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Study on Farmers' Willingness to Participate in High-Standard Farmland Construction Against the Background of Agricultural Green Development

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Abstract: Within the context of agricultural green development, the construction of high-standard farmland plays a crucial role in enhancing agricultural productivity, ensuring food security, and achieving sustainable development. However, as the direct participants, farmers' willingness and enthusiasm to engage in high-standard farmland construction largely determines the success of these initiatives. Therefore, based on data from 326 samples in Qinghai Province, this study employs a structural equation model to analyze the impact of farmers' cognition and the current condition of farmland on the willingness to participate in high-standard farmland construction and verify the mediating effect of information trust. The results indicate the following: (1) the impact pathways of farmers' cognition on participation willingness vary across different dimensions, with subjective norms and behavioral attitudes having a direct positive influence, while perceived behavioral control shows no direct effect; (2) the current condition of farmland has a direct and significant negative effect on participation willingness; (3) information trust exhibits varying mediating effects across different pathways, showing a partial mediating effect on behavioral attitudes and subjective norms, a full mediating effect on perceived behavioral control, and a suppressive effect on farmland condition. This study, grounded in the context of China's green agricultural development goals, provides new insights into the relationship between government policy implementation and farmers' willingness to participate. It establishes a scientific foundation for policymakers to formulate strategic green development policies.

Keywords: agricultural green development; high-standard farmland construction; farmers' willingness to participate; theory of planned behavior

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1. Introduction

Agricultural green development is a crucial pathway for implementing the "green" development concept and achieving sustainable agricultural growth [1]. The promotion of high-standard farmland construction policies has created opportunities for China's transition towards green agricultural development. However, China's agriculture has long been overly dependent on natural resources, chemical fertilizers, and pesticides, leading to a series of environmental issues such as declining soil productivity [2] and ecological degradation [3]. In the long term, this resource-intensive and environmentally harmful development model is unsustainable [4,5]. In alignment with the United Nations' 2030 Sustainable Development Agenda, which emphasizes the goal of "halting and reversing land degradation" (United Nations, 2023), this initiative aims to enhance the comprehensive productivity of cultivated land, effectively addressing challenges like land degradation and ensuring national food security. The 2021 "National High-Standard Farmland Construction Plan (2021–2030)" issued by the Ministry of Agriculture and Rural Affairs of China emphasizes that the construction of high-standard farmland, through the promotion of green agricultural technologies, significantly improves agricultural green development by

optimizing farmland ecological patterns, achieving significant savings in water, electricity, fertilizer, and pesticides, and enhancing the overall farmland ecological environment. The implementation of this policy presents a valuable opportunity for advancing agricultural green development [6,7].

The theory of planned behavior (TPB) is a psychological framework used to explain individual decision-making in specific contexts. In research on farmers' willingness to engage in collective action, TPB is commonly employed to understand and analyze the psychological and behavioral intentions underlying farmers' participation in group activities and to guide intervention design [8]. Accordingly, this study draws on TPB to conduct an in-depth analysis of farmers' willingness to participate in high-standard farmland development, as well as the influencing factors and underlying mechanisms shaping this willingness. This article aims to analyze farmers' willingness to participate in public project development and the factors influencing their engagement while examining the mechanisms at play. By sharing the experiences of Qinghai, we hope to facilitate the integration of infrastructure development with sustainable agricultural strategies in fragile ecosystems, advancing global agricultural sustainability.

The study is organized as follows: the introduction and Section 2 provide a literature review of the field, highlighting the current state and challenges of research on green agricultural development. Section 3 constructs an analytical framework for farmers' participation intentions based on the theory of planned behavior. Section 4 introduces the research area and data sources. Section 5 employs a structural equation model to explore the interactions among latent variables. Section 6 discusses the implications based on the results, followed by conclusions and recommendations.

2. Literature Review

The concept of high-standard farmland was first introduced in the 2005 Central Document No. 1 in China. In 2022, the Standards for High-Standard Farmland Construction (2022 Edition) was issued, further clarifying the main components of high-standard farmland construction: farmland infrastructure projects, soil fertility enhancement, and management requirements. Among these, farmland infrastructure development encompasses land leveling, irrigation and drainage, field road construction, farmland protection and ecological conservation, and electricity distribution. The 2023 Central Document No. 1 highlights the phased transformation of permanent basic farmland into high-standard farmland, signifying a comprehensive acceleration of this initiative. As an infrastructure-oriented initiative, high-standard farmland construction distinctly embodies the characteristics of public benefits [9].

