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Assessing the Impact of Confirmation of Rights and Collective Trust on Farmer's Forestry Management and Protection Behaviour—A Case of Collective Forest Areas in Zhejiang and Jiangxi Provinces, China

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Abstract: Confirmation of rights and collective trust (interpersonal and institutional) can act as primary factors for facilitating effective forest management and conservation. Collective forests are lands held collectively by either rural or indigenous communities based on a shared history, language, culture, or lineage. It is an institutional arrangement in which communities are involved wholly or partly in decision-making and contribute knowledge and labour to achieve healthy forests and social well-being. Based on the existing literature, the nature of collective forest rights and trust can be derived from social, rather than economic, prospects. Therefore, based on the institutional theory, this study constructs a theoretical framework to verify the impact of the confirmation of rights and trust on farmers' forestry management conservation behaviour. The empirical setup of the study was comprised of a data set of 682 collective forest farmers in Zhejiang and Jiangxi provinces, China. We utilized the negative binomial regression model to quantify the proposed framework. The main conclusions were as follows. Confirmation of rights and collective trust had a significant positive role in promoting farmers' forestry management and protection behaviour. Increasing the confirmation of rights and trusts by one unit increased the number of farmers' forest management and protection by 1.846 and 2.631 times, respectively. The interaction between confirmation and trust did not substantially affect farmers' behaviour. The diverse forest labour force, the total area of forest land, and the number of forest plots had a significant positive impact, while the head of the village and the number of migrant workers significantly and negatively impacted farmers' behaviour. Therefore, it is necessary to further improve the forestry land rights system and strengthen the trust mechanism so that it can become an effective institutional incentive for farmers to manage and protect forests.

Keywords: confirmation; trust; binomial regression; forestry management; farmers; collective forest area

1. Introduction

As an integral part of the ecosystem, forests play a crucial role in maintaining a healthy balance of the environment, conserving biodiversity and providing natural resources for society [1]. They also act as reservoirs (sinks) for carbon dioxide, a greenhouse gas released into the atmosphere by human processes, which may contribute to global warming [2,3]. Global forestry issues, such as deforestation, degradation, and biodiversity loss, have persisted and increased significantly in recent decades. Thus, if forests are not appropriately and sustainably managed, the comprehensive development of the current and future generations can be hampered [4,5]. With the expansion of globalization, deforestation and desertification by losing forest land have emerged as a significant global problem and can

eventually influence attaining sustainable development goals (SDGs) set by the United Nations (UN) [6]. Therefore, the management and protection of forests have been a primary concern for various international development organizations, governments, and academia and have gained significant public attention. A well-structured and effective forest management and protection plan can help achieve environmental, social, and economic goals [7,8] while conserving forested land and water, preventing forest diseases, insects and pests, and reducing deforestation, forest fires, and promoting afforestation [9,10].

Given the increasing speed of worldwide deforestation and global habitat destruction [11], a comprehensive initiative and collaborative participation are necessary to effectively regulate and protect forest resources. The need for sustainable and collaborative forest management and protection has become more obvious [12,13]. Thus, the notion of the collective or community-driven forest has evolved. Collective forests have long fostered a crucial socio-economic and cultural impact within rural mountainous regions of China, particularly after the opening-up policy was applied [14,15]. Collective forests have long played an important economic, cultural and social role in the remote mountainous areas of China [16,17]. It could effectively strengthen forest management and protection by involving local communities and building an integrative measure to improve ecosystems and resilient forestlands [18]. Collective forest areas are where collective forests gather and are owned and managed in a flexible model based on a human-nature partnership that mainly relies on local stewardship of natural resources. It is a forest where local communities are entrusted with protecting and managing nearby forests, and each householder is responsible for a specific forest area [19]. It delegates control to individual households and creates individual tenure [20]. The importance of strengthening forest management and protection to ensure forest safety in communal forest areas and improve farmers' livelihoods is recognized globally by academia, government and international development organizations [21,22].

In 2003, the Chinese government started actively promoting and restructuring the tenure framework for communal forestry. The collective forestry rights structure denotes the right of tenure, usage, earnings and disposal of forest resources fostered by the collective ownership of economic organizations or units [15]. In contrast to individual private property, most collective forest lands are governed by customary rights, rules, and institutions that pre-date most modern governments and continue to adapt to changing circumstances [23]. Customary rights govern this forest land in ways that support local cultures and livelihoods. While customary forest rights, rules, and institutions vary, many community members have inheritable rights to part of the collective's forest land to support their families [24,25]. The remaining forest is the community's common property, called "forest commons", with community rules governing access and use [26]. The collective forest area in southern China is located in the northern subtropical zone at 22–31 degrees north latitude and 108–120 degrees east longitude, covering ten provinces (regions) such as Jiangxi and Zhejiang. The terrain is dominated by low mountain and hilly mountainous areas, half-mountain districts and counties, and the altitude is generally 300–800 m, dominated by commercial timber forests and man-made reserve forests [27].

