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Source: Tropical Conservation Science, 15(1)

Published By: SAGE Publishing

URL: <https://doi.org/10.1177/19400829221084562>


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Multi-Dimensional Social Capital and Farmer's Willingness to Participate in Environmental Governance

Tropical Conservation Science
Volume 15: 1–12
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DOI: 10.1177/19400829221084562
journals.sagepub.com/home/trc


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Abstract

Background: The construction and development of formal institutions has been lagging behind in rural areas of China for decades, so the role of social capital is particularly important. In the context of China's implementation of the rural revitalization strategy, considering the impact of social capital on farmers' willingness to participate in environmental governance is profitable to the improvement of rural human settlement environment and the increase in the implementation efficiency of relevant policies.

Methods: Based on the micro-data of villages in Anhui Province, this paper uses the logit model to explore the effects of social capital of trust, network, and norm on farmers' willingness to participate in environmental governance.

Results: The results show that both network social capital and norm social capital have a significant effect on farmers' willingness to participate in environmental governance, and the marginal effect of network social capital is greater than that of norm social capital. After controlling both social network and social norm, however, the effect of social trust is not evident. With the improvement in farmers' schooling level and income level, the impact of social network and social norms on farmers' willingness to participate become gradually insignificant, and social capital appears to be "the capital of the poor."

Conclusion: Given the above results, we can improve the willingness of farmers to participate in the village environmental governance and lay a solid foundation for the improvement of rural human settlement environment by cultivating village trust, broadening social network, and creating a social custom of mutual benefit.

Implications for Conservation: Effective environmental governance is an important measure to achieve sustainable development goals. Farmers' willingness to participate in environmental governance plays a significant role in improving the effectiveness of rural environmental governance. Accordingly, the study of how social capital affects farmers' willingness to participate provides not only valuable enlightenment for rural environmental governance and protection, but also a long path for sustainable development and biodiversity protection.

Keywords

trust social capital, network social capital, norm social capital, farmer participation, environmental protection

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Received: 28 October 2021; revised: 1 February 2022; accepted: 15 February 2022

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Introduction

In the middle of the 20th century, some developed countries noticed the pollution of domestic sewage and promulgated a series of laws to actively improve the domestic sewage treatment rate. According to the data from the Ministry of Housing and Urban-Rural Development (MOHURD) of China in 2019, China's urban sewage treatment rate is 96.81%, while the rural sewage treatment rate is only 33.30%, and the per capita park area in rural areas is only one-ninth of that in urban areas. Moreover, the data from the National Bureau of Statistics of China in 2019 shows that the amount of agricultural plastic film used was 2.4077 million tons and the amount of pesticides used was 1.917 million tons, of which Anhui province accounted for 4.31% and 6.32%, respectively. Therefore, the pollution caused by agricultural life and production has become a prominent shortcoming that restricts the transformation and development of rural areas. Faced with the double constraints of resource allocation and environmental governance, there is a long way to go for environmental governance in China rural development (Yu, 2018). Furthermore, the first meeting of the 19th the Communist Party of China (CPC) Central Leading Group for Comprehensively Deepening Reform deliberated and adopted the "Three-year Action Plan for the Improvement of Rural Living Environment," aiming to accelerate the improvement of rural living environment and further improve the level of rural living environment (Central office of the people's Republic of China, office of the State Council, 2018). The 2019 «Government Work Report» put forward that it is necessary to carry out the improvement of rural human settlements according to local conditions, promote the "toilet revolution," trash and sewage treatment, and build beautiful villages (State Council government working report, 2019). The sanitary conditions of toilets are directly related to the health of people in developing countries and the protection of the ecological environment, and the toilet revolution is dedicated to improving the sanitary conditions of toilets.

At present, the pollution of life and production in rural areas in China severely affects the play of rural production and ecological functions. In the context of the "strategic of rural vitalization" proposed by the Chinese government, rural environmental governance has important practical significance for promoting the rural revitalization strategy and ecological civilization construction (Deng & Wang, 2019; Wang et al., 2020a). The village environment is the hidden wealth shared by villagers. Rural environmental improvement is related to the building of a moderately prosperous society in all respects, the fundamental well-being of farmers, and the civilization and harmony of rural society. The necessity, importance, and urgency of rural environmental management are obvious.

Rural environmental governance is a public issue that requires the involvement of farmers to produce real results.