Globally, many countries are actively exploring ways to promote green agricultural development by improving agricultural infrastructure. The United States has implemented the "National Agricultural Irrigation Improvement Program", aimed at enhancing agricultural irrigation efficiency and promoting sustainable water use, which forms a key part of its strategy. In India, the Rashtriya Krishi Vikas Yojana program focuses on investing in agricultural infrastructure, particularly to support small and marginal farmers in improving agricultural productivity. Brazil's "Agricultural Modernization Project" and "Sustainable Rural Development Project" emphasize farmland improvement, supporting infrastructure such as irrigation systems and soil improvement to strengthen the foundations of agricultural growth [10]. Additionally, the European Union's Common Agricultural Policy (CAP), introduced in 2020, is dedicated to building a sustainable food system and supporting the goal of green agricultural development by protecting and enhancing biodiversity within rural ecosystems. These initiatives reflect the proactive efforts and practices of various countries in pursuing the path of green agricultural development [11].

Scholars have extensively researched high-standard farmland construction, focusing on its effects, models, challenges, and influencing factors. Regarding its effects, high-standard farmland construction promotes the transition of agricultural production toward scale and specialization [12]. It fosters the emergence and expansion of new professional

farmer groups and stimulates rural industrial development [13], driving income and consumption growth among farmers [14] and contributing to county-level rural economic development [15]. In terms of models, some scholars classify high-standard farmland construction into six categories: intensive, industrial, resource-based, characteristic, technological, and convenience-based models [16]. Based on location conditions, soil quality, and socioeconomic factors, other scholars categorize these models into location-optimized, soil-quality-improving, and socially advocated types [17]. As for challenges, the literature frequently discusses issues related to construction supervision and operational management [18]. Problems such as inadequate or absent supervision during construction and the emphasis on construction over management have been highlighted [19]. Currently, the lack of clarity regarding the responsibility for the management of high-standard farmland diminishes farmers' motivation to actively engage in the upkeep of these projects, even though they are the primary beneficiaries [20,21]. Regarding influencing factors, some studies have used binary logistic regression to explore the factors affecting farmers' participation in high-standard farmland construction [22,23]. However, due to methodological limitations, only the direct effects of these factors were examined, leaving indirect effects unaddressed.

Through a review of the literature, we identified two core issues. First, high-standard farmland construction in China has long been conducted under a government-led model, which often overlooks the publicly beneficial nature of such projects and the critical role of farmers. This oversight has led to situations where, due to information asymmetry and opportunistic behaviors, farmers are either unwilling or passively involved in these initiatives. Consequently, farmers' willingness to participate may be influenced by informational factors. Ignoring these factors could result in a misjudgment of how farmers' perceptions affect their participation intentions. Second, farmers' willingness is shaped by multiple interacting factors. Relying solely on discrete choice models without accounting for interactions among these factors may produce biased estimates. Structural equation modeling offers greater advantages in capturing the pathways of influence among variables.

3. Theoretical Analysis and Fundamental Assumptions

3.1. Analysis of the Impact of Farmers' Cognition on Their Willingness to Participate

The theory of planned behavior (TPB) was proposed by Ajzen in the 1980s as an extension and refinement of the earlier Theory of Reasoned Action (TRA) developed by Ajzen and Fishbein [24]. According to the Theory of Reasoned Action, behavioral intention is the direct determinant of actual behavior, while behavioral intention itself is influenced by attitudes toward behavior and subjective norms. However, Ajzen observed that human behavior is not entirely voluntary and is often constrained by various factors. Consequently, he introduced the concept of "perceived behavioral control", thus forming the theory of planned behavior. This theory is often used to explain and analyze farmers' psychological motivations and behavioral tendencies in participating in collective activities, such as irrigation management, cooperative operations, community-supported agriculture projects, and collective purchasing and selling [8]. It provides a robust analytical framework for understanding behavioral decision-making [25].