Confirmation of rights and collective trust could be two decisive factors in the collective forest area. In forestry, confirmation of rights denotes the legal and formal rights to access and use forest resources [28]. In contrast, collective trust represents mutual understanding and confidence in other parties, such as governmental institutions and personnel, family members and peers [29]. However, existing literature highlights the importance of confirmation of rights and collective trust. For example, Yang et al. [30] found that confirming forest land rights promoted forest area growth and stock volume. Ying and Chen [31] used local data to find that the number of forest fires in the country after the collective forest tenure system reform decreased by as much as 52.66%–64.86%, and the area of forest diseases and insect pests decreased by 25.95%–39.23%. Xiao et al. [32] used the data of 1227 sample rural households from nine provinces of China and found that the confirmation of forest land ownership significantly improved farmers' enthusiasm for

forestry management and protection. According to the study of Yu et al. [33], confirmation of rights has a promoting effect, and farmers' investment in management and protection increases with the enhancement of the perceived security of property rights. Larson [34] investigated community tenure rights in Asia, Africa and Latin America and found it has a decisive factor for the selected farmers to conserve forests more responsibly than without the rights. In a study of 28 European countries, Weiss et al. [35] found and advocated that conformation of property and resource usage rights can be a major driver for increasing farmers enthusiasm and willingness to protect the major collective forestland.

On the other hand, unclear property rights and lack of trust may hinder the betterment of collective forest management and protection [36]. Moreover, those may cause ineffective management and protection of collective forests and accelerate the degradation of resources in the long run [37,38]. The degree of trust is closely related to the characteristics of trust objects and presents the aspects of differential order minimum (see Chen et al. [39] for more details). Some literature further verifies the role of trust in farmers' input behaviour. For example, Bohr [40] found that trust helps farmers to participate in the supply of environmental public goods. Meng et al. [41] and Mi et al. [42] highlighted that trust positively impacts farmers' ecological input and willingness to participate in various communal forest practices. De Vries et al. [43] advocated that interpersonal trust primarily forms institutional trust and eventually acts as an influencing factor to increase the framer's enthusiasm for participating in collective actions.

The above results have essential relevant significance for this study. Some areas still need to be substantially explored and improved. Juan and Ruiping [44] and Ren et al. [45] and Poudyal et al. [46] focused on the importance of confirmation of rights and collective trust, and most of them explored these two components in an isolated manner. There may be a relationship between confirmation of rights and trust, which may affect farmers' forestry management and protection, and needs to be critically explored. Moreover, there is a lack of empirical results and approaches to evaluate the smallholder-farmer forestry management and protection behaviour; the impact of collective trust has especially not been adequately explored.

Based on institutional theory, this study builds a theoretical framework for measuring the confirmation of rights and trust in fostering farmers' forestry management and protection behaviour. The study represents forest management and protection as maintaining and conserving the existing forest to seek the farmer's mutual interest. We used an empirical data set of 682 farmers in collective forest areas in Zhejiang and Jiangxi Provinces, China, to craft the findings. To the best of our knowledge, the study is among the first attempts to integrate confirmation of rights and collective trust in the core analytical model and test it with empirical data. The structured framework is expected to provide a theoretical and practical reference for the government to formulate and promote farmers' forestry management and protection behaviour, assess the structural investment optimization, and deepen the core objectives of forest tenure reform. Moreover, the study aims to provide a thorough decision support model for further optimizing the forestry management and protection environment, stimulating farmers' enthusiasm for forestry management and safety, and providing a reference for future research.

2. Theoretical Background and Hypothesis Development

This study outlines its core theoretical assumption based on institutional theory (for more details, see Powell and DiMaggio [47]). The institutional theory is a concept used in sociology and organizational studies focusing on the societal system's most fundamental and enduring components [48]. It examines how social structures, such as plans, regulations, norms, and procedures, become accepted as authoritative recommendations for appropriate conduct in social settings [49,50]. The institutional theory holds that institutions are the rules of the game of societal relationships and reliability. More formally, they are artificially set constraints for people's mutual relations [51,52]. Institutional theory is frequently employed to analyse the acceptance and dissemination of formal administrative frameworks, such as

formal regulations, established procedures, and novel administration models [53,54]. Most of the research reveals that institutional theory imposes a hierarchical structure of society constituted of rules, including the constitution, written and customary laws, and individual contracts, which collectively operate as incentives and restrictions for people's conduct.

The definition of institutional theory used in this article refers to the recognized frameworks, concepts, regulations, conventions, and practices that can, directly and indirectly, impact other participants in the collaborative network. The institutional theory generally divides institutions into formal and informal rules [55]. Formal rules, also known as formal systems, refer to a series of political and economic rules and regulations consciously created by the government to fulfil specific purposes and aims [56]. Seemingly, informal norms are established implicitly from long-term practice and have enduring life [57]. They are part of the culture passed down from generation to generation, comprising values, beliefs, ethics, moral conceptions, conventions, and ideology [58]. The current study describes trust as an informal system and the confirmation of rights as a formal one.