As environmental governance is characterized by large investment, low direct economic benefit, and insignificant short-term benefit, it commonly falls at the end of the investment willingness of local governments. It is not reasonable to take the government or market as the only way to solve environmental public affairs. Without the participation of farmers, the relevant governance policies formulated by the government will be trivial and cannot be put into practice, easily forming the "prisoner's dilemma" of environmental regulation. We should analyze the independent governance of the rural environment from the perspective of self-organization (Ostrom, 1990). Problems like the uncertainty of environmental problems make the government confront many difficulties in the process of environmental governance. Introducing the power of the public can effectively reduce the burden of the government (Huang et al., 2017). As a new rural environmental governance mechanism, farmer participation is particularly crucial in rural environmental governance. Social capital has become an important analytical perspective that affects farmers' willingness to participate in environmental governance, such as farmers' willingness to participate in carbon sink management (Han et al., 2017), ecological compensation (Zhang et al., 2013), invest in environmental protection (Yan et al., 2016), etc. In addition, China is a typical relationship society, especially in rural areas where formal system construction and development are relatively backward. Social capital affects almost all aspects of rural society, such as the supply of village public goods, community governance, peasant household capital loans, farmers' health, income, etc. (Wang et al., 2017, 2019). The influence of social capital on farmers' individual behavior is particularly prominent in rural society, which provides a new idea for social capital to intervene in rural environmental governance. There are some differences in farmers' incomes and schooling levels between the eastern and western regions of China. To ensure the accurate implementation of environmental governance policies, these factors must be considered. Therefore, whether social capital affects farmers' willingness to participate in environmental governance? What sort of social capital has more effect on farmers' involvement? Whether there are differences in income and educational background between social capital and farmers' willingness to participate in environmental governance? There is no doubt that these problems are worth discussing.

This paper analyzes the effects of social capital of trust, network, and norm on farmers' willingness to participate in environmental governance using micro-survey data of rural areas in Anhui Province of China. Different from the existing studies, the main contributions of this paper are as follows. First, most studies on social capital's effect on farmers' willingness to participate in environmental governance are analyzed from one dimension of social capital, while its mechanism needs to be further studied. Moreover, the importance of different dimensions of social capital needs to be

clarified. Second, the existing research is mostly qualitative research based on case analysis, while quantitative research is comparatively uncommon. Based on micro-survey data of rural areas in Anhui Province of China, this paper uses the economic model to empirically analyze the influence of various dimensions of social capital, providing a new perspective for the improvement of rural human settlement environment. Third, this paper investigates whether there are differences in the role of social capital among different groups (high-income farmers and low-income farmers, high-education farmers vs. low-education farmers) and whether social capital is more likely to be the social capital of the poor.

The rest part of the paper is organized as follows. Literature Review and Research Assumptions section reviews the literature and makes hypotheses. The Methods chapter describes our data sources, model building and variables. The Results chapter report key findings and discussion. Discussion section summarizes and provides policy recommendations.

Literature Review and Research Hypothesis

Putnam (1993) proposed that social capital refers to the characteristics of social organizations, such as networks, trust, and norms, which are conducive to mutually beneficial actions and collaboration. Ostrom (2009) states that the mechanism of trust, supervision, and regulation generated through communication and game among members will prompt participants to adopt behaviors that conform to common interests, thereby helping to overcome the dilemma of traditional environmental governance models. Song (2010) proposes that rural social capital can break the “Prisoner’s Dilemma” of farmers’ cooperation, and resolve conflicts of interests in the environmental protection of the participants, so as to facilitate the achievement of environmental protection goals. Anderson and Schirmer found that social capital and social network had a significant effect on improving the public’s willingness to participate in low-carbon infrastructure construction (Anderson & Schirmer, 2015). Social capital is also found to influence farmers’ willingness to participate in farmland protection and watershed ecological management through information transmission, trust mechanism, and normative constraints (Shi et al., 2018, 2019).

As there is a significant positive correlation between organizational social capital level and environmental governance performance (Liu, 2011), the improvement of organizational social capital level is favorable to the development of the green economy in China (Wan & Liao, 2018). Harring (2013) shows that social trust contributes to protecting the environment based on the data of the International Social Survey Program. Taking rural waste recycling as an example, Yan et al. (2016) argue that social capital can promote farmers’ willingness to participate in environmental investment. Multi-dimensional heterogeneity of social capital has a significant impact on farmers’ participation in the

supply of quasi-public goods (Miao, 2014). Farmers with higher levels of social capital networks, norms, and trust are more likely to engage in pro-environmental behaviors (Zhu and Lei, 2018). Social capital, such as networks, can not only effectively solve the problem of the high cost of policy supervision and implementation in environmental protection but also promote collective action in environmental protection to ensure the realization of policy objectives (Feng et al., 2019). Hu and Zhuang (2019) found that trust, networks, and norms have clear benefits in carrying out collective actions, reducing governance costs and forming long-term mechanisms. There is a nonlinear relationship between social capital and environmental governance performance, and the impact of social capital on environmental governance results has an institutional heterogeneity effect (Qi et al., 2015; Wang et al., 2020b). Studies have found that social capital stock will have positive or negative impacts on environmental governance (Du et al., 2016). A review of the existing literature shows that social trust, social networks and social norms all play a role in the process of environmental governance.

