Influence of Self-Identity and Social Identity on Farmers' Willingness for Cultivated Land Quality Protection

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Abstract: Exploring farmers' willingness for cultivated land quality protection (WCQP) is crucial for preserving land quality. The existing sociopsychological research often examines farmers' WCQP from a single perspective—either self-identity or social identity—overlooking the structural relationship between the two. This oversight hinders the development of synergistic policies for cultivated land quality protection. Based on a micro-survey of 439 farm households in Shaanxi Province, China, this study constructs a theoretical analysis framework for farmers' WCQP that integrates the structural relationships of self-identity and social identity. Self-identity is further subdivided into cognitive identity, emotional identity, and behavioral identity. Using structural equation modeling (SEM), the study analyzes the impact of cognitive identity, emotional identity, behavioral identity, and social identity on farmers' WCQP. Additionally, the moderating effects of social identity are explored. The results indicate that (1) based on the baseline regression results, farmers' cognitive identity, emotional identity, behavioral identity, and social identity all promote WCQP among farmers; (2) the analysis of moderating effects further indicates that farmers' social identity enhances the positive impact of cognitive identity on their WCQP. However, the moderating effect of social identity is conditional in shaping the impact of emotional identity on farmers' WCQP. These findings remain valid after addressing endogeneity and conducting robustness tests. When farmers' emotional identity is high, social identity strengthens its promotive effect on their WCQP, but when farmers' emotional identity is low, social identity actually hinders this effect. Our research not only simultaneously considers both the self-identity and social identity of farmers but also delves into their structural relationship. This provides theoretical support and practical guidance for developing more targeted land quality conservation policies from a social–psychological perspective.

Keywords: farmers' willingness for cultivated land quality protection; self-identity; social identity; structural relationships; SEM; China

1. Introduction

The decline in cultivated land quality has become a global issue, with the insufficient use of organic fertilizers and excessive pesticide spraying by farmers identified as key factors [1]. According to the "Global Assessment of Soil Pollution" published by the Food and Agriculture Organization and the United Nations Environment Programme, approximately one-third of the world's arable land has degraded due to the improper use of agricultural inputs such as fertilizers and pesticides [2]. In response, governments worldwide have implemented various policies to protect cultivated land quality. In Europe, the Ecological Focus Area initiative, part of the Common Agricultural Policy, aims to limit the use of chemical fertilizers and pesticides and improve soil quality on farms. In the United States, the Environmental Protection Agency has established offices such as the Pesticide Program Office to strictly regulate the registration and application of traditional chemical pesticides, encouraging farmers to use biopesticides in agricultural production [3]. The Chinese government also places high importance on protecting cultivated land quality

by enhancing soil fertility, enforcing strict standards for the use of fertilizers and pesticides, promoting soil remediation techniques, and encouraging organic agriculture. Despite these efforts, a significant gap remains between policy expectations and reality [4,5]. Policies for protecting cultivated land quality are typically top-down institutional arrangements, but the micro-agents of agricultural production are the farmers themselves [6]. Overlooking the underlying logic of farmers' willingness for cultivated land quality protection (WCQP) often leads to insufficient farmer response, thereby diminishing the effectiveness of these policies. Therefore, exploring farmers' WCQP from their perspective is undoubtedly key to addressing the decline in cultivated land quality.

As a discipline that encompasses both psychology and sociology, social psychology provides an important theoretical basis for exploring farmers' WCQP [6]. The existing research on farmers' WCQP from a social–psychological perspective generally revolves around two main viewpoints. One perspective considers farmers as independent decision-making units in agricultural production, emphasizing that farmers' self-identity is crucial for influencing their WCQP. Studies have shown that a higher environmental self-identity can predict an individual's participation in sustainable pro-environmental behaviors [7]. This leads farmers to support cultivated land quality protection policies [6], and reduce the use of chemical fertilizers and pesticides, thereby maintaining the land's long-term fertility. Moreover, a strong self-identity fosters a closer connection between farmers and their land [8], further encouraging their willingness to engage in land pollution protection actions. The other perspective views farmers as members of rural societies, suggesting that social identity is essential to promoting their WCQP. Research indicates that social identity plays a significant role in forming group effects among farmers [9], establishing a common value system and behavioral norms within rural societies. This fosters a pro-environmental social consensus among farmers, enhancing their collective willingness to engage in pro-environmental actions. Consequently, farmers become actively involved in collective environmental protection activities [10], thereby stimulating their WCQP.

The tendency of farmers to reside in close-knit villages necessitates that their behavioral logic is influenced by both individual and group attributes, particularly in the context of rural China where geographical and kinship ties often overlap [11]. Indeed, self-identity is indicative of the individual attributes of farmers, while social identity reflects their collective attributes. This leads to the fact that farmers' WCQP is influenced both by self-identity and by social identity. Moreover, farmers' belongingness to a village group often shapes their self-identity, a factor that is frequently overlooked in the existing research. This means that the impact of self-identity on farmers' WCQP is moderated by social identity. However, the existing research typically analyzes farmers' WCQP from a single perspective of either self-identity or social identity, neglecting the synergistic effects of both identities and the underlying structural relationship between them. Consequently, this oversight makes it challenging to harmonize different policies aimed at protecting cultivated land quality. Given the knowledge gap mentioned above, the aim of this study is to develop a theoretical analysis framework for farmers' WCQP based on micro-survey data from farmers in Shaanxi Province, China. This framework will consider the structural relationship between self-identity and social identity. Additionally, the study will decompose self-identity into three dimensions: cognitive identity, emotional identity, and behavioral identity. It will explore the effects of both self-identity and social identity on farmers' WCQP and investigate the moderating effect of social identity on the relationship between self-identity and farmers' WCQP. This study contributes in three significant ways: First, unlike the existing research that analyzes farmers' WCQP from a single perspective of either self-identity or social identity, by incorporating self-identity and social identity into the theoretical framework for farmers' WCQP, we advance the existing theoretical research from a social–psychological perspective and provide a foundation for comprehending the underlying rationale behind farmers' WCQP. Second, by considering both self-identity and social identity and their hierarchical structural relationships, we investigate how social identity shapes the impact of self-identity on farmers' WCQP. This offers new insights for

government entities to design cohesive policies that promote farmers' WCQP. Last, in the current global context where smallholder farmers remain prevalent, this study focuses on Chinese smallholder farmers. Our research findings can serve as practical references for countries or regions with similar characteristics, aiming to enhance farmers' WCQP.

The remainder of this paper is divided into five sections: Section 2 presents the theoretical analysis and research hypotheses, Section 3 describes the data sources and methodological choices, Section 4 presents the research results, Section 5 discusses the findings, and Section 6 offers conclusions and policy implications.

2. Theoretical Analysis and Research Hypotheses

2.1. Self-Identity and Farmers' WCQP

Self-identity is a fundamental aspect of individuals' embodied experience, characterized by continuity and sameness. It serves as a crucial starting point in the field of social psychology for analyzing individual behavior [6,12]. Farmers, for instance, maintain a long-term and stable adherence to their self-identity positioning. They emphasize and persist in their role perception [13], thereby forming identity standards that guide behavior associated with that role [14]. According to the theory of Embodied Cognition, self-identity can be further broken down into three dimensions: cognitive identity, emotional identity, and behavioral identity [8]. Cognitive identity pertains to an individual's cognition of their own identity, emotional identity encompasses the emotional experiences associated with their identity, and behavioral identity demonstrates the extent to which individuals align their actions with their identity.