2.1. Impacts of Confirmation of Rights on Farmers' Forestry Management and Protection Behaviour

According to the theory of property rights (read Demsetz [59] for details), unstable property rights can lead to an unforeseeable future and an income loss for farmers, eventually inhibiting farmers' investment behaviour. The new round of forest tenure system reform in China confirms the specific area, specifies all potential resource utilization power [60], and gives farmers more legal and transparent contract management rights, which fosters long term rights and cannot be adjusted, which can protect the future income of the land owners [61]. Moreover, it strengthens the stable expectation of future income, stimulating farmers' investment [61]. The existing literature generally uses either a property right certificate or contract management certificate to measure the confirmation of rights and examine its impact on investment behaviour. For example, Ali et al. [62] found formalization of farmland property rights significantly improved farmers' long-term investment in soil protection in Rwanda. Zhou et al. [63] outlined that a new round of farmland ownership confirmation especially prompted farmers to resume farming. Lu et al. [64] showed that the confirmation of farmland ownership substantially increased investment in farmyard manure management. Suyanto et al. [65] found that there was a property security effect in confirmation of rights, confirmation of rights encouraged income guarantee, and income guarantee led farmers to increase investment. They also found that those farmers assured by the confirmation of rights gained a 15.4% increase in total farmland investment. Therefore, confirmation of rights can stimulate farmers' awareness, eventually increasing forestry management and protection participation. In view of this, this study proposes Hypothesis 1:

H1: Confirmation of rights can affect farmers' participation in forestry management and protection.

2.2. Impact of Trust on Farmers' Forest Management and Protection Behaviour

Trust is a pervasive and imperceptible psychological component, and it can go beyond existing information to generalize some behavioural expectations [66]. As per the core component of the systems, trust can directly impact farmers' forestry management and protection behaviour, which requires effective communication, cooperation and restraint [67]. However, trust is an essential component of the social pillar of sustainability (see Dragicevic [68] and Bonisoli et al. [69] for more details). When a particular party can establish a profound trust, it can assist in establishing the required level of confidence and long-term cooperation. As farmers are highly risk-sensitive [70], they will most likely avoid or reduce participation in those if they find any risk of distrust associated with any conventions or interventions [71].

In the context of farmers' trust, the existing literature (such as Xu et al. [71], Juan and Ruiping [44] and Vayro et al. [72]) mostly identified the "possibility of obtaining help from

others in times of difficulty". Such an expectation will promote their willingness to participate in actions under the premise of taking risks [73]. The actors can reduce internal friction and promote the system's efficiency [74]. The framer's trust can be increased by extending the information flow between different social groups [70], promoting knowledge sharing, and enhancing farmers' control over forestry management and profit expectations [75]. Under the influence of trust, the actors' actions are more flexible and can better adapt to the requirements of the dynamic environment [76]. It should be emphasized that although trust is divided into interpersonal and institutional trust [29], both essentially mean that farmers have to rely on others to satisfy their interests [77].

Farmer household forestry management and protection include various activities such as forestry pest prevention, fire prevention, theft prevention, etc. Forestry management and protection need communication, cooperation and restraint among the core stakeholders. Trust in systems and institutions directly impacts farmer household forestry management and protection. Therefore, if farmers have sufficient trust expectations for any trusted party, it may incentivize farmers' forestry management and protection activities. Because of this, this article proposes Hypothesis 2a, Hypothesis 2b, and Hypothesis 2c

H2a: Trust positively affects farmers' forestry management and protection.

H2b: Interpersonal trust has an incentive effect on farmers' forestry management.

H2c: Institutional trust has an incentive effect on farmers' forestry management.

2.3. The Moderating Role of Trust between Confirmation of Rights and Farmers' Forestry Management and Protection Behaviour

As confirmation of right fosters significant security to use and possess a particular forest area, a specific interaction of trust may impact the farmer's decision-making [78] and significantly influence their participation in collective forest management and protection measures [79]. Regarding forest tenure and confirmation rights, the existing literature on forest management indicates that farmers' trust can be derived from interpersonal and institutional trust [80,81].

In China, family and village cadres significantly impact building a relatively stable trust relationship of "family management, family accounting, more work, self-financing" in actual management, which is embedded in the social structure [77,82]. Village cadres occupy a niche in China's governance structure and are considered the specific executors of national policy and local government administrative tasks [83]. The existing studies used the interaction of village cadres to evaluate interpersonal trust. According to the study of Xu et al. [71], farmers' interpersonal trust is largely influenced by the perception built within the village cadres. A higher level of village cadres of particular households can foster higher interpersonal trust [84]. In a study of smallholder farmers' perception and behaviour regarding community participation in Shaanxi, Chian Hu et al. [85] found that interpersonal trust can significantly mediate the farmer's trust and choice and influence decision-making. Therefore, it can be argued that if the farmer has positive interpersonal trust, they may participate better in forest management and protection [86,87].

Regarding the regulation of institutional trust to the confirmation of rights, institutional trust is the social identity of public institutions' rights allocation and management constraints [88]. Institutional trust is the social recognition of the allocation of rights and interests of public institutions and management constraints, which means that farmers have a higher level of trust, and the confirmation of rights has a more significant positive impact on their forestry management and protection [89]. In terms of the adjustment of interpersonal trust to the confirmation of rights, the respect and recognition of interpersonal trust to rural land rights and interests inhabits the farmer's direct behaviour ability, and higher interpersonal trust helps to control the decline of farmers' land perception [90]. Higher interpersonal trust helps to inhibit farmers' perception of land control [91]. Therefore, in an environment with a higher level of trust, the confirmation of rights may have a significant

moderating or interacting impact on forestry management and the protection of farmers. Because of this, this study proposes Hypothesis 3a, 3b and 3c:

H3a: Trust has a significant positive moderating/interacting effect on the relationship between confirmation of rights and forestry management and protection.