Deutsch (1958) suggests that trust is an individual’s expectation of something or other individuals, and responding to this expectation. The improvement of the level of trust between individuals has a positive impact on individuals making positive responses. Bohr (2014) takes the American residents’ environmental protection activities at the expense of their own interests as the research object, empirically analyzes the determinants, and concludes that the increase in social trust contributes to the supply of public goods. He et al. (2015) divides social trust into interpersonal trust and institutional trust and shows that social trust can effectively improve farmers’ willingness to participate in environmental governance. The higher level of trust reflects the higher expectations of individuals for the future, which strengthens the willingness of individuals to cooperate with other individuals. The higher the social trust, the stronger the willingness of farmers to participate in environmental governance. Therefore, this paper puts forward:

H1: The higher the degree of social trust, the stronger the willingness of Chinese farmers to participate in rural environmental governance.

Based on consanguinity and geography, Chinese humanistic tradition forms a “pattern of differential order,” with individuals as the center, spreading out layers to form a network of relationships. Consanguinity and geography are the bonds of interpersonal relations and also part of the capital of modern society. To improve the level of rural environmental governance, it is imperative to increase the participation of farmers (Wang et al., 2013), and various participants in the social network can increase their benefits by strengthening the frequency of cooperation (Putnam et al., 1994). Hu and Hu (2016) suggest that social networks are considered as the foundation for the existence of rural social

capital; therefore, the coverage and stability of farmers' social networks have an important impact on environmental governance. This invisible network connects each subject in rural environmental governance. The greater the density of the network, the closer the interconnection between the subjects, the faster the flow of information, and the wider the network coverage, the more subjects will participate in rural environmental governance. The extension of social network will drive more farmers and groups to participate in the activities of human settlement environment governance, thus enhancing farmers' sense of participation, sense of gain, and happiness. Accordingly, this paper puts forward:

H2: The level of social networks positively affects the willingness of Chinese farmers to participate in rural environmental governance.

Different from formal institutions, social norms are a type of behavioral norms that mediate social relations between people. The behavioral norms and standards shared by all members of a social group are social norms, including customs, religious norms, ethical norms, association characters, and legal norms. Social norms are embedded in the ideology of farmers in the form of "inherited ethical habits," which can reduce the transaction cost of ethical law approval due to rational disapproval (He et al., 2019). Studies have identified that reputation demands such as fame and face can substantially promote farmers' environmental-friendly behaviors (Xu et al., 2016). Putnam asserts that social norms can merge self-interest with solidarity and mutual assistance to better solve problems of action. When social norms constrain people's behaviors, it is possible for farmers to participate in the environmental field, allowing all entities to voluntarily maintain common environmental resources. This in turn contributes to subjects' active participation in environmental governance and increases farmers' willingness to participate in environmental governance. Accordingly, this paper puts forward:

H3: The degree of social norms positively affects the willingness of Chinese farmers to participate in rural environmental governance.

Methods

Research Design

In order to make the research more credible, quantitative, and qualitative methods are utilized, respectively (Wang et al., 2020a, 2020b). This research quantitatively analyzed the relationship between social capital and willingness to manage the environment through a literature review and a questionnaire survey.

Research Population, Sample Size, and Sampling Procedure

Based on the 2019 national annual environmental data statistics, air quality data, and cross-sectional water quality monitoring data in various regions of Anhui Province, 7 counties from these four regions are selected comprehensively on the rural environment, rural agriculture, and industrial development, and about 10 administrative regions are selected for each county. In the village, a questionnaire survey is conducted on a household basis. Delete the questionnaire whose long-term residential address does not belong to Anhui Province and the farmer samples whose main information is missing, and 376 valid questionnaires were obtained with an effective response rate of 96.7%.

Research Data and Instrument for Data Collection

The questionnaire design used in this paper assigns "very poor," "poor," "average," "good," and "very good" to 1–5 following the Likert 5-level scaling. Questions about frequency were selected according to reference criteria. The indicators listed in the questionnaire mainly include the characteristic information of the individual samples, the social capital of the village samples and the environmental status and governance of the village samples. Information of the individual sample includes gender, age, education level, personal annual income, annual household income, per capita arable land area of the sample village, and distance to the nearest township government. The social capital of village samples is measured from three dimensions: social trust, social network, and social norm. The environmental status of the village samples incorporates the existing pollution conditions, major sources of pollution and the primary condition of comprehensive treatment of the environment.