2.1.1. Impact of Cognitive Identity on Farmers' WCQP

Cognitive identity, the most fundamental aspect of self-identity, reflects self-consistency and is a crucial manifestation for an individual to explore and embrace their identity [15,16]. According to the Self-Determination Theory, individuals naturally aspire for autonomy, and behaviors driven by self-determination are typically internally motivated [17]. Farmers who possess a strong cognitive identity have a clear understanding of their role as farmers, which reinforces their intrinsic motivation to engage in land protection activities [18]. This, in turn, can foster a positive awareness of environmental conservation [12]. As their understanding deepens, their intention to support environmental protection strengthens [19,20], ultimately enhancing their happiness, creativity, and commitment to participating in land protection activities [21]. Based on this, the following hypothesis is proposed:

Hypothesis 1 (H1). *Farmers' cognitive identity promotes their WCQP.*

2.1.2. Impact of Emotional Identity on Farmers' WCQP

Emotional identity encompasses the emotional responses that individuals develop towards their own sense of self based on higher-level beliefs or values. These emotions can serve as normative emotions or evaluative desires [22]. The Affect Control Theory postulates that stable emotions can offer insight into individual behavior and aid individuals in assuming specific roles [23]. In the context of farming, when farmers strongly identify with their own identity, their emotional identity becomes an "emotional norm" that governs their actions in accordance with their sense of self [24]. The stronger a farmer's emotional identity, the more inclined they are to cherish the deep emotional connections they establish with the land [8], perceiving it as an indispensable element of their livelihood and existence. Consequently, they are more likely to develop a robust WCQP [25]. Based on this reasoning, the following hypothesis is put forth:

Hypothesis 2 (H2). *Farmers' emotional identity enhances their WCQP.*

2.1.3. Impact of Behavioral Identity on Farmers' WCQP

Behavioral identity refers to the degree to which an individual acknowledges and engages in behaviors that align with their identity in specific situations. It involves how individuals express their self-identity through their actions, representing the external manifestation of self-identity [8]. Constructivism suggests that actual identity generates corresponding actions and imposes obligatory constraints on those actions [26]. Based on this theory, the higher a farmer's behavioral identity, the more likely they are to engage in actions consistent with their identity. When the land is contaminated with fertilizers or pesticides, farmers with a strong behavioral identity are driven by internal constraints to view themselves as key agents in land protection. They recognize that their actions are crucial for sustainable agriculture [27] and thus actively address land pollution issues. Farmers with a strong behavioral identity are generally more inclined to take proactive measures to protect the land ecosystem [27], which is likely to result in a stronger WCQP. Therefore, the following hypothesis is proposed:

Hypothesis 3 (H3). *Farmers' behavioral identity promotes their WCQP.*

2.2. Social Identity and Farmers' WCQP

Social identity is a multi-faceted concept that encompasses the cognition, attitudes, and behaviors of individuals, groups, and organizations towards specific domains [28]. According to the Social Identity Theory (SIT), social identity can exert normative and constraining influences on farmers, affecting their willingness and behavior through various channels, including the creation of social opinions and the formation of group pressures [17]. By aligning agricultural production decisions with social norms and group expectations [29], social identity encourages farmers to feel a sense of responsibility towards both society and future generations [30], thus enhancing their WCQP. Moreover, social identity also fosters a strong sense of belonging and responsibility within the rural survival context, discouraging the pursuit of short-term economic gains during agricultural production and motivating farmers to contribute to collective interests [31], thereby further enhancing their WCQP. Based on these premises, the following hypothesis is proposed:

Hypothesis 4 (H4). *Farmers' social identity enhances their WCQP.*

2.3. Self-Identity, Social Identity, and Farmers' WCQP

Farmers' self-identity arises from their role and value recognition in agricultural production, while their social identity pertains to their recognition of status and role within a group [32]. Farmers' decision-making is influenced by both their individual self-identity and their group social identity. Additionally, the internal structure of group belonging further shapes the impact of self-identity on farmers' WCQP through social identity.

Cognitive identity reflects the alignment between a farmer's self-cognition and societal values. A strong cognitive identity motivates farmers to achieve a higher WCQP. When a farmer's social identity is stronger, it enhances the alignment of their cognitive identity with the expectations and standards of their social group, thereby improving their self-cognition and recognition of social value identity [16]. This alignment strengthens the positive effect of cognitive identity on farmers' WCQP. Emotional identity is influenced by emotional norms and fosters closer emotional ties with the land. Farmers with a strong emotional identity, driven by shared values within their rural society [23], are more likely to become effective land managers and demonstrate environmentally responsible attitudes and behaviors in agricultural production [33]. This connection enhances their pro-environmental willingness and strengthens their WCQP. Behavioral identity refers to the extent to which farmers' actions align with their self-identity. A strong behavioral identity allows farmers to generate internal motivation through self-regulation, actively practicing their identity in agricultural production, and exhibiting a stronger WCQP. When social

identity is stronger, it increases farmers' susceptibility to rural social norms and values [34], which heightens external pressures and enhances the motivational force behind behavioral identity. This, in turn, further strengthens farmers' pro-environmental willingness and the positive effect of behavioral identity on their WCQP. Based on these insights, the following hypotheses are proposed:

Hypothesis 5 (H5). *Farmers' social identity strengthens the promotional effect of cognitive identity on their WCQP.*

Hypothesis 6 (H6). *Farmers' social identity enhances the promotional effect of emotional identity on their WCQP.*

Hypothesis 7 (H7). *Farmers' social identity reinforces the promotional effect of behavioral identity on their WCQP.*

Based on these hypotheses, we have developed a theoretical framework to analyze the impact of self-identity and social identity on farmers' WCQP (Figure 1).
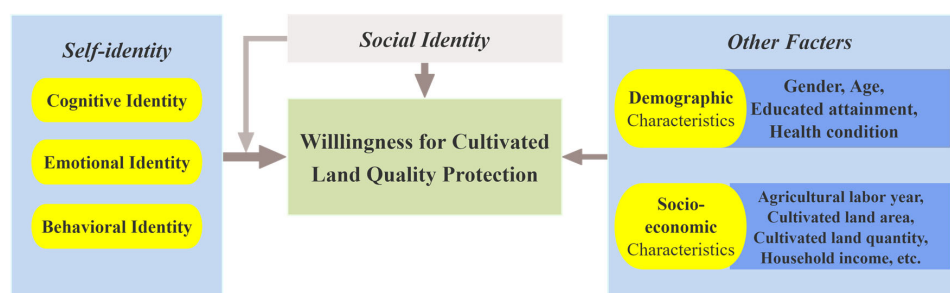

Figure 1. Theoretical framework.