H3b: Interpersonal trust has a significant positive moderating/interacting effect on the relationship between confirmation of rights and forestry management.

H3c: Institutional trust has a significant positive moderating/interacting effect on the relationship between rights confirmation and forestry management and protection.

3. Materials and Methods

3.1. Data Sources

According to the Food and Agriculture Organization of the United Nations (FAO), smallholders are small-scale farmers, pastoralists, forest keepers, and fishers who manage areas varying from less than one hectare to 10 hectares [70]. The farmers in the collective forest area mainly engage in family operations, and the operation scale is relatively small [45]. Thus, the study selected smallholder farmers within the key collective forest areas in Zhejiang and Jiangxi provinces from August to September 2020 as primary respondents. Zhejiang and Jiangxi were chosen as these two provinces are regarded for their critical collective forest areas in the south, and both belong to the provinces where the new round of collective forest ownership was initially confirmed [92]. After carefully considering factors such as forest resources, economic development, and forest tenure reform, Anji County and Suichang County in Zhejiang, Sichuan County and Chongyi County in Jiangxi were selected as the research areas. Three townships were randomly selected from each county, and four administrative villages were randomly selected from each township. Based on the village size, 15 to 20 farmers were randomly selected from each of the selected villages.

The empirical data was comprised of face-to-face interviews and structured questionnaires. The questionnaire included all the critical variables of the study: the characteristics of the household head, basic family information, confirmation of forest land rights, forestry production and management, and trust in the village. The interviewed farmers were mainly family forest tenure holders and operators in collective forest areas. That is, they had a common identity as collective forest operators. In the formal survey, we first approached the household head with at least three years of experience in forest management and protection, and if the household head was unavailable, we obtained the required information from the immediate decision-maker from the particular household. In the formal survey, we approached 825 farmers. Among them, 109 respondents were excluded as they did not complete the survey at different stages of the actual survey. Some only filled in less than one-fifth of the questionnaire and lacked vital information, while others only lacked the critical information required for performing analysis. A total of 716 responses were obtained for further processing. In the final data, 34 samples were removed as they were missing essential information. Thus, 682 samples with complete information required for analysis were selected for final processing.

As the primary respondents of the survey were farmers, there may have been predominantly potential biases in the responses aligned with the existing literature (such as Yi et al. [89], Xu et al. [71] and Ahmad et al. [75]); thus, the study ensured the following steps. First, before performing the final survey, the team discussed and obtained oral permission from the village head and grasped critical inputs regarding the village structure and existing forest management and protection systems. This helped us understand the basic situation of the village and assisted in ensuring the farmers' responses were consistent with the village information. Second, the questionnaire was designed with confirmatory questions to ensure that farmers' answers to critical information were correct and consistent. Third, we ensured one-to-one interviews in the survey, preventing farmers from being

influenced by others. In addition, before final responses were obtained, we discussed and explained the context and content of the survey with each respondent.

3.2. Variable Selection

3.2.1. Yearly Engagement of Forest Management and Protection by Farmer

The forest production cycles in collective forest areas are relatively long, and in addition to the production input in the afforestation stage, farmers also need uninterrupted management and protection (including fire prevention, insect control, disease prevention, etc.) [45,93]. To effectively quantify farmers' forestry management and protection behaviour, it is more scientific and comparable to use management and protection experiences [94,95]. This is because experiences in forestry management and protection denote the number of days farmers spend on management and protection [96]. In addition, although the accuracy of measurement units of times is lower than that of days, the higher measurement times can provide substantial comparability between different farmers [97,98]. Therefore, to effectively quantify the forestry management and protection of farmers, and based on the existing literature (such as Ren et al. [45], Lu et al. [99] and Wang et al. [91]), the experience in management and protection was used as a proxy variable to measure forestry management and protection. We used the following question to grasp the experience: How many times did you engage in forest management and protection in a year? The survey found that 27% of farmers engaged in forestry management and protection 14.471 times per year, 57.18% were managed and protected 1–10 times per year, and 16.13% managed and protected the forest more than ten times a year.

3.2.2. Core Independent Variables

The forest tenure certificate is the factual evidence and proof for confirming forest land rights [80]. Therefore, "whether the forest land has been issued and confirmed" is the proxy variable for confirmation. The sample survey data shows that 90.5% of the farmers completed the issuance and confirmation of rights, while 9.5% did not complete the rights due to the collective failure to issue, boundary disputes and other reasons. Referring to the research of Walker [100] and Dong et al. [101], we utilized the following questions based on the five-level Likert scale, and the weighted average by the arithmetic mean of the responses was calculated. The weighted average denotes an arithmetic average. A weighted average is beneficial to match the frequency of values in a particular data set which can provide more reliable data than a basic average [102]. A weighted average is an average of factors when certain factors count more than others or are of varying importance. The observation unit is compounded by the weight allotted in a weighted average, then summed and divided by the total dataset [95]. The reliability of the observations may thus be increased by using a weighted average [103]. Aligned with the study of Xu et al. [71] and Wang et al. [91], we utilized the following question to measure interpersonal trust and institutional trust respectively: "How much trust do you have in your relatives, friends, neighbours, and villagers in the same village" and "How much do you trust the village committees, forestry management agencies, and township governments?". The Likert five-level scale used to determine farmers' trust in relatives and friends, neighbours and villagers in the same village was: very distrustful = 1, relatively distrustful = 2, trusting = 3, relatively trusting = 4, and very trusting = 5; farmers' trust in village committees, forestry management institutions, and township governments was: very distrustful = 1, relatively distrustful = 2, trusting = 3, relatively trusting = 4, and very trusting = 5. However, the overall level of trust was represented by the weighted average score of both types of trust. The survey data showed that the average comprehensive scores of the sample farmers' interpersonal, village and institutional level trust were 3.630, 4.072, and 3.188, respectively.