Research Data and Instrument for Data Collection

The Likert 5-level scale is used in the questionnaire design of this research. The options of each variable in the social capital measurement are arranged in a deepened order from 1 to 5. The results of willingness to participate in environmental governance are unwillingness and willingness. The OLS model regards sorting as cardinality processing, so we choose Logit model. Assume that the determining equation of villagers' willingness to participate in environmental governance is as follows

$$\text{logit}(\text{willingness}_i = 1) = \Phi(\phi_1 + \beta X_i + \mu_i) \quad (1)$$

$$\text{logit}(\text{willingness}_i = 1) = \Phi(\alpha_1 \text{Trust}_i + \alpha_2 \text{Network}_i + \alpha_3 \text{Norm}_i + \beta X_i + \mu_i) \quad (2)$$

where the subscript i represents the i th interviewed individual, the explained variable y_i is the dummy variable of the individual samples' willingness to participate in environmental governance activities in the village, and μ_i is the random error term.

Measurement of Research Variables

In this paper, villagers' willingness to participate in environmental governance activities in villages is measured as the proxy variable of rural environmental governance indicators. According to the willingness of individual villagers to contribute labor or cash when their village is under environmental governance, the values of "not willing" or "willingness" are 0 or 1, respectively.

This paper measures individual social capital ownership from three dimensions of social trust, social network, and social norms to quantify the stock of social capital. The synthesis method utilizes principal component analysis, and reference to Zhao (2012) and Li et al. (2019) assumes that social capital can be measured.

Social Trust. According to Coleman's classification of social trust, we split social trust into interpersonal trust and institutional trust. In this paper, three indicators of interpersonal trust are selected: village trust (VT), neighborhood trust (NT), and relative trust (RT). The measurements of these three indexes are based on questions of "Do you trust your relatives?" "Do you trust your neighbors?" "Do you trust people in your village?" respectively. The variable of the trust of village cadre and village committee (GT) is selected from the institutional trust, which is measured based on the question of "Do you trust the village cadres and committees?" For the above question, the values of 1, 2, 3, 4, and 5 are assigned according to the trust intensity (very distrust, distrust, average, trust, very trust), respectively.

Social Network. The social network mainly depends on the attitude of the villagers to help when there are weddings or funerals in the village, which is reported by the respondents according to their own feelings. Referring to Miao (2014) and Zhao (2012), social networks are measured by five questions: "How do villagers' willingness to contribute when labor and energy are needed in village roads and water conservation facilities?" "How do villagers' willingness to help when there are weddings or funerals in the village?" "During the harvest time, how villagers' willingness to help each other?" "How villagers' willingness to participate in the village cadre election?" "How villagers' willingness to contribute when labor and fund are needed to construct infrastructure in the village?" The values of 1, 2, 3, 4, and 5 are assigned according to their willingness to help (very not active, not active, average, active, very active), respectively.

Social Norm. Referring to Miao (2014) and Shi et al. (2019), social norms are measured by four questions: "Are there any

public rules such as the 'villager conventions' 'village conventions' in the village? How carefully do villagers adhere to the rules?" "What do you think of the effect of implementing a certain regulation in the village?" "What do you think should be done if someone in the village does something harmful to their interests?" "Will the villagers report their problems to the village cadres and committee? How much attention is paid to by the village cadres and committee?" The values of 1, 2, 3, 4, and 5 are assigned according to the degree (very bad, bad, average, good, very good), respectively.

Control Variables. Studies have found that gender, age, and educational level have important effects on farmers' willingness to participate (Feng et al., 2014; Zhu, 2008). Following these studies, we choose several personal characteristic variables, including Gender: male is assigned as a value of 1 and female a value of 0; Age: the actual age of the interviewee; Degree of education: in order to reduce information loss, the educational level of respondents is assigned according to the selected educational years limit, so the value of illiteracy is 1, the value of primary education is 2, the value of middle school, secondary vocational school, or technical secondary school is 3, the value of junior college or bachelor's degree is 4, and the value of education level above bachelor's degree is 5; and Annual household income: it is divided into five grades: less than 10,000 yuan, 10,000–30,000 yuan, 30,001–50,000 yuan, 50,001–100,000 yuan, and more than 100,000 yuan, which are assigned as values of 1, 2, 3, 4, and 5, respectively. We also consider other factors that may affect villagers' willingness to participate in comprehensive governance of human settlement environment, such as the characteristics of villagers' environmental perception (Lin et al., 2016; Zhu, 2008). Because individual farmers are the main agricultural production and operation units in China, small-scale agriculture makes it difficult to conduct soil quality tests. China implemented the "river chief system" in 2017, which requires each river and lake to have a person in charge, indicating that the country attaches great importance to the management of water quality and the environment. Therefore, the evaluation of individual samples of village water quality is selected as the characteristic variable of environmental perception in this paper.