Accordingly, this paper measures farmers' individual cognition from the three dimensions of attitudes toward behavior, perceived behavioral control, and subjective norms to explore its impact on their willingness to participate in the construction of high-standard farmland [26]. Attitudes toward behavior (ATB) refers to the positive or negative emotional attitude that individuals form toward a particular behavior based on their own experience. For example, the perception that high-standard farmland construction can improve farmland quality may enhance farmers' willingness to participate. Subjective norms (SNs) refer to the social pressure that influences an individual's decision-making process. When making decisions, farmers may feel this social pressure, and an increased awareness of high-standard farmland construction could, in turn, affect their willingness to participate. Perceived behavioral control (PBC) refers to an individual's perceived ability to control

a behavior [27]. Farmers' assessments of their own abilities will influence their decision to participate in high-standard farmland construction. Based on this, the following basic hypotheses are proposed:

H_{11}: *Attitudes toward behavior (ATB) have a positive impact on farmers' willingness to participate.*

H_{12}: *Subjective norms (SNs) have a positive impact on farmers' willingness to participate.*

H_{13}: *Perceived behavioral control (PBC) has a positive impact on farmers' willingness to participate.*

3.2. Analysis of the Impact of Farmland Conditions on Farmers' Willingness to Participate

The theory of planned behavior primarily explores the influence of individual cognition on behavioral intention. However, in reality, behavioral intention is also influenced by external environmental factors [28]. Guagnano et al. incorporated external environmental factors into their analytical framework and proposed the "Attitude–Context–Behavior" theory. This theory suggests that external environments and individual cognition interact and influence each other, stating that individual behavior results from the interaction between internal environmental attitudes and external contextual factors [29]. Farmland conditions (FCs), as an important external contextual factor, directly influence farmers' willingness to participate in high-standard farmland construction. The opportunity cost theory posits that individuals consider the potential benefits of forgoing one choice when making decisions. For example, if the current condition of farmland is good, farmers may perceive the opportunity cost of participating in high-standard farmland construction to be too high, meaning they would need to forgo current production activities and income to invest in construction. If existing farmland already provides satisfactory returns, farmers may believe that the additional investment and participation would not sufficiently compensate for the loss of current income [30]. Thus, the following hypothesis is proposed:

H_{21}: *Farmland conditions (FCs) have a negative impact on farmers' willingness to participate.*

3.3. Analysis of the Mediating Effect of Information Trust

Farmers' decision-making is influenced by their degree of information mastery and the level of trust they place in the information they receive [31]. Information plays a crucial role in determining farmers' willingness to participate in the construction of high-standard farmland [32]. Attitudes toward behavior perceived behavioral control, and subjective norms are components of individual cognition formed by external factors based on personal experience, knowledge, and other factors. These differences in individual cognition can lead to variations in how individuals judge and use information, thereby affecting their trust in this information. If farmers lack sufficient knowledge about high-standard farmland, issues such as information asymmetry between them and the implementers may arise, leading to discrepancies between their individual cognition and actual events, which, in turn, affects their willingness to participate.

Additionally, the four key elements that influence the process of information dissemination are the source, receiver, information itself, and channel [33]. The overall quality of information dissemination is determined by the overall strength of the information source, which, in turn, is influenced by the external environment. The village committee, as the government entity with the most direct contact with farmers, is also the final executor of government policies. For farmers, the village committee plays a key role in publishing and disseminating information, making it the primary channel through which they receive information. Therefore, a favorable external environment contributes to enhancing the positive image of the village committee, which, in turn, increases farmers' trust in the information provided by the committee. Based on this, the following basic hypotheses are proposed:

H_{31}: *Information trust has a positive mediating effect on the relationship between attitudes toward behavior (ATB) and farmers' willingness to participate.*

H_{32}: *Information trust has a positive mediating effect on the relationship between subjective norms (SNs) and farmers' willingness to participate.*

H_{33}: *Information trust has a positive mediating effect on the relationship between perceived behavioral control (PBC) and farmers' willingness to participate.*

H_{34}: *Information trust has a positive mediating effect on the relationship between farmland conditions (FCs) and farmers' willingness to participate.*

3.4. Analysis Framework

Based on these theoretical analyses, the framework diagram of this study is illustrated in Figure 1. This analytical framework outlines the socioeconomic background and agricultural conditions of the study area. It further elucidates how theoretical analysis reveals farmers' behavioral intentions and cognitive processes, ultimately aiming at the goal of agricultural green development. The framework illustrates the logical relationship between background factors and farmers' perceptions of policy objectives, highlighting the role of high-standard farmland construction in promoting ecological protection and agricultural green development [34].