3.2.3. Control Variables

The variables of age, education level, and the cadres of the household head village were selected to represent the characteristics of the household head by referring to the

current research results [67,104,105]. The education level of the head of the household was measured by years of schooling, where primary schooling and below denotes six years, eight years are middle school, and ten years represent high school and above. The fact that the household head is a village cadre means they have a higher social status and non-agricultural employment, which may affect their management and care investment. The forestry labour force is measured by family members involved in forestry production activities. The cumulative number of household members was denoted as the total forestry labour force. Likewise, the forestry labour force and the number of migrant workers were selected to represent the characteristics of the family population.

The number of forest blocks and the forest land were preferred for measuring the total forested area. The distance to home and the distance from forest land to road represented the forest land endowment of farmers; the participation of cooperatives and the farmers who used timber forests were selected to represent farmers' management. The non-agricultural income was chosen to represent the degree of the non-agricultural station of farmers, and the policy publicity was selected to represent the policy environment. Finally, three county-level dummy variables of Suichang, Sichuan and Chongyi were introduced as the influence of unobservable regional characteristics on farmers' management and protection behaviour.

The head of the household's education level was measured by years. The higher the number of years of education, the higher the head of the household's education level. Table 1 represents the basic information of sample farmers.

Table 1. Basic information of sample farmers.

Name	Classification	Frequency	Proportion (%)	Name	Classification	Frequency	Proportion (%)
Forestry management	0 times	182	26.69	Age of head of household	45 and under	91	13.34
	1 time–10 times	390	57.18		45–60 years old	281	41.21
	More than 10 times	110	16.13		60 and over	310	45.45
Confirmation of rights	Confirmation	617	90.47	The educational level of the head of household	Primary school and below	350	51.32
	Unconfirmed	65	9.53		Junior high school	251	36.8
	[very low, low)	1	0.15		High school and above	81	11.88
Trust	[lower, general)	32	4.69	Head of the household village cadre	Yes	54	7.92
	[general, higher)	485	71.11		No	628	92.08
	[higher, very high]	164	24.05		0 people	241	35.34
	[very low, low)	1	0.15	Forestry workforce	1–2 people	420	61.58
Interpersonal trust	[lower, general)	5	0.73		3 people and above	21	3.08
	[general, higher)	171	25.07		1 hectare and below	457	67.01
	[higher, very high]	505	74.05	Woodland area	1 hectare–5 hectares	186	27.27
	[very low, low)	6	0.88		5 hectares and above	39	5.72
Institutional trust	[lower, general)	139	20.38	Timber forest-based farmers	Timber forest management	445	65.25
	[general, higher)	448	65.69		Other	237	34.75
	[higher, very high]	89	13.05	Non-farm income	50,000 yuan and below	364	53.37
Cooperative participation	Participate	89	86.95		50,000–100,000 yuan	157	23.02
	Not involved	593	13.05		100,000 yuan and above	161	23.61

3.3. Model Construction

The explanatory variable of this study was the count data, so the count model was more suitable for the research and analysis of this paper. Therefore, we first constructed the Poisson model of the number of labour forces involved in forestry management and protection as:

$$P(Y_i|x_i) = e^{\lambda_i}\lambda^{y_i}{}_i/y_i! \tag{1}$$

Among them, $y_i = 0, 1, 2, 3 \ldots\ldots n$; λ_i represents the average number of occurrences $E(Y_i|x_i) = \text{Var}(Y_i|x_i) = \lambda_i$. While assuming that the samples are independent and iden-

tically distributed, the sample likelihood function and its log-likelihood function are described as follows:

$$L(\beta) = \exp(\sum_{i=1}^{n} \lambda_i) \cdot \prod_{i=1}^{n} \lambda_i{}^{y_i} / \prod_{i=1}^{n} y_i \tag{2}$$

$$\ln L(\beta) = \sum_{i=1}^{n} [(-\lambda_i) + y_i \ln \lambda_i - \ln(y_i!)] \tag{3}$$

However, the number of farmers' forestry management and protection may fluctuate significantly due to unobservable heterogeneity so that the variance is greater than the mean, and the problem of over-dispersion occurs. In this case, the negative binomial distribution model can solve this problem. The negative binomial distribution relaxes and adjusts the Poisson distribution assumptions as follows:

$$E(y_{ij}) = \lambda_{ij}, \text{ while} Var(y_{ij}) = \lambda_{ij}(1 + \lambda_{ij}/\theta).$$

When θ approaches 0, $Var(y_{ij})$ is infinitely enlarged, and when θ approaches ∞ $Var(y_{ij})=E(y_{ij}) = \lambda_{ij}$, the model becomes a general Poisson distribution. The negative binomial distribution model is an extension of the Poisson distribution model, but it solves the problem of excessive data dispersion. In addition, there is a "zero accumulation" phenomenon in the number of farmers' forestland management and protection. The zero-inflated Poisson regression model and the zero-inflated negative binomial regression model may also be chosen for better fitting models. For this reason, this study also tested the regression effects of variables in the Poisson model, negative binomial model, zero-inflated Poisson model, and zero-inflated negative binomial model and selected the most suitable explanatory model. Table 2 portrays the detailed definitions of the variables used in the study.