Results

This section presents the results and the discussion of the findings. Before the regression, the data and collection methods are tested for reliability. We use KMO (Kaiser–Meyer–Olkin) statistical tests and Bartlett spherical tests. In the reliability test, the Cronbach's α coefficients of social trust, social network, and social institution are 0.866, 0.822, and 0.828, respectively. In the validity test, the KMO value is 0.931, and the p value of Bartlett sphericity test is less than 0.05. It can be seen that the questionnaire design and

questionnaire data used in this paper have passed the validity and reliability test and are suitable for further research.

Demographic Characteristics of the Respondents

Table 1 presents the demographic characteristics of the respondents.

The basic characteristics of village samples are that 70.18% of the village samples have garbage disposal centers or centralized collection points, while only 32.39% have sewage treatment centers, which reflects the seriousness of rural sewage treatment problems. The basic characteristics of the individual samples are as follows: most of the individual samples are male; approximately half of the individuals surveyed have an annual income of less than 10,000 yuan. About 51.7% of households have an annual income of less than 50,000 yuan; about three-quarters of individuals have a high school education or below.

Table 1. Variable Correlation Table.

Variables	Willingness	Trust	Network	Norm
Willingness	1.00			
Trust	0.24	1.00		
Network	0.36	0.68	1.00	
Norm	0.37	0.58	0.69	1.00

Table 2. Descriptive Statistics for all Variables.

Variables	Variable description	Max	min	Mean	S.D.
Trust	The degree of trust in relatives	1	5	3.88	0.804
	The degree of trust in neighbors	1	5	3.70	0.763
	The degree of trust in villagers in the same village	1	5	3.58	0.792
	The degree of trust in village cadres and village committees	1	5	3.70	1.022
Network	The degree of villagers' willingness to contribute when labor and energy are needed in village road and water conservancy facility	1	5	3.91	0.846
	The degree of villagers' willingness to help when there are weddings or funerals in the village	1	5	4.07	0.785
	The degree of villagers' willingness to help each other during the harvest time	1	5	3.69	0.757
	The degree of villagers' willingness to participate in the village cadre election	1	5	3.82	0.904
Norm	The degree of villagers' willingness to contribute when labor and fund are needed to construct infrastructure in the village	1	5	3.56	0.944
	The degree of villagers adhering to the common policy	1	5	3.25	1.245
	The effect of implementing regulations in the village	1	5	3.65	0.962
	The attitude of villagers when someone in the village does something harmful to the public interest	1	5	3.80	1.177
Willingness	The attitudes of villagers toward reporting problems to village cadres and committee and the degree of attention paid to by village cadres and committee	1	5	3.44	1.167
	The degree of villagers' willingness to contribute when the village undertakes environmental governance (unwillingness=0, willingness=1)	0	1	0.83	0.379
Control variables	Gender	0	1	0.83	0.375
	Age	18	72	29.24	14.683
	Annual household income (fincome)	1	5	3.28	1.294
	Village water quality (wq)	1	5	3.39	1.102

Note. In the above table, except for the willingness to participate in environmental governance, gender, age, and household income, the mean value of variables is obtained from the assignment value of 1, 2, 3, 4, and 5, according to the degree of very poor, poor, fair, good, and very good, respectively.

Analysis of Empirical Results

Model Regression Results. The regression results are reported in Table 2. Models 1, 2, and 3 are Logit models, including social trust, social network, and social norm, respectively. In all models, control variables such as gender, age, family annual income, education level, and perception of water quality are included. The input margin effect is to consider the change ratio of farmers' willingness to participate in environmental governance when the level of social capital in each dimension increases by 1 percentage point when trust, network, and social capital are simultaneously controlled.

Compared with columns 1 and 4 of Table 3, when social networks and social norms are not controlled, the regression result of social trust is 0.473, which is significant at the 1% level. When the three factors are controlled simultaneously, the regression result for social trust is 0.0241, which is not significant, suggesting that the improvement of social trust level cannot effectively improve farmers' willingness to participate. Bohr (2014) and He et al. (2015) only consider the impact of trust. Qualitative analysis shows that social trust has a certain impact on environmental governance, which is consistent with the first column of Table 3. When trust, network, and norm are considered at the same time, the change in trust level may be constrained by the degree of norm, leading to an insignificant influence of trust on farmers' willingness to govern environmental governance. Granovetter (1983) describes the strength of the relationship between neighbors as a "strong connection," which is manifested as a

Table 3. Dimensional Logistic Regression Results of Social Capital.

