use of resources and carry out environmental management and supervision and other services, while government subsidies provide convenience for rural residents to carry out service outsourcing. Therefore, rural residents receive government subsidies to promote green production through service outsourcing. Hypothesis H3 is supported.

The right side of Model (4) in Table 3 is the effect model of technical support on service outsourcing. The results show that the coefficient is 0.412, in which the number of technical services that rural residents accept from the government has a positive influence on their service outsourcing and is significant at the 0.05 level. A possible reason is that the government provides technical support to help rural residents solve technical problems in the process of service outsourcing. And it can reduce the risk of production and operation through the form of service outsourcing, reduce the pressure they face, and improve production efficiency and quality. On the right side of Model (5), both technical support and service outsourcing are included in the regression analysis, and the results show that technical support has no significant effect on rural residents' green production, while service outsourcing has a positive influence on rural residents' green production and is significant at the 0.01 level, with a coefficient of 0.471. The possible reasons are:

The average age of rural respondents is 62.8 years old (as shown in Table 1). Besides providing technology, service outsourcing is more important for providing productivity. Undoubtedly, the use of government-provided technical services by rural households in the form of service outsourcing has greatly improved the efficiency and quality of rural residents' green production and dispersed some risks. The green production of rural residents can be more specialized and large-scale. Therefore, after receiving technical support from the government, rural residents can promote green production through service outsourcing. Hypothesis H5 is supported.

Table 3. Analysis results of mediation effect of service outsourcing.

Variable	Model (4) Service Outsourcing		Model (5) Rural Residents' Green Production	
Government subsidies	0.031 *** (0.006)		0.017 ** (0.008)	
Technical support		0.412 ** (0.192)		0.201 (0.182)
Service outsourcing			0.463 *** (0.031)	0.471 *** (0.030)
Control variable	Controlled	Controlled	Controlled	Controlled
Number of samples	1079	1079	1079	1079

Note: ** and *** are significant at the significance levels of 0.05, and 0.01, respectively; there are robust standard errors in brackets.

4.3.2. Mediating Effect of Productive Assets

The left side of Model (6) in Table 4 is the effect model of government subsidies on productive assets. The results show that the coefficient is 0.052, in which the degree of government subsidies accepted by rural residents has a positive influence on the number of productive assets, which is significant at the 0.01 level. The possible reasons are as follows: Government subsidies can provide additional financial support to rural residents, enabling them to invest in more efficient and green productive assets, and help them expand production scale and improve production efficiency, thus further improving rural residents' profits. Therefore, government subsidies increase the number of rural residents' productive assets. On the left side of Model (7), government subsidies and productive assets are also included in the regression analysis. The results indicate that both government subsidies and productive assets have a positive influence on rural residents' green production and are significant at the 0.01 level, with coefficients of 0.025 and 0.104, respectively. The possible reasons are that productive assets can improve the efficiency of rural residents' green production; meanwhile, green production technology and equipment can reduce the negative effect on the environment, and decrease pollution and waste in the production process. Government subsidies can directly increase the capital input of rural residents' green production, so that rural residents have the ability to implement green production, thereby investing more in it to obtain more subsidies and profits. Therefore, rural residents receive government subsidies to promote green production by increasing productive assets. Hypothesis H4 is supported.

The right side of Model (6) in Table 4 is the effect model of technical support on productive assets. It is found that the degree to which rural residents accept technical support provided by the government has a positive influence on the number of productive assets and is significant at the 0.01 level, with a coefficient of 0.787. The main reasons are that on the one hand, the technical support provided by the government may be divided into production method and equipment supports, so the technical support provided by the government can directly increase the number of productive assets of rural residents; on the other hand, through technical training for rural residents, the government can make rural residents realize the importance of green and efficient production equipment and take the initiative to increase productive assets. On the right side of Model (7), both technical support and productive assets are included in the regression analysis. The results show

that technical support has no significant influence on rural residents' green production, while productive assets have a positive influence on it and the variable is significant at the 0.01 level, with a coefficient of 0.135. This is mainly because the increase in productive capital, especially green production equipment, can not only improve the environment and reduce pollution, but also enhance production efficiency, revenue, and living standards for rural residents. Green productive assets can promote the government to provide technical support for the sustainable use of resources in rural residents' green production. Therefore, rural residents can conduct green production by increasing productive assets after receiving technical support from the government. Hypothesis H6 is supported.

Table 4. Analysis results of mediating effect of productive assets.

Variable	Model 6 Productive Assets		Model 7 Rural Residents' Green Production	
Government subsidies	0.052 *** (0.005)		0.025 *** (0.007)	
Technical support		0.787 *** (0.165)		0.275 (0.174)
productive assets			0.104 *** (0.034)	0.135 *** (0.034)
Control variable	Controlled	Controlled	Controlled	Controlled
Number of samples	1079	1079	1079	1079

Note: *** is significant at the significance levels of 0.01; there are robust standard errors in brackets.

The direct responses to the six research hypotheses are shown in Table 5.

Table 5. Results of the research hypotheses.

Research Hypotheses	Results
H1: Government subsidies have a significant positive influence on rural residents' green production	Supported
H2: Technical support has a significant positive influence on rural residents' green production	Supported
H3: Government subsidies have a significant positive influence on rural residents' green production by increasing service outsourcing	Supported
H4: Government subsidies have a significant positive influence on rural residents' green production by increasing rural residents' productive assets	Supported
H5: Technical support has a significant positive influence on rural residents' green production by increasing service outsourcing	Supported
H6: Technical support has a significant positive influence on rural residents' green production by increasing their productive assets	Supported

5. Discussion

This paper empirically analyzed the effect of government subsidies and technical support on rural residents' green production, and explored the mechanism of service outsourcing and productive assets using the theory of rural residents' behavior. It looked at the 2022 CLES data as a sample, and used the ordered logit model, oprobit test model, and mediating effect model.