Table 2. Variable Definitions.

Variable	Assignment Description	Mean	Standard Deviation	Minimum	Maximum Value
Dependent variable					
Forestry management	The number of forestry management and protection (year)	15.512	56.520	0	365
Core independent variable					
Confirmation of right	Whether the forestry land has been issued and confirmed: no = 0, yes = 1	0.905	0.294	0	1
Trust	The weighted score of the six types of object trust indicators of farmers	3.630	0.469	1.833	5
Interpersonal trust	The weighted score of farmers' trust in relatives, friends, neighbours, and villagers in the same village	4.072	0.531	1.667	5
Institutional trust	The weighted score of farmers' trust in village committees, forestry management agencies, and township governments	3.188	0.592	1.333	5
Control variable					
Age of head of household	(age)	57.051	9.898	22	78
Education level of the head of the household	(year)	6.624	3.367	0	16
Head village cadres	Yes = 1, no = 0	0.079	0.270	0	1
Forestry workforce	(people)	1.041	0.919	0	4
Number of migrant workers	(people)	1.459	1.169	0	5
Forest area	(ha)	1.463	2.860	.022	31
Number of forest blocks	(piece)	2.755	1.747	1	15
Woodland distance from home	(km)	2.910	2.085	0.010	15
Woodland to road distance	(km)	1.406	1.348	0.030	10
Timber forests are the main farmers	The largest proportion of timber forest area = 1, other = 0	0.652	0.477	0	1
Cooperative participation	Participated = 1, not participated = 0	0.130	0.337	0	1
Non-farm income	(10,000 yuan)	1.837	1.094	0	2.648
Policy Advocacy	Yes = 1, no = 0	0.390	0.488	0	1
Suichang	Suichang = 1, other = 0	0.236	0.425	0	1
Suichuan	Suichuan = 1, other = 0	0.242	0.429	0	1
Chongyi	Chongyi = 1, others = 0	0.235	0.424	0	1

4. Results

The model selection subsection shows that the Poisson model, negative binomial model, zero-inflated Poisson model, and zero-inflated negative binomial model may all be suitable for the number of forestry management and protection. The variables were brought into each model to test and find the most suitable. The mean and variance of forest management and protection times were 14.472 and 54.678, respectively, which did not meet the condition that the expected variance of the explained variables of the Poisson model is equal. Moreover, the *p* value of the Alpha test was 0, so the Poisson model was rejected. Similarly, in terms of the zero-inflated model, the Vuong statistic was −4.08, which was much smaller than the recommended value of −1.96, so the zero-inflated model was rejected. Therefore, we used the negative binomial regression model results to explain the influence of confirmation, trust and their interaction terms on farmers' forestry management and protection. The specific results of the negative binomial model are shown in Table 3.

Table 3. Benchmark model results and tests.

Variable	Model 1		Model 2	
	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Confirm right	0.613 **	0.243	0.606 ***	0.236
trust	0.967 ***	0.170	——	——
interpersonal trust	——	——	0.297 **	0.145
institutional trust	——	——	0.658 ***	0.144
Confirmation * Trust	——	——	——	——
Confirmation of power * interpersonal trust	——	——	——	——
Confirmation of rights * Institutional trust	——	——	——	——
age of head of household	0.842	0.574	0.668	0.549
Education level of the head of the household	0.026	0.028	0.019	0.027
Head village cadres	−0.951 ***	0.286	−1.017 ***	0.290
forestry workforce	0.468 ***	0.090	0.477 ***	0.089
Number of migrant workers	−0.234 **	0.095	−0.203 **	0.094
Forest area	0.366 ***	0.084	0.374 ***	0.084
number of forest blocks	0.177 ***	0.056	0.179 ***	0.057
Woodland distance from home	−0.059	0.045	−0.062	0.045
Woodland to road distance	0.045	0.066	0.045	0.065
Timber forest is the main farmer	−0.186	0.186	−0.182	0.186
Cooperative participation	0.301	0.281	0.324	0.284
non-farm income	−0.042	0.112	−0.070	0.109
Policy Advocacy	0.236	0.181	0.270	0.179
regional variable	controlled		controlled	
Log-likelihood	−2003.745		−2002.446	
Wald Chi *	222.54		221.89	
p-value	<0.001		<0.001	
sample size	682		682	

Note: ***, **, * represent the significance levels of 1%, 5%, and 10%, respectively; the interaction item in the table is the product of the variables after centralization; the age of the household head and the forest area are the logarithmic values of their actual values.

4.1. Benchmark Model Results and Analysis

The results of Model 1 and Model 2 in Table 3 show that the confirmation of rights had a significant positive impact on forestry management and the protection of farmers. It represented that complete confirmation of rights can foster higher enthusiasm levels of farmers for forestry management and protection. The contractual management rights, income rights, and disposal rights of forest land are clearly defined in the form of forest tenure certificates so that farmers have a clear management expectation for the future and there will be more significant economic incentives. The mechanism drives farmers to be more proactive in managing and protecting activities such as fire prevention, pest control, disease prevention, and fire prevention. Thus, hypothesis one (H1) was accepted.