3. Materials and Methods

3.1. Data Source

The data for this study were collected through a micro-survey of grain crop districts in Shaanxi Province, China, conducted by our research team from July to August 2023. Shaanxi Province was selected for two main reasons: First, as a major agricultural province in western China, Shaanxi has numerous rural areas where farmers' lifestyles shape their self-identity and social identity, making it a representative province for sampling. Second, due to historical factors, rural areas in Shaanxi are relatively closed and stable with minimal social change. This stability helps reduce the interference of external factors on the research results, focusing the analysis on the impact of farmers' self-identity and social identity on WCQP. To ensure the representativeness of the sample, we considered both economic development levels and geographical locations [35,36]. We initially assessed the economic development levels among the different cities in Shaanxi Province. According to the data released by the Provincial Bureau of Statistics in 2023, the sampling sites were selected from three prefecture-level cities: Xi'an (ranked first in GDP with CNY 11,486.51 billion), Xianyang (ranked third with CNY 2817.55 billion), and Shangluo (ranked ninth with CNY 902.56 billion) for the year 2022 (see Figure 2). These cities represent different levels of economic development. Additionally, we chose three geographically adjacent cities to ensure similarity in farmers' behavioral logic, thus minimizing research errors. We used a stratified random sampling method to select 2–3 counties in each city, followed by the selection of towns and villages within those counties using the same logic. In each village, 10–20 questionnaires were distributed based on the number of households. A total of 500 questionnaires were collected from 31 villages. After excluding those with missing information or contradictory responses, 439 valid questionnaires remained, yielding a validity rate of 87.8%.
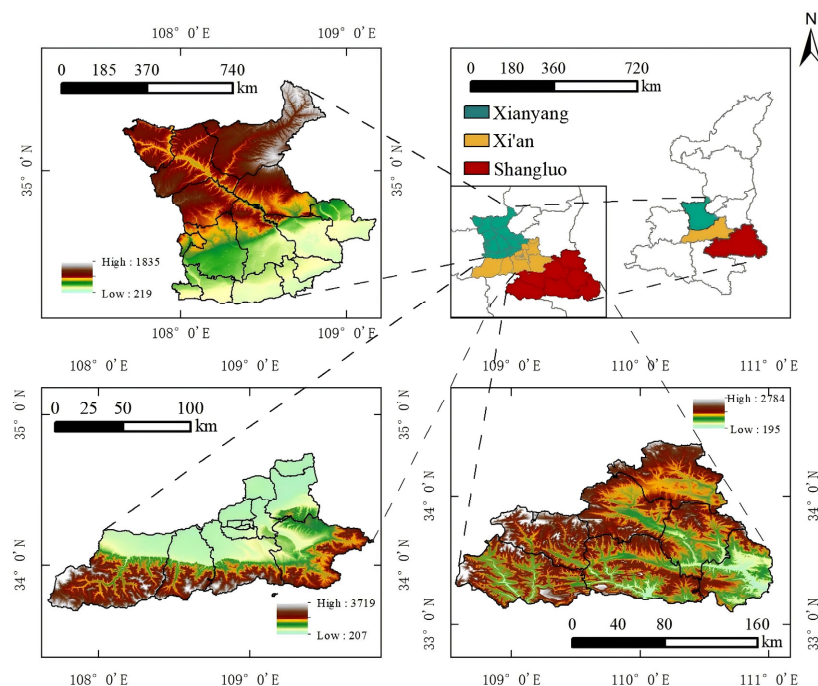
Figure 2. Study area.

3.2. Variable Selection

3.2.1. Dependent Variable

The dependent variable of this study is farmers' WCQP, which includes the desire to improve soil quality, prevent soil pollution, implement soil and water conservation measures, promote organic agriculture, and oppose illegal land reclamation and mining [37]. In China, the decline in soil quality is primarily attributed to the unreasonable use of fertilizers and pesticides [1]. The Central No. 1 Document of 2024 released by the Central Committee of the Communist Party of China (CPC) and the State Council emphasizes the rational use of fertilizers and pesticides as a crucial aspect of soil quality protection policies, which is also a central focus of related research. Consequently, we elicited farmers' WCQP using the following two questions in the survey: "Are you willing to use organic fertilizers instead of chemical fertilizers?" and "Are you willing to reduce pesticide usage"?

3.2.2. Core Independent Variables

Self-identity is the core independent variable in this study and is divided into three dimensions: cognitive identity, emotional identity, and behavioral identity. These dimensions reflect an individual's recognition, emotional acceptance, and perspectives on behavioral practices [33]. To ensure accurate measurement, we referred to Wang's [38] methodology, using 2 to 3 items for each dimension. Cognitive identity was measured with the following three questions: "You are a true rural person", "You fully accept the characteristics of rural people", and "You believe your rural identity is worthy of respect". Emotional identity was measured using the following three questions: "You do not feel lonely in the countryside", "Compared to urban identities, you do not feel inferior", and "You enjoy the lifestyle of rural people." Behavioral identity included two questions: "You enjoy dealing with rural people" and "You like to participate in rural collective activities."

Social identity, which serves as both a core independent variable and a moderating variable in this study, refers to an individual's sense of identity, belonging, and pride within their social group or community. Following the approach of Faghani et al. [39], we measured farmers' social identity with three questions: "You feel a sense of belonging to your village", "You identify with your village", and "You feel proud to be a member of your village."

All the questions mentioned above to assess farmers' WCQP and their self- and social identities were measured using a 5-point Likert scale. For farmers' WCQP, the scale ranged from "very unwilling" to "very willing", with values assigned from 1 to 5, where the higher scores indicate stronger WCQP. For cognitive identity, emotional identity, behavioral identity, and social identity, the scale ranged from "strongly disagree" to "strongly agree", also with values from 1 to 5, where the higher scores indicate stronger identity.

3.2.3. Control Variables

Demographic and socio-economic characteristics are the key control variables in examining farmer behavior. Based on Burton and Tatlidil et al. [40,41], we measured farmers' demographic characteristics using gender, age, educational attainment (Edu), and health condition (Hlth), and their socio-economic characteristics were measured using agricultural labor years (ALY), cultivated land area (CLA), cultivated land quantity (CLQ), household income (Income), total number of household members (Households), and agricultural labor forces (ALF).

The methods of measuring the dependent variable, core independent variable, and control variables in this study are summarized in Table 1.

3.3. Research Methods
3.3.1. Structural Equation Modeling (SEM)

To study the impact of self-identity and social identity on farmers' WCQP, this paper employs an SEM (SmartPLS version 3.2.9). However, verifying moderating effects in this study involves interaction terms between latent variables, which violates the conditions required for applying the traditional linear SEM. Therefore, this study adopted the covariance-based partial least squares model (PLS-SEM) as suggested by Chin et al. [42]. This method is robust to data normality, sample size, and measurement scale, and allows for the inclusion of latent variables and interaction terms between them in the model.