Variable	Model 1	Model 2	Model 3	Model 4	Marginal effect (based on Model 4)
Trust	0.473*** (0.1166)			0.0241 (0.1606)	0.242% (0.0161)
Network		0.803*** (0.1396)		0.488*** (0.1673)	4.914%*** (0.0162)
Norm			0.750*** (0.1218)	0.538*** (0.1367)	5.418%*** (0.0130)
Gender	-0.114 (0.3761)	-0.197 (0.3966)	-0.235 (0.3852)	-0.259 (0.4058)	-2.609% (0.0407)
Age	-0.0408*** (0.0107)	-0.0327*** (0.0111)	-0.0311*** (0.0115)	-0.0286** (0.0115)	-0.287%** (0.0011)
Fincome	0.155 (0.1234)	0.205 (0.1308)	0.134 (0.1322)	0.158 (0.1354)	1.589% (0.01365)
Edu	0.290 (0.2257)	0.423* (0.2340)	0.515** (0.2312)	0.575** (0.2538)	5.784%** (0.0250)
Vwq	-0.146 (0.1476)	-0.378** (0.1622)	-0.417** (0.1636)	-0.548*** (0.1742)	-5.516%*** (0.0168)
C	-1.261 (1.3114)	-4.339*** (1.5116)	-2.699** (1.3499)	-5.276*** (1.6226)	

Note. 1. Standard errors are displayed in parentheses. 2.***, ** and * represent significance at the 1%, 5%, and 10% levels, respectively.

long-term high-frequency multi-dimensional interaction (the so-called “meet regularly or frequently”). This interaction enhances farmers’ sense of identity with each other, thereby reducing the transaction costs of the agreed action. Nonetheless, this sense of identity can be affected by many factors, particularly when the relationship network and social norms exist at the same time, which may weaken the influence and lead to the insignificant impact on participation intention.

As can be seen from the results of Model 2 and Model 4 in Table 3, the regression results of social networks are 0.803 and 0.488, respectively, which are positively significant at the 1% level, and the coefficients are both positive. Therefore, it shows that the improvement of social network level is conducive to improving farmers’ willingness to participate in environmental governance. As can be seen from the last column of Table 3, at the current level, if the level of social network increases by 1%, the probability of farmers participating in environmental governance activities will increase by 4.914%. This is consistent with the results of the qualitative analysis by Hu and Hu (2016). Just as the social network is defined as “a unique set of connections between a group of specific individuals,” the governance of the human living environment can also be recognized as a unique connection among villagers. Since farmers in the same village live in the same environment with the same air, water, and soil quality, the environment can be recognized as a hidden treasure shared by the village. Social networks increase the connections between farmers, speed up the flow of information, and promote more farmers and groups to participate in human settlement governance activities, thereby enhancing farmers’ sense of participation, sense of gain, and happiness. Improving the level of social network will encourage more farmers to participate in environmental protection activities, and this personal participation and practical experience will enable farmers to voluntarily protect the common hidden wealth—environmental quality. Consequently, the improvement in social network level has a positive effect on farmers’ willingness to participate in environmental governance.

Compared with columns 3 and 4 in Table 3, the regression results of social norms are 0.750 and 0.538, respectively,

which are significant at the 1% level, and the regression coefficients are positive, indicating that the higher the degree of social norms, the stronger the willingness of farmers to participate in environmental governance by 5.418%. The marginal effect of social norms is greater than that of social networks. This is consistent with the analysis results of Xu et al. (2016). The marginal effect of social norms is greater than that of social networks. Social norms are a type of moral restraint, which are non-mandatory self-discipline norms to restrain the subject’s behavior. Social norms can restrain environmental damage and enable farmers to voluntarily preserve common environmental resources. The higher the degree of social norms in villages, the stronger the restraint on farmers’ behavior and the stronger the cohesive force when “working with one heart and one mind.”

Sub-Samples Estimation. Higher the income of farmers, the higher their evaluation of the effect of rural public goods supply (Wang et al., 2019; Zhu et al., 2011). The effect of village environmental governance is quasi-public goods, and the higher the farmers’ evaluation of the effect of village environmental governance, the stronger their willingness to participate in the governance. Accordingly, according to the annual personal income and education level of the individuals interviewed, the data were divided into the high-income group (annual income over 50,000 yuan), the low-income group (annual income below 50,000 yuan), the high-education group (high school education or above), and the low-education group (high school education or below). The regression results are shown in Table 4.