The results of Model 1 in Table 3 show that trust significantly impacts farmers' forestry management. On the one hand, trust can reduce uncertainties in forestry management and protection. The more farmers follow the words and deeds of other subjects or social values, the higher their enthusiasm for forestry management and protection. On the other hand, trust is conducive to resolving disputes in the production process and the ownership of income. The higher profit expectations of farmers increase the number of forestry management and protection.

The results of Model 2 in Table 3 show that both interpersonal trust and institutional trust have a significant positive impact on farmers' forestry management. Interpersonal trust is expressed as the degree of trust of farmers in geography and kinship. A good environment of trust in geography and kinship is conducive to encouraging farmers to learn or imitate the behaviour of people around them, and it is also conducive to helping and supervising each other. Institutional trust represents farmers' affirmation of the system to ensure a viable forestry management situation, and the risk of having income loss encourages farmers to increase investment and active participation in forestry management and protection. Thus, hypotheses H2a, H2b, and H2c were accepted.

In terms of control variables, the head village cadres significantly and negatively impact the forestry management and protection of farmers. Farmers who serve as village cadres have industrial and commercial backgrounds and less leisure time for forestry management and protection, significantly inhibiting forestry management and protection. Forestry labour has a significant positive impact on forestry management behaviour. The richer the forestry labour resources, the higher the upper limit of the labour force that farmers can invest in forestry management and protection, which has an incentive effect on their forestry management and protection behaviours. The number of migrant workers significantly and negatively impacts forestry management and the protection behaviour of farmers. The number of migrant workers represents reduced labour resources available to farmers.

The higher the number of migrant workers, the more farmers rely on non-agricultural livelihoods, which increases the opportunity cost of their forestry management and protection, significantly inhibiting farmers' behaviour. Forest area has a significant positive impact on farmers' forestry management and protection behaviour. The larger the forest area, the more likely farmers are to rely on forestry for their livelihoods, and the degree of specialization is higher, thus promoting farmers' forestland management and protection. The number of forestland blocks has a significant positive impact on forestry management and the protection of farmers. The larger the number of forest blocks, the more scattered forest management, forcing farmers to increase the number of management and protection behaviour.

4.2. Results and Analysis of the Moderating Effect

Confirmation of rights may indirectly affect the forestry management and protection of farmers through the influence of trust. As shown in the results of Models 3 and 4 in Table 4, the interaction terms of confirmation of rights and trust, interpersonal trust, and institutional trust had no significant impact on farmers' forestry management and protection. Possible reasons for this are that the cultural attributes of trust make it relatively stable in a certain period, the confirmation policy is a new institutional form, and the related trust or trust relationship has not been effectively constructed, which makes the confirmation of rights and rectifies the relationship between them. Thus, hypotheses H3, H3a, and H3b were not supported. Therefore, the interaction term of confirmation of rights and trust was introduced, and the model regressed again.

Table 4. Moderating effect results and analysis.

Variable	Model 3		Model 4	
	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Confirm right	0.604 **	0.251	0.576 **	0.241
trust	0.967 ***	0.170	——	——
interpersonal trust	——	——	0.279 *	0.145
institutional trust	——	——	0.666 ***	0.141
Confirmation * Trust	−0.124	0.587	——	——
Confirmation of power * interpersonal trust	——	——	0.499	0.503
Confirmation of rights * Institutional trust	——	——	−0.554	0.382
Log-likelihood	−2003.722		−2001.600	
Wald Chi^2	222.54		231.57	
p-value	<0.001		<0.001	
sample size	682		682	

Note: ***, **, * represent the significance levels of 1%, 5%, and 10%, respectively; the interaction item in the table is the product of the variables after centralization; the age of the head of the household and the forest area is the logarithmic values of their actual values; control variable has been controlled.

4.3. Marginal Effect Results and Analysis

Based on the negative binomial model results mentioned above, this article further assesses the influence of confirmation of rights and trust on farmers' forestry management and protection behaviour. The results are shown in Table 5. From Model 5 and Model 6 in Table 5, it can be seen that each unit of increase in the confirmation of rights increased the number of farmers' forestland management and protection by 1.846 times. Similarly, each unit increase in trust increased the number of farmers' forestland management and protection behaviour by 2.631 times. The regression results of different dimensions of trust, as shown in Model 7 and Model 8, depicted that each increase of interpersonal trust by one unit increased the number of farmer's forest land management and protection by 1.346 times, and each increase of institutional trust by one unit increased the number of farmer's forest land management and protection behaviour by 1.930 times.

Table 5. Marginal effect results.

Variable	Model 5		Model 6		Model 7		Model 8	
	IRR	Robust Standard Error	IRR	Robust Standard Error	IRR	Robust Standard Error	IRR	Robust Standard Error
Confirm right	1.846 **	0.449	1.830 **	0.460	1.832 ***	0.433	1.779 **	0.428
trust	2.631 ***	0.448	2.630 ***	0.447	——	——	——	——
interpersonal trust	——	——	——	——	1.346 **	0.195	1.322 *	0.191
institutional trust	——	——	——	——	1.930 ***	0.277	1.946 ***	0.275
Confirmation * Trust	——	——	0.883	0.519	——	——	——	——
Confirmation of power * interpersonal trust	——	——	——	——	——	——	1.647	0.828
Confirmation of rights * Institutional trust	——	——	——	——	——	——	0.574	0.219

Note: ***, **, * represent the significance levels of 1%, 5%, and 10%, respectively; the interaction item in the table is the product of the variables after centralization; the age of the head of the household and the forest area are the logarithmic values of their actual values; control variable has been controlled.