PLS-SEM involves two sequential steps. The first step assesses the measurement model utilized in the study. This entails assessing various indicators, including Cronbach's alpha (>0.6), composite reliability (CR), average variance extracted (AVE), and factor loadings (>0.5) for cognitive identity, emotional identity, behavioral identity, and social identity. It is crucial for these indicators to conform to reference standards to ensure the validity of the measurement model estimates [43]. The subsequent step involves analyzing the results of the structural model. The PLS path modeling method and bootstrapping (5000 subsamples) are employed for estimation to obtain reliable estimates of the structural model [44]:

$$Cog_i = \alpha_{cogi}CID + \varepsilon 1 \ (i = 1,2,3), \tag{1}$$

$$Emo_i = \alpha_{emoi}EID + \varepsilon 2 \ (i = 1,2,3), \tag{2}$$

$$Beh_i = \alpha_{behi}BID + \varepsilon 3 \ (i = 1,2), \tag{3}$$

$$Soc_i = \alpha_{soci}SID + \varepsilon 4 \ (i = 1,2,3), \tag{4}$$

$$WCQP_i = \alpha_{wcqpi}WCQP + \varepsilon 5 \ (i = 1,2), \tag{5}$$

Equations (1)–(5) depict the measurement model, wherein Sog_i, Emo_i, Beh_i, Soc_i, and $WCQP_i$ are the latent variables denoting cognitive identity, emotional identity, behavioral identity, social identity, and *WCQP*, respectively. These variables are to be measured based on the observed variables *CID*, *EID*, *BID*, *SID*, and *WCQP*. The coefficient α signifies factor loadings, and ε refers to the measurement error.

$$WCQP = \beta_1 CID + \beta_2 EID + \beta_3 BID + \beta_4 SID + \beta_5 CID \times SID \\ + \beta_6 EID \times SID + \beta_7 BID \times SID + \eta CV + \mu, \tag{6}$$

Equation (6) represents the structural model, with CV serving as the control variable. $CID \times SID$, $EID \times SID$, and $BID \times SID$ represent the interaction terms between social

identity and cognitive identity, emotional identity, and behavioral identity, respectively, utilized to examine the moderating effect of social identity. The parameter β gauges the path coefficients between the latent variables, indicating the overall impact of the control variables on WCQP, while μ represents the structural error.

Table 1. Variable structure and description.

Variable (Abbreviation)	Question (Units)	Scale/Definition
Dependent variable		
WCQP	WCQP1—Are you willing to replace chemical fertilizers with organic fertilizers?	1 = Very Unwilling, 2 = Unwilling, 3 = Neutral, 4 = Willing, 5 = Very Willing
	WCQP2—Are you willing to reduce the use of pesticides?	
Core independent variable		
Cognitive identity	Cog1—You are a true rural person.	
	Cog2—You fully accept the characteristics of rural people.	
	Cog3—You believe your rural identity deserves respect.	
Emotional identity	Emo1—You do not feel lonely in the countryside.	1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree
	Emo2—Compared to urban identities, you do not feel inferior.	
	Emo3—You enjoy the lifestyle of rural people.	
Behavior identity	Beh1—You enjoy interacting with rural people.	
	Beh2—You like to participate in rural community activities.	
Social identity	Soc1—You feel a sense of belonging to your village.	
	Soc2—You strongly identify with your village.	
	Soc3—You are proud to be a member of your village.	
Control variable		
Gender	Male or Female.	0 = Male and 1 = Female
Age	Your age (years).	Actual age
Edu	Education level.	1 = No schooling, 2 = Elementary school, 3 = Junior high school, 4 = High school, 5 = College or above
Hlth	Health condition.	1 = Very Poor, 2 = Poor, 3 = Average, 4 = Good, 5 = Very Good
ALY	Years engaged in agricultural production (years).	Years engaged in agricultural production
CLA	Your family's grain crop cultivation area (mu).	Area of grain crops cultivated
CLQ	How many plots of cultivated land does your family own (number of plots).	Number of cultivated land plots
Income	Your family's total income in 2022 (CNY 10,000).	Actual family income in 2022
Households	Number of people in your household (people).	Actual number of family members
ALF	Number of family members engaged in agricultural labor (people).	Actual number of labor force members

3.3.2. Instrumental Variable Method

In the data analysis process, omitted variables and bidirectional causality can lead to endogeneity problems in model estimation, which reduces the accuracy and reliability of the results. To address these issues, this study selected several instrumental variables: the level of local village self-governance (Self-governance), local agricultural subsidy policies (Subsidize policy), the distance between family residences and rural roads (Distance), and local resettlement policies (Resettlement policy). These variables were chosen to address potential endogeneity in cognitive identity, emotional identity, behavioral identity, and social identity, respectively, using the instrumental variable method.

Based on these instrumental variables, we applied the two-stage least squares method (2SLS) for estimation to mitigate endogeneity issues: The first stage involves regression of the instrumental variables on the endogenous core independent variables to test the effectiveness of the instrumental variables and to check for endogeneity in the core independent variables. In the second stage, for the core independent variables with endogeneity, their fitted values are used as substitutes, and WCQP is re-regressed on the fitted values of the core independent variables to effectively estimate the true impact of the endogenous core independent variables on the dependent variable.

4. Results

4.1. Descriptive Statistics of the Sample

The descriptive statistics of the interviewed farmers' WCQP, self-identity, social identity, demographic characteristics, and socio-economic features are presented in Table 2.

The results from Table 2 indicate that the mean score for farmers' WCQP is 3.752. Specifically, the average willingness to use organic fertilizers instead of chemical fertilizers and to reduce pesticide usage is 3.500 and 4.005, respectively. These scores suggest a moderately high willingness but also indicate room for improvement in farmers' WCQP. Regarding the three dimensions of self-identity, the mean scores are as follows: cognitive identity, emotional identity, and behavioral identity are 4.208, 3.423, and 4.131, respectively. While the score for emotional identity is somewhat lower, the scores for cognitive and behavioral identity are relatively high. The mean score for social identity is also high at 4.121. These results are consistent with the characteristics of the traditional Chinese smallholder farmers, who generally possess strong self and social identities [45]. In terms of demographic characteristics, the respondents are predominantly female, accounting for 51.5%, with an average age of 58.788 years, reflecting the typical "aging agriculture" trend in China [46]. Most respondents have low educational attainment, with 61.0% having completed junior high school or less, which aligns with the general education level of smallholder farmers in China [47]. The average number of years spent in agricultural production is 39.3, with 79.5% of the farmers having over 30 years of experience, characteristic of the traditional agricultural regions in China [48]. Regarding health, 54.8% of the respondents report having "good" or "very good" health, indicating overall good health among the farmers, which is consistent with the capability of elderly farmers in China to remain active in agriculture despite their age [49]. In terms of socio-economic characteristics, the average cultivated land area per family is 5.021 mu, with an average of 2.959 plots per family, reflecting the limited but fragmented nature of cultivated land in rural China [50]. The average annual family income is relatively low at CNY 50,190. The average household consists of 4.777 people, with 2.075 people engaged in agricultural labor per family. Overall, the demographic and socio-economic features of the interviewed farmers align with the typical conditions of the traditional agricultural areas in China, lending representativeness to the sample.

Table 2. Results of descriptive statistics.