In this study, the first conclusion drawn from this study is that government subsidies and technical support have a significant positive influence on rural residents' green production; in terms of government subsidies affecting rural residents' green production, this is consistent with the findings of the literature [5,41] that rural residents who accept government agricultural subsidies are able to optimize the allocation of factors for green production and increase their value recognition to maximize benefits. But the literature [42] reached the opposite conclusion, which pointed out that agricultural subsidies have a negative impact on agricultural green development. The main reason for this may be that the data in this study are newer in comparison and the study area is more focused; in addition, the policy for agricultural green production provided by Jiangsu Province

is better, and agricultural subsidies have a significant effect on rural residents' green production in this scope. On this basis, this study further explored the comprehensive benefits of agricultural green subsidies on the production behavior of rural residents, and delved into the specific mechanisms of governmental influence on rural residents' green production in terms of service outsourcing and productive assets. In terms of technical support influencing rural residents' green production, it is in line with the findings of the literature [43,44] that increased digital literacy and digitization can reduce costs and contribute to green production; it mainly focuses on the role of digitization of agribusinesses and digital literacy in promoting green production. Technical support actually encompasses factors such as digital literacy and digitization. Furthermore, this study further revealed how technical support could work collaboratively to promote green production of rural residents through various ways, such as optimizing the allocation of resources and improving the level of technology.

The second conclusion of this study is that service outsourcing and productive assets play a mediating role in the process of government subsidies and technical support, positively affecting rural residents' green production; for the effect of service outsourcing on rural residents' green production, the literature [45] has reached a similar conclusion, and it argues that the outsourcing of services can break down the technological barriers to green production for rural people and promote green production. In addition, this study mainly analyzed service outsourcing from the perspective of breaking down technical barriers to green production, and examined in depth how government subsidies and technical support can affect rural residents' green production through the mediating variable of service outsourcing. Government subsidies can help rural residents to outsource part of their production processes so that they can focus on the adoption and application of green production technologies; however, technical support can improve the quality and efficiency of outsourcing services to further promote rural residents' green production. Regarding the effect of productive assets on rural residents' green production, the literature [35] has reached a similar conclusion. Socialized services can promote rural residents' green production through access to green production materials. Furthermore, few previous studies have analyzed the relevance and mechanism of government subsidies and technical support for green production by rural residents. This study analyzed how productive assets can act as a mediating variable to enable government subsidies and technical support to affect rural residents' green production. Government subsidies can guide rural residents to invest in green productive assets, thus enhancing the level of green production in agriculture; however, technical support can improve the efficiency of green production by optimizing the use and management of productive assets, which further promotes rural residents' green production.

6. Policy Implications

In the process of agricultural green development, government subsidies and technical support are of great significance to promote the transformation of the agricultural industry, improve the rural ecological environment, and strengthen the quality of agricultural products. They are also important driving forces to promote rural residents' green production and improve their revenue and life quality.

According to the research results and discussions, the following policy implications were put forward. Firstly, government subsidies should be targeted to green production, guiding rural residents to use green production technology and equipment, encouraging them to increase investment in productive assets, and ensuring that subsidy funds are effectively and efficiently applied to the field of green agricultural development. Secondly, the government should provide much more technical support. The government should actively promote advanced green production technology and agricultural machinery and equipment to rural residents (so that they can understand that green production can bring tangible benefits to themselves and the surrounding environment) and train rural residents to use green production technology. Thirdly, the government should establish a service

outsourcing platform. It can guide rural residents to outsource some non-core agricultural production and operation activities to professional organizations and personnel, which can not only improve the quality, efficiency, and profits of rural residents' green production, but also reduce resource waste in the production process. Fourthly, the government should strengthen supervision and evaluation. It should establish and improve the supervision and evaluation mechanisms of rural residents' green production, and regularly inspect their production behavior. Moreover, it should also give appropriate rewards to rural residents who perform well in green production, and provide guidance and assistance to them with pollution problems in production, so as to continuously improve rural residents' green production level and promote agricultural green development.

7. Conclusions

The following two conclusions are drawn. Firstly, the regression results of the orderly logit model show that government subsidies have a significant influence on rural residents' green production. After controlling the characteristics of individuals, families, and cultivated land, the path coefficient is 0.032, which is significant at the 0.01 level; technical support significantly affects rural residents' green production, and the path coefficient is 0.390, which is statistically significant at the 0.05 level. The above results are still valid after a robustness test. Secondly, the results of the mediating effect model indicate that the addition of government subsidies and technical support significantly promotes rural residents' green production through increasing service outsourcing and productive assets. In addition, research results were drawn and comprehensively analyzed and discussed, and then targeted policy implications were proposed.

This paper has made some contributions to the research on rural residents' green production and agricultural green development, but there are still some limitations. It focuses on the effect of government subsidies and technical support on rural residents' green production, but fails to subdivide rural residents' green production according to the differences that may exist in different regions. Therefore, further regional difference analysis and comparative research may be needed. Subsequent research design and more in-depth theoretical analyses can be used to remedy these shortcomings.

Author Contributions: S.W.: empirical analysis and the writing of the first draft. J.X.: data collection and processing. F.T.: review and revision of manuscript. Q.C.: selection of the topic of the article and controlling of the research ideas. Y.L.: manuscript translation. For this paper, each author made different contributions. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data come from the Rural Revitalization Data Resource Platform of Nanjing Agricultural University, relying on the China Land Economic Survey (cles (www.njau.edu.cn)) (accessed on 28 June 2024).

Conflicts of Interest: The authors declare no conflicts of interest.

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