In order to make the research results more conducive to the precise implementation of policies, we are more concerned about the role of social capital of different dimensions among different groups, in addition to considering the impact of social capital on farmers’ willingness to participate in environmental governance. Income level and schooling level will have a significant impact on individual environmental protection behavior (Fan, 2020). The difference in farmers’ income will modify the supply of agricultural public goods.

Table 4. Result of Sub-Samples Regression.

Variables	(1)		(2)	
	Low-income	High-income	Low-education	High-education
Trust	-0.0102 (0.1679)	-0.0980 (0.3301)	0.0391 (0.1805)	0.155 (0.4435)
Network	0.490*** (0.1753)	0.628* (0.3470)	0.416** (0.1831)	0.491 (0.4443)
Norm	0.558*** (0.1448)	0.559 (0.3465)	0.551*** (0.1542)	0.667* (0.4039)
C	-5.249*** (1.5672)	-4.881 (3.6165)	-2.946** (1.4608)	-6.132** (3.0305)
Control variable	Yes	Yes	Yes	Yes

Note. 1. Standard errors are displayed in parentheses. 2.***, ** and * represent significance at the 1%, 5%, and 10% levels, respectively.

The following conclusions can be drawn: First, when social network and social norms are controlled at the same time, social trust of the four groups has no obvious effect on farmers' willingness to participate in environmental governance; Second, social norms and social networks have a more significant effect on low-income farmers' willingness to participate, while their effect on high-income farmers is not obvious. Third, farmers with low schooling level are substantially affected by social network and social norms, while farmers with high-education level are not significantly affected by social trust and social network dimensions. As can be seen from the regression results, with the increase in farmers' income levels, the impact of social norms on farmers' willingness to participate in environmental governance has progressively become insignificant. Likewise, the effect of social norms and social networks on the willingness of farmers with low schooling levels to participate in environmental governance is more significant. Therefore, based on the average education level and income level of villages, taking different incentive measures for farmers' willingness to participate in environmental governance will result in better environmental governance effects.

Robustness Test

Replace the Explanatory Variable by Different Methods. There may be deviations when social capital is divided into social trust, social network, and social norm, so we consider replacing the independent variable. There are two methods commonly used by scholars to synthesize social capital. One is to synthesize social capital (SCI) by using principal component analysis; the other is to obtain social capital by directly summing up the sub-dimensional indicators. In order to reduce variable construction error, this paper utilizes two methods to synthesize the three variables of social trust, social network, and social norms into total social capital. The regression results are as follows (Table 5).

This paper controlled personal perceived characteristics of gender, age, annual household income, education level, and water quality. The results in the above table show that social capital is significant at the 1% level, which further confirms that social capital has a positive impact on the improvement of villagers' willingness to participate in environmental

Table 5. Logistic Regression Results of Total Social Capital.

Variables	Model 5	Model 6
SCI	0.639*** (0.1005)	
Social		0.368*** (0.058)
Gender	-0.257 (0.4022)	-0.257 (0.4020)
Age	-0.0307*** (0.1173)	-0.0307*** (0.0114)
Fincome	0.153 (0.1341)	0.152 (0.1340)
Edu	0.541** (0.2498)	0.540** (0.2499)
Wq	-0.514*** (0.1717)	-0.512*** (0.1716)
C	-5.610*** (1.5998)	-5.581*** (1.5982)

Note. 1. Standard errors are displayed in parentheses.

2. ***, ** and * represent significance at the 1%, 5%, and 10% levels, respectively.

governance. Enhancing the level of social capital can make villagers more willing to participate in environmental governance.

Replace the Explained Variable. We also changed the assignment to the interpreted variable. Specifically, we reassign the result of the degree of villagers' willingness to contribute money and efforts when the village is in environmental governance. Unwillingness is assigned a value of 1, between willingness and unwillingness is assigned a value of 2, and willingness is assigned a value of 3. The regression results are shown in Table 6:

By comparing Model 7 with Model 4, and Model 8 with Model 5, it can be found that changing the assignment to environmental governance willingness does not affect the regression results, which further confirms the robustness of the basic model and the reliability of the original regression results.

Replace the Explained Variable. The ultimate purpose of studying the influence of social capital on villagers' willingness to participate in environmental governance, is to improve the effectiveness of rural human settlement environmental governance by increasing their willingness to participate in environmental governance. Therefore, considering the impact of social capital on the effect of environmental governance, this paper selects the evaluation of environmental governance effect of individual samples as the proxy variable for the effect of human settlement environmental

Table 6. Adjust the Assignment of Dependent Variables.