Variables	Indicator	Mean	Std. Dev.	Min	Max
Dependent Variable					
WCQP	-	3.752	1.004	1	5
-	WCQP1	3.500	1.184	1	5
-	WCQP2	4.005	1.157	1	5
Core Independent Variables					
CID	-	4.208	0.841	1	5
-	Cog1	4.469	0.926	1	5
-	Cog2	4.371	0.930	1	5
-	Cog3	3.784	1.257	1	5
EID	-	3.423	1.201	1	5
-	Emo1	3.339	1.450	1	5
-	Emo2	3.467	1.378	1	5
-	Emo3	3.462	1.414	1	6
BID	-	4.131	0.986	1	5
-	Beh1	4.212	0.999	1	5
-	Beh2	4.050	1.093	1	5
SID	-	4.121	1.013	1	5
-	Soc1	4.185	1.066	1	5
-	Soc2	4.132	1.062	1	5
-	Soc3	4.048	1.116	1	5
Control Variables					
Gender	-	0.515	0.500	0	1
Age	-	58.788	14.850	12	87
Edu	-	2.651	1.160	1	5
Hlth	-	3.524	1.244	1	5
ALY	-	39.308	17.471	0	78
CLA	-	5.021	3.738	0	25
CLQ	-	2.959	1.972	0	18
Income	-	5.019	4.696	0	35
Households	-	4.777	1.956	1	14
ALF	-	2.075	1.234	0	10

4.2. Reliability and Validity Tests

Table 3 presents the results of the confirmatory factor analysis for the farmers' cognitive identity, emotional identity, behavioral identity, social identity, and WCQP. It also includes the results of the reliability and validity tests.

The results in Table 3 show that Cronbach's α values range from 0.639 to 0.930, and all the CR values exceed 0.8, indicating acceptable reliability [51]. The factor loadings for all the observed variables fall between 0.687 and 0.957, and the AVE values are above 0.6, demonstrating good convergent validity [52]. Furthermore, the square roots of the AVE values for cognitive identity, emotional identity, behavioral identity, social identity, and farmers' WCQP are greater than the absolute values of the correlations between these latent variables, indicating good discriminant validity [53,54].

Table 3. Results of reliability, convergent, and distinctive validity tests.

Variables	Factor Loading	Cronbach's Alpha	CR	AVE	CID	EID	BID	SID	WCQP
CID	0.844 0.911 0.687	0.749	0.858	0.671	0.819				
EID	0.830 0.846 0.872	0.807	0.886	0.722	0.297	0.850			
BID	0.957 0.925	0.874	0.940	0.886	0.267	0.221	0.942		
SID	0.922 0.953 0.933	0.930	0.955	0.876	0.402	0.189	0.168	0.936	
WCQP	0.874 0.839	0.639	0.847	0.734	0.413	0.457	0.258	0.320	0.857

Note: values on the diagonal represent the square root of the AVE.

4.3. Model Fit Tests and Estimation Results

Based on the reliability and validity tests, this paper employs a structural equation model to analyze the impact of farmers' self-identity and social identity on their WCQP. Following the methodology of Hu and Bentler [55], the Standardized Root Mean Square Residual (SRMR), Squared Euclidean Distance (d_ULS and d_G), and Normed Fit Index (NFI) are used as the indicators for assessing model fit. The results are presented in Table 4.

Table 4. Results of the fitness test of the model.

Index	Model Value	Recommended Value	Acceptance
SRMR	0.043	<0.08 good fit; <0.1 reasonable fit	Good
d_ULS	0.508	Below 0.95	Reasonable
d_G	0.290	Below 0.95	Reasonable
NFI	0.813	>0.9 good fit; >0.8 reasonable fit	Reasonable

Table 4 indicates that all the selected indicators are within the acceptable range, demonstrating good model fit. The estimation results of the structural equation model are illustrated in Figure 3.

The results in Figure 3 indicate that cognitive identity, emotional identity, behavioral identity, and social identity all have a significant positive impact on farmers' WCQP. Specifically, cognitive identity, emotional identity, behavioral identity, and social identity account for 26.6%, 30.9%, 10.0%, and 13.7% of the variation in WCQP, respectively. The influence of these four variables on WCQP, in descending order, is as follows: emotional identity, cognitive identity, social identity, and behavioral identity. This confirms that these identities promote WCQP and preliminarily validates hypotheses H1 to H4. Regarding the moderating effect of social identity, there are notable differences in how social identity moderates the impact of cognitive, emotional, and behavioral identities on farmers' WCQP. Specifically, social identity significantly enhances the positive impact of cognitive identity on WCQP, suggesting that social identity further strengthens the effect of cognitive identity on WCQP, thereby preliminarily validating hypothesis H5. However, the moderating effect of social identity on the impact of emotional identity on WCQP is significantly negative, which contradicts the hypothesis. social identity significantly inhibits the positive impact of emotional identity on WCQP, contrary to expectations. Additionally, no significant moderating effect of social identity is observed in the relationship between behavioral identity and WCQP, which also contradicts the hypothesis. Overall, among hypotheses H5 to H7, only hypothesis H5 is preliminarily validated, while hypotheses H6 and H7 are not validated.
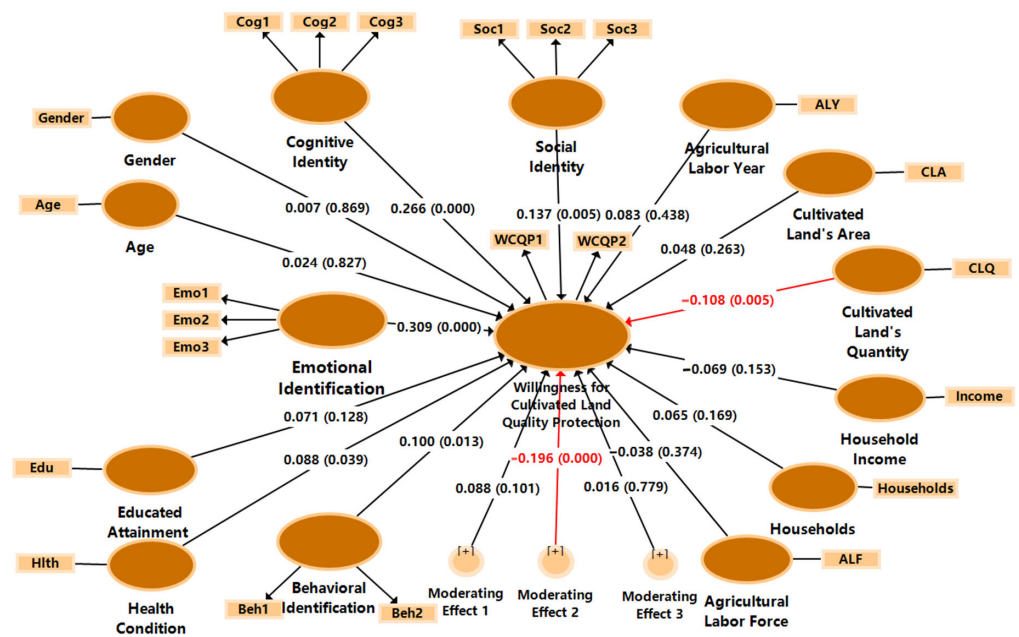
Figure 3. PLS-SEM estimation results.