5. Discussion

Based on an empirical setup, this study utilized institutional theory to construct and test a model for fostering confirmation of rights, trust and farmers' forestry management and protection behaviour. Aligned with existing studies (for example, Pagdee et al. [106]

and Wilkie and Painter [107]), we found that the confirmation of rights significantly promoted farmers' forest management and protection. Several other studies also advocated the importance of confirmation of rights for availing welfare of farmers in China [108,109]. Since land ownership in China is not transferable, farmers must obtain usage rights (the term "management right of rural contracted land" is used in Chinese law). It is a fact that the confirmation of rights can provide them more certainty to use the land and seek their livelihood [110].

Our study also depicted that interpersonal and institutional trust is a significant driver for farmers to participate in collective forest management and protection. As it happens, in China, personal relationships and kinship are crucial [111], and they can significantly change the interpersonal decision-making of the farmer [112]. It is a fact that if farmers have greater trust in systems and institutions, they will more likely obey the discretion made by the institutions, which is well aligned with the findings of this study. In research on agri-environmental management in the Netherlands, De Vries et al. [43] outlined similar findings. In a study of Shaanxi Province and Sichuan Province, China, Dai et al. [113] evaluated the impact of communal forest management on nature reserve protection dilemmas in China and found similar results. We also analysed further and found a negative interaction between confirmation of rights and overall trust, which is quite different from the study of Copena et al. [114]. In terms of involving actors, our study found that the number of village leaders and migrant workers significantly and negatively impacted farmers' forestry management and protection. In a study of sustainable forest management in Tajikistan, Kasymov et al. [115] outlined similar findings. The number of forest labour force, forestland area and forestland management blocks had a significant positive impact. In the study of rural Ethiopian participatory forest management practices, Gatiso [11] depicted similar findings.

6. Conclusions

Based on the institutional theory, this article assessed property confirmation of rights, trust and farmers' forestry management and protection behaviour in an integrated framework. It then used 682 data of farmers in collective forest areas in Zhejiang and Jiangxi to establish a counting model to verify the impact of rights confirmation, trust and their interaction terms on farmers' forestry management and protection. This study is expected to assist the government in understanding the critical interaction between farmers' confirmation of rights and collective trust, and formulate and promote farmers' forestry management and protection. Moreover, the findings will help the legislator in structural optimization and deepen the reform of forestry rights. The negative binomial regression model presented in the study has shown that confirmation of rights and collective trust have a decisive role in promoting forestry management and the protection of farmers. Moreover, it represents the perceived degree of forestry property rights. The following policy guidelines can be drawn from the analytical approach and discussion section.

(i) Strengthening the trust mechanism is required to improve the forestland rights confirmation system further within China's aspects of collective forest areas. Moreover, it should be highlighted as an effective institutional incentive for farmers' participation in forestry management and protection. (ii) It is necessary to implement the forestland rights confirmation policy further, solve the problems of shortcomings of the existing forest rights and unclear boundaries at the grassroots level, and realize the integration of farmers, forest land, and forest tenure certificates. The government should consciously strengthen the structure of a trusted environment through social, cultural and other means and strengthen the rural collective credit system to shape farmers' interpersonal trust and empowerment of rural households. Likewise, the government should strengthen the publicity of forestland rights confirmation policies and improve farmers' awareness of forest tenure certificates. (iii) As the cultural attribute of trust is destined to be difficult to change in the short term, the government should accelerate the construction of certain formal institutions in a targeted manner.

This study also faced some limitations and challenges, which need to be considered in future research. The cross-sectional data used in this paper cannot profoundly investigate the evolution process of confirmation of rights and trust and their dynamic impact on farmers' forestry management and protection. The responses from emerging countries' farmers can be biased. Therefore, a potential study should try to obtain panel data for analysis. The current analysis specifically focussed on the data collected from two provinces. In future research, the study area should be further expanded based on the research framework. Likewise, considering the role of trust, the potential study should develop the connotation, types and measurement methods of forest land ownership determination, adopt more ways to measure farmers' investment in forestry management and protection, build more realistic decision-making scenarios, and deeply reveal the internal relationship between ownership determination, trust and farmers' forestry management and protection. Predictive behaviour modelling tactics can be integrated with the presented design with diverse scenarios. Moreover, future researchers should consider various structural modelling tactics, including slacks-based measure (SBM) and super SBM, that present a more robust structural representation of the outlined framework.

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Institutional Review Board Statement: This study did not involve personal data, and the respondents were well aware that they could opt-out at any time during the data collection phase. Moreover, we obtained verbal consent from every respondent before starting the formal survey. Therefore, any written Institutional Review Board statement is not required, which aligns with the Declaration of Helsinki.

Informed Consent Statement: This study obtained verbal informed consent from all subjects involved before starting the formal survey.

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