Variables	Model 7	Model 8
Trust	0.0171 (0.1127)	
Network	0.464*** (0.1237)	
Norm	0.310*** (0.0936)	
sci		0.466*** (0.0639)
Control variables	yes	yes
Prob > chi2	0.0000	0.0000
Pseudo R ²	0.1572	0.1492

Note. 1. Standard errors are displayed in parentheses. 2.***, ** and * represent significance at the 1%, 5%, and 10% levels, respectively.

governance activities. According to the evaluation of the effectiveness of the comprehensive governance work carried out by the individual samples, the five grades in very bad, not good, fair, good, and very good are assigned as values of 1–5, respectively. The regression results are shown in Table 7.

As can be seen from Table 7, when control variables are included, social trust, social network, social norms, and total social capital are all significant at the 5% level, which is not different from the results of the basic model.

Discussion

As for the results of the quantitative analysis, the improvement of social networks and social norms contributes to the improvement of farmers' willingness to participate, and social norms have the most obvious effect when trust, network, and social capital are controlled simultaneously. The possible explanations for this result are as follows: First, according to the principle of diminishing marginal effects, the current level of social norms in rural areas is relatively low, and farmers are poor in formulating and complying with village rules and regulations. Therefore, increasing the level of social norms has a greater effect on farmers' willingness to participate in environmental governance. Secondly, social network measures the frequency of contact between villagers and other villagers, organizations, and the government. The improvement of social network will reflect the connection between villagers and other subjects and the expansion of social relationship networks. Due to peer pressure, farmers will be more actively involved in environmental governance activities. Thirdly, social norms can restrain the behavior of farmers, the government, and social groups to a certain extent, so that all subjects involved in the environmental governance of human settlements can consciously safeguard collective interests, and also provide a guarantee for all subjects. For example, I promise not to destroy the results of environmental governance, so that others will not destroy the results of environmental governance under the constraints of social norms. When violating ethical norms requires high reputation costs, farmers will consciously abide by the norms and consciously maintain the effect of environmental governance.

Table 7. Robustness Test: Adjust the Dependent Variables.

Variables	Model 9	Model 10
Trust	0.269** (0.1071)	
Network	0.259** (0.1102)	
Norm	0.226** (0.0894)	
sci		0.433*** (0.0557)
Control variable	yes	yes
Prob > chi2	0.0000	0.0000
Pseudo R ²	0.1574	0.1573

1. Standard errors are displayed in parentheses. 2.***, ** and * represent significance at the 1%, 5%, and 10% levels, respectively.

Moreover, the study also finds that the effect of social capital, such as network and norms, is more significant on villagers with low-income and low education level, indicating that social capital tends to be “the capital of the poor.” The explanation is that villagers with a low-income and low education level are inclined to improve their living standards. The increase in their social capital will expand their contacts and obtain more information, which will help them increase their enthusiasm for participating in public affairs. In rural areas where the economy is underdeveloped and the formal system is relatively backward, how to cultivate social capital to promote village environmental governance is worth of attention. In addition to economic and political means, raising the level of social capital can be regarded as the third way to deepen the effects of rural human settlement environment governance. These results are not only applicable to rural areas in China but also have reference significance for rural environmental governance and biodiversity conservation in developing countries.

Implications for Conservation

This study shows that social capital plays an important role in improving environmental protection efficiency, and improving the level of social capital can significantly improve the quality of the rural environment. Three ways to improve environmental quality by changing the stock of social capital are as follows: (1) Provide opportunities for farmers to express their views and enhance social trust. On the basis of digging deep into traditional resources such as neighborhood dependence and mutual assistance, we need to provide farmers with opportunities to express various opinions, and increase trust and cooperation among farmers. In addition, we should enhance the sense of responsibility of grassroots leading cadres and actively create more jobs for farmers in the construction of various renovation projects, so that villagers can feel the credibility and trustworthiness of the government. (2) Build a multi-level information interaction network and expand social networks. Under the guidance of party building, party members and deputies of the people's congress should take the lead in establishing non-profit environmental protection organizations in the village. Moreover, we should make full use of

offline and online publicity channels to build a multi-level information interaction network, and reduce the cost of obtaining environmental protection information, so as to increase the willingness to participate in environmental governance. Improving the overall education level of farmers through basic education and skill training with the help of local educational resources is a feasible way to increase the willingness to participate in environmental governance in the long-term. (3) Strengthen social norms and normalize environmental protection. Village cadres should guide all farmers to participate in the formulation of incentive mechanisms and guide farmers to conduct self-management. Improving village regulations and civil contracts, and enhancing farmers' awareness of discipline and honesty and trustworthiness can help reduce the difficulty of environmental governance and enhance farmers' willingness to participate in environmental governance.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the National Social Science Fund of China under Grant No.17BJL044.

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