4.4. Endogenous Treatment

4.4.1. Instrumental Variable Estimation Results

To ensure the accuracy of the analysis, this paper further employs the instrumental variable method to address potential endogeneity issues. The selection of instrumental variables must meet the principles of relevance and exogeneity. From the perspective of relevance, higher levels of rural village self-governance is a form of organizational democracy that can enhance farmers' participation in their communities [56], thereby increasing their pride and identification with their identity. Agricultural subsidies reduce rural labor outflow, which helps maintain agricultural employment and strengthens farmers' emotional identity with their roles [57]. The proximity of family residences to rural roads affects farmers' ability to engage in rural activities; closer proximity facilitates participation in collective events [58], thereby enhancing behavioral identity. Local resettlement policies provide security for elderly farmers, fostering psychological attachment to the locality [59] and thus strengthening social identity. From the perspective of exogeneity, the level of local village self-governance, agricultural subsidy policies, proximity to rural roads, and the implementation of resettlement policies are variables that are not directly related to farmers' WCQP but influence it indirectly through cognitive identity, emotional identity, behavioral identity, and social identity. Therefore, these instrumental variables theoretically satisfy the requirements of relevance and exogeneity.

This paper employs the two-stage least squares (2SLS) method to address endogeneity issues. The process is divided into two stages: First stage, regress instrumental variables on the endogenous core independent variables. Four separate models are used: Local village self-governance is regressed on cognitive identity. Local agricultural subsidy policies are regressed on emotional identity. The distance between family residences and rural roads is regressed on behavioral identity. Local implementation of resettlement policies is regressed on social identity. Second stage, regress the estimated values of the endogenous core independent variables obtained in the first stage on farmers' WCQP. The results of these analyses are presented in Table 5.

Table 5. Results of 2SLS estimation.

Variables	First-Stage Regression				Second-Stage Regression
	Model 1	Model 2	Model 3	Model 4	Model 5
CID	-				0.260 ***
	-				(0.057)
EID (subsidize policy)		0.134 *			2.111 ***
		(0.067)			(0.271)
BID			-		−0.445 ***
			-		(0.083)
SID (resettlement policy)				0.200 ***	0.685 ***
				(0.069)	(0.220)
Control variables	YES	YES	YES	YES	YES
First-stage Chi^2	0.190	6.379 **	1.341	25.343 ***	
First-stage Cragg–Donald Wald F statistic	37.551	109.920	63.846	148.807	
Second-stage R^2					0.341

Note: the t-statistics are presented in parentheses; *, **, and *** indicate significance at the 10% and 1% significance levels, respectively.

The results from Table 5 indicate that based on the first-stage regression results, the Cragg–Donald Wald F-statistics for the instrumental variables are 37.551, 109.920, 63.846, and 148.807. All the values exceed the critical thresholds of 16.38 (15% maximal IV size), indicating that there are no issues with the weak instrumental variables [60]. The levels of local village autonomy, local agricultural subsidy policies, the distance between family residences and rural roads, and the implementation of local resettlement policies all have coefficient estimates significant at the 1% level. This confirms that the instrumental variables are strongly correlated with the endogenous explanatory variables and are effective. Additionally, Chi-square tests, based on robust scores, reveal that cognitive identity and behavioral identity do not exhibit endogeneity. However, emotional identity and social identity show signs of endogeneity.

Using the predicted values from the first stage of the two-stage least squares (2SLS) estimation, the second stage involved regressing these values for emotional identity and social identity on farmers' WCQP (Model 5). The results indicate that cognitive identity, emotional identity, behavioral identity, and social identity all retain significant effects on WCQP, but the direction of these effects remains unchanged. This confirms that even after addressing endogeneity issues, cognitive identity, emotional identity, behavioral identity, and social identity continue to have a significant positive influence on farmers' WCQP. Thus, the reliability of the initial findings is upheld.

4.4.2. Propensity Score Matching (PSM)

Farmers' self-identity and social identity often correlate with their demographic and socio-economic characteristics, which can lead to sample self-selection bias [61]. To address this and ensure the validity of the study results, this paper follows Li et al.'s [62] methodology by dividing farmers into higher (treatment group) and lower (control group) categories based on the mean values of cognitive identity, emotional identity, behavioral identity, and social identity. We then employ the Propensity Score Matching (PSM) model to estimate the average treatment effects of these identities. Before estimating these effects, we use cognitive identity, emotional identity, behavioral identity, and social identity as the dependent variables in a multinomial logistic regression analysis. Farmers' demographic and socio-economic characteristics serve as the independent variables (see Table 6). The significant variables from this regression are subsequently used as matching variables in the PSM model.

Table 6. Binomial logistic regression results for propensity matching score.

Variables	CID		EID		BID		SID	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
Gender	0.466 **	0.208	0.003	0.208	−0.654 ***	0.212	0.159	0.206
Age	−0.014	0.016	−0.037 **	0.016	−0.013	0.017	−0.035 **	0.016
Edu	0.058	0.108	0.333 ***	0.102	0.237 **	0.106	0.175 *	0.106
Hlth	0.026	0.089	−0.125	0.089	0.092	0.087	0.029	0.086
ALY	0.035 **	0.014	0.032 **	0.013	0.034 **	0.015	0.038 ***	0.013
CLA	0.025	0.030	0.009	0.029	0.067 **	0.032	−0.015	0.029
CLQ	0.022	0.060	−0.041	0.050	0.016	0.053	−0.042	0.051
Income	0.082 ***	0.030	0.046 **	0.023	0.018	0.022	0.031	0.023
Households	0.001	0.061	0.041	0.060	−0.002	0.056	0.070	0.057
ALF	−0.031	0.085	−0.122	0.088	−0.083	0.089	−0.076	0.088
Prob > chi²	0.000		0.002		0.001		0.065	

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% significance levels, respectively; "Prob > chi²" represents the p-value for the joint significance of the model.

Table 6 indicates a self-selection issue with the farmers' self-identity and social identity. Following Abadie and Imbens [63], the nearest neighbor matching, radius matching, and kernel matching methods are used to estimate the average treatment effects, as shown in Table 7.

Table 7. Results of the estimates of the average treatment effects.

Variable	Matching Method	Average Treatment Effect	Standard Deviation	t-Value
CID	1:3 nearest neighbor matching	0.501 ***	0.111	4.99
	Caliper match	0.493 ***	0.123	5.28
	Nuclear matching	0.555 ***	0.100	5.57
	ATT mean	0.516	-	-
EID	1:3 nearest neighbor matching	0.685 ***	0.111	5.67
	Caliper match	0.737 ***	0.098	7.32
	Nuclear matching	0.760 ***	0.094	8.09
	ATT mean	0.727	-	-
BID	1:3 nearest neighbor matching	0.805 ***	0.116	6.61
	Caliper match	0.740 ***	0.100	7.05
	Nuclear matching	0.766 ***	0.098	7.72
	ATT mean	0.770	-	-
SID	1:3 nearest neighbor matching	0.309 **	0.118	2.72
	Caliper match	0.102 ***	0.103	3.42
	Nuclear matching	0.357 **	0.101	2.34
	ATT mean	0.256	-	-

Note: ** and *** indicate significance at the 5% and 1% levels, respectively.

Table 7 presents the results indicating that irrespective of the method employed (1:3 nearest neighbor matching, caliper matching, or kernel matching), the elimination of sample self-selection bias demonstrates that cognitive identity, emotional identity, behavioral identity, and social identity continue to exert a significant positive influence on the implementation of WCQP among the farmers. On average, higher levels of these identities lead to an increase in WCQP of 51.6%, 72.7%, 77.0%, and 25.6%, respectively, thereby further confirming the validity of hypotheses H1-H4.

To ensure the reliability of the PSM results, a balance test was conducted, as shown in Table 8.

Table 8. Results of balance test.

Group	Matching Stage	Matching Method	Pseudo-R^2	LR	Mean Bias	Med. Bias	B
CID	Before matching		0.054	32.45 ***	30.5	32.3	54.6 [+]
	After matching	1:3 nearest neighbor matching	0.001	0.46	2.8	1.3	6.0
		Caliper match	0.002	1.19	5.1	4.2	10.0
		Nuclear matching	0.001	0.93	3.7	3.0	8.8
EID	Before matching		0.037	22.36 ***	18.7	19.1	45.1 [+]
	After matching	1:3 nearest neighbor matching	0.002	1.29	5.7	5.7	10.8
		Caliper match	0.001	0.81	5.3	5.5	8.6
		Nuclear matching	0.001	0.40	3.5	3.8	6.0
BID	Before matching		0.051	30.72 ***	22.4	28.9	53.7 [+]
	After matching	1:3 nearest neighbor matching	0.001	0.81	3.1	3.4	8.9
		Caliper match	0.000	0.21	1.7	1.5	4.6
		Nuclear matching	0.001	0.77	3.2	3.4	8.8
SID	Before matching		0.018	10.87 **	9.3	7.6	32.3 [+]
	After matching	1:3 nearest neighbor matching	0.001	1.00	6.1	6.7	8.7
		Caliper match	0.000	0.15	2.9	3.3	3.5
		Nuclear matching	0.001	0.44	1.0	0.7	5.8

Note: ** and *** indicate significance levels of 5% and 1%, respectively; Pseudo-R^2 represents the pseudo R^2; LR is the likelihood ratio statistic; Mean bias represents the average bias; Med bias represents the median bias; B represents the absolute standardized bias; [+] indicates that the B value exceeds the 25% threshold.

The analysis from Table 8 demonstrates that the application of three different matching methods to the four core variables leads to a decrease in Pseudo-R^2, LR, Mean bias, Med bias, and B. Moreover, all the PSM results successfully pass the balance test, indicating that the matching effect of PSM in this paper is deemed satisfactory.

4.5. Robustness Checks

In order to ensure the reliability of the findings, the value of the dependent variable (i.e., CLQP) utilized in SEM is further replaced by, "Are you willing to utilize pesticides and fertilizers in a scientific and rational manner?" and the moderating effect of social identification was quantified through a second-order computation method. The outcomes are presented in Table 9.

The results from Table 9 demonstrate that, even after conducting rigorous robustness checks, the significance and direction of the impact of cognitive identity, emotional identity, behavioral identity, and social identity, as well as the moderating effect of social identity, remain consistent. These findings strongly suggest that the results of this study are robust and reliable.

4.6. Further Analysis of the Relationship between Emotional Identity, Social Identity, and Farmers' WCQP

To further explore why social identity inhibits the promotive effect of emotional identity on farmers' WCQP, we categorize the farmers into four groups based on their mean values of emotional identity and social identity: low emotional and low social identity (I), high emotional and low social identity (II), low emotional and high social identity (III), and high emotional and high social identity (IV). We then use the SEM approach to re-evaluate the impact of emotional identity on WCQP and assess the moderating effect of social identity across these categories. The results are detailed in Table 10.

Table 9. Robustness check result of the effects of self-identity and social identity on farmers' WCQP.

Variables	Model 6		Model 7	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
CID	0.085 *	0.050	0.270 ***	0.059
EID	0.333 ***	0.041	0.309 ***	0.041
BID	0.089 **	0.042	0.098 **	0.041
SID	0.227 ***	0.051	0.140 ***	0.049
CID×SID	0.131 *	0.069	0.087 **	0.044
EID×SID	−0.129 ***	0.044	−0.191 ***	0.036
BID×SID	−0.041	0.066	0.015	0.044
Gender	0.08	0.043	0.027	0.108
Age	−0.015	0.103	0.007	0.041
Edu	−0.016	0.048	0.072	0.048
Hlth	0.057	0.044	0.088 **	0.044
ALY	0.099	0.099	0.082	0.104
CLA	0.062	0.042	0.046	0.042
CLQ	−0.088 **	0.040	−0.108 ***	0.038
Income	−0.089	0.046	−0.070	0.049
Households	0.066	0.049	0.065	0.047
ALF	−0.024	0.048	−0.039	0.043

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% significance levels, respectively.

Table 10. Differentiated emotional and social identity among farmers and their relationship with WCQP.

Variables	I		II		III		IV	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
CID	0.020	0.116	−0.011	0.177	0.168 *	0.087	0.267 ***	0.099
EID	0.135	0.105	0.956 ***	0.162	−0.060	0.098	0.250 ***	0.085
BID	0.171 *	0.098	−0.014	0.090	−0.025	0.081	0.155 *	0.085
SID	0.256 **	0.114	−0.029	0.102	0.477 ***	0.052	0.052	0.090
EID×SID	−0.314 **	0.151	0.158	0.174	−0.101	0.139	0.288 ***	0.079
Control variables	YES		YES		YES		YES	

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% significance levels, respectively.

The analysis from Table 10 reveals that when farmers possess a high emotional identity, regardless of whether their social identity is high or low, the interaction between emotional identity and social identity has a significant positive impact on farmers' WCQP, regardless of whether their social identity is high or low. Conversely, when emotional identity is low, its positive influence on WCQP diminishes. This indicates that a high emotional identity benefits from the presence of a strong social identity, enhancing the effect on WCQP. However, when emotional identity is low, social identity weakens the positive impact of emotional identity on WCQP.

5. Discussion

This paper constructs a theoretical framework to analyze farmers' WCQP within the context of both individual and collective attributes. By incorporating self-identity and social identity, and further subdividing self-identity into cognitive, emotional, and behavioral dimensions, the study examines their effects on farmers' WCQP as well as the moderating role of social identity. Our analysis reveals several interesting findings.

Cognitive identity, emotional identity, and behavioral identity all promote farmers' WCQP, highlighting the crucial role of self-identity in enhancing farmers' WCQP. This is consistent with the findings of Lavuri et al [64]. Regarding cognitive identity, when farmers identify with their role as farmers, their intrinsic motivation drives them to engage

in farmland conservation activities, which enhances their well-being [17] and encourages them to adopt scientific farming techniques, proper fertilization methods, and environmentally friendly agricultural practices [20]. This, in turn, improves their WCQP. From the perspective of emotional identity, our research findings are consistent with those of Vande Velde et al. [19]. Vande Velde et al. investigated the impact of emotional identity on pro-environmental behaviors among Belgian dairy farmers. Their study found that negative emotional identity towards soil pollution weakened farmers' willingness to engage in pro-environmental behaviors, while positive emotional identity significantly enhanced their intention to practice such behaviors. This conclusion aligns with our findings, further corroborating the significant role of emotional identity in influencing individuals' environmental intentions and behavioral choices. Generally, emotions such as "pride", "happiness", and "self-esteem" are vital in shaping farmers' emotional identities [65]. These positive emotions act as "emotional norms [24]", aligning farmers' emotional responses with their identity and thereby enhancing their WCQP. Additionally, farmers with a strong emotional identity often develop deeper emotional bonds with their land, valuing these connections, which promotes WCQP [25]. From the perspective of behavioral identity, our findings are similar to those of Savari et al. [27], but differ from the results reported by Carfora et al. [66]. Carfora et al.'s study on farmers in southern Italy found that behavioral identity did not significantly enhance farmers' pro-environmental intentions. In their research, behavioral identity was primarily examined at the family level, focusing on how individuals' social identity affects the WCQP of other family members. In contrast, our study investigates behavioral identity at the individual level, exploring how an individual's own behavioral identity impacts their WCQP. This focus on the individual rather than the family level could be a key reason for the discrepancy in the results between our study and Carfora et al.'s findings. Actually, as an external manifestation of self-identity, behavioral identity can establish constraints that create subjective norms, prompting farmers to regulate their own behavior [26]. This internal drive ensures that farmers with high behavioral identity maintain a proactive attitude towards protecting farmland and achieving sustainable agriculture [27], often resulting in habitual behaviors that benefit farmland quality [67] and foster WCQP. These findings suggest that enhancing farmers' self-identity should be a key consideration in formulating policies for farmland quality conservation.

Social identity also significantly promotes WCQP, aligning with the findings from Burk et al. [33] and Kiral et al. [34]. Burke et al.'s study on farmers in eastern Idaho, USA, found that social identity can improve farmers' attitudes and behaviors towards environmental protection. Kiral et al. reported that social identity promotes individual pro-environmental behavior by boosting collective environmental actions. In the context of rural China, where smallholder farmers live within village communities, "conformity" is a core survival strategy for small-scale farmers. Those with a strong social identity, who hold strong local views, are more likely to act for the common goals of their rural communities. This inclines them to make agricultural production decisions that deeply align with local values and are more inclined to pursue collective goals. This social alignment influences their agricultural decisions to conform to the community norms and expectations, fostering a heightened sense of responsibility and belonging [30]. Consequently, the farmers with a strong social identity are more likely to prioritize sustainable ecological practices and collective interests, thereby enhancing WCQP. This suggests that strengthening farmers' social identity is an essential strategy for policymakers focused on improving farmland quality conservation.

Our research also confirms that social identity enhances the impact of cognitive identity on WCQP, consistent with the findings of Lequin et al. [18]. Lequin et al. demonstrated that cognitive identity is malleable and influenced to some extent by social identity, making it easier for individuals to align with societal expectations and goals. Based on this, Lequin proposed a strategy to use social identity to improve the cognitive identity of group members in a more passive manner, thereby fostering pro-environmental social identity among individuals. Actually, in close-knit rural communities, when farmers

value their role and identity within the group, they tend to care more about the group's views, and their self-perceptions are more attuned to group expectations and align their self-perceptions with social norms. Due to this alignment, particularly in the context of green development, rural societies expect farmers' self-perception and social values to be unified, further enhancing the promotive effect of cognitive identity on farmers' WCQP. Emotional identity serves as an "emotional norm", shaping farmers' emotional connections with the land and thereby promoting their WCQP. However, social identity has a mixed moderating effect on this relationship. Specifically, when farmers' emotional identity is high, social identity amplifies its positive impact on their WCQP. The farmers with strong emotional bonds to their land, coupled with a strong social identity, are more motivated to improve sustainable farming practices. Conversely, when emotional identity is low, social identity weakens its impact on farmers' WCQP. The farmers with low emotional identity often exhibit conservative attitudes [68] and limited initiative in engaging with their social group. In this scenario, social identity may reinforce traditional behaviors and resistance to change [18], reducing the positive influence of emotional identity on farmers' WCQP. However, when emotional identity is high, farmers, due to their love for rural life, show higher activity in interpersonal interactions [69], and their social identity further encourages them to enhance their social prestige by actively improving their sustainable use of farmland [70], thus promoting the impact of emotional identity on their WCQP. Compared to cognitive and behavioral identity, the relatively low mean score of emotional identity in this study suggests that enhancing farmers' WCQP through emotional and social identity requires careful consideration of their interplay. Policy interventions should be tailored to address the varying levels of farmers' emotional identity, ensuring that the efforts to strengthen social identity do not inadvertently undermine the potential benefits of emotional identity on their WCQP. These findings highlight the need for a nuanced approach in policy design, balancing emotional and social identity factors to effectively enhance WCQP among farmers.

Last but not least, this study has some limitations. While it examined farmers' WCQP, it did not address their actual behaviors towards farmland conservation. There remains a gap between intentions and actual actions, which is an important area for future research.

6. Conclusions and Policy Recommendations

Cognitive identity, emotional identity, behavioral identity, and social identity all enhance farmers' (WCQP). This suggests that government policies aimed at farmland quality conservation should consider the significant roles of both self-identity and social identity. To further enhance WCQP, policies could focus on strengthening these identities. For cognitive identity, the government could organize workshops and educational training to promote agricultural culture, helping farmers recognize their critical role in agricultural production and environmental protection, and guiding them to discover and accept their identity, thereby enhancing their cognitive identity. For emotional identity, the government can establish rural mental health counseling centers and progressively improve the rural mental health service system to help farmers develop positive emotions, enabling them to discover and fulfill their value as farmers, which would strengthen their emotional identity. For behavioral identity, the government can use economic incentives to organize farmers in land quality protection activities, enabling farmers to act on their self-perception, thereby improving their behavioral identity. For social identity, the government can establish agricultural cooperatives to provide an organizational foundation for unity and cooperation among farmers, boosting their sense of belonging and responsibility towards their community, and consequently enhancing their social identity, which in turn enhances farmers' WCQP. Regarding moderating effects, social identity enhances the positive impact of cognitive identity on farmers' WCQP. However, its effect on the relationship between emotional identity and farmers' WCQP varies depending on the level of emotional identity. When farmers' emotional identity is high, social identity can further enhance its impact on their WCQP. Conversely, when farmers' emotional identity is low, social identity may

inhibit its effect. Therefore, when promoting farmers' WCQP through self-identity and social identity, the government should consider these varying effects. For farmers with low emotional identity, it is crucial to first enhance their emotional identity before focusing on social identity. This approach will help avoid the scenario where low emotional identity, combined with social identity, hinders the positive impact of emotional identity on WCQP.

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