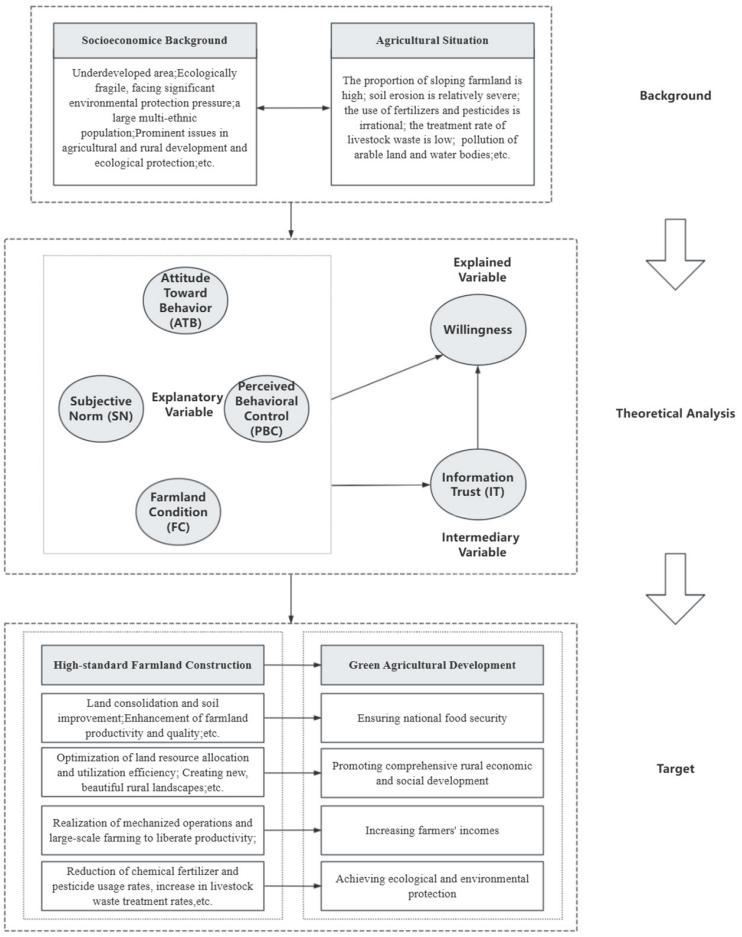


Figure 1. Analysis framework diagram.

4. Materials and Methods

4.1. Study Area

Qinghai Province, located in western China, occupies the northeastern part of the Qinghai–Tibet Plateau, known as the "Roof of the World". As it lies in the upper reaches of the Yangtze River Basin and serves as the source region for many of Asia's major rivers, it is often referred to as the "Source of Rivers" [35]. This unique geographical position

places significant ecological preservation responsibilities on the region. This study area is characterized by a fragile ecological environment, with severe issues of soil erosion still prevalent. High-standard farmland construction plays a crucial role in mitigating the negative environmental impacts of farmland, such as soil erosion and the loss of fertilizers and pesticides. It is vital for conserving water and soil, protecting biodiversity, promoting sustainable agriculture, and improving water resource management. Therefore, high-standard farmland construction in Qinghai is of particular importance.

According to the 2023 National Economic and Social Development Statistical Bulletin issued by the Qinghai Provincial Bureau of Statistics, the annual per capita disposable income of urban residents in Qinghai was CNY 40,408, while that of rural residents was only CNY 15,614, reflecting a significant income gap between urban and rural areas. For rural residents, operating net income accounted for 35.42% of per capita disposable income, though this proportion decreased by 1.0 percentage points compared to the previous year, indicating a continued downward trend. The project area, located at an altitude between 2750 and 4622 m, is characterized by harsh natural conditions and predominantly alpine meadow soils. This area represents a transitional zone between agricultural and pastoral lands. Households in this region still largely rely on traditional farming and livestock activities. The main crops include wheat, legumes, rapeseed, and potatoes, following a single cropping cycle with rotational and fallow practices. The exact location of the study area is shown in Figure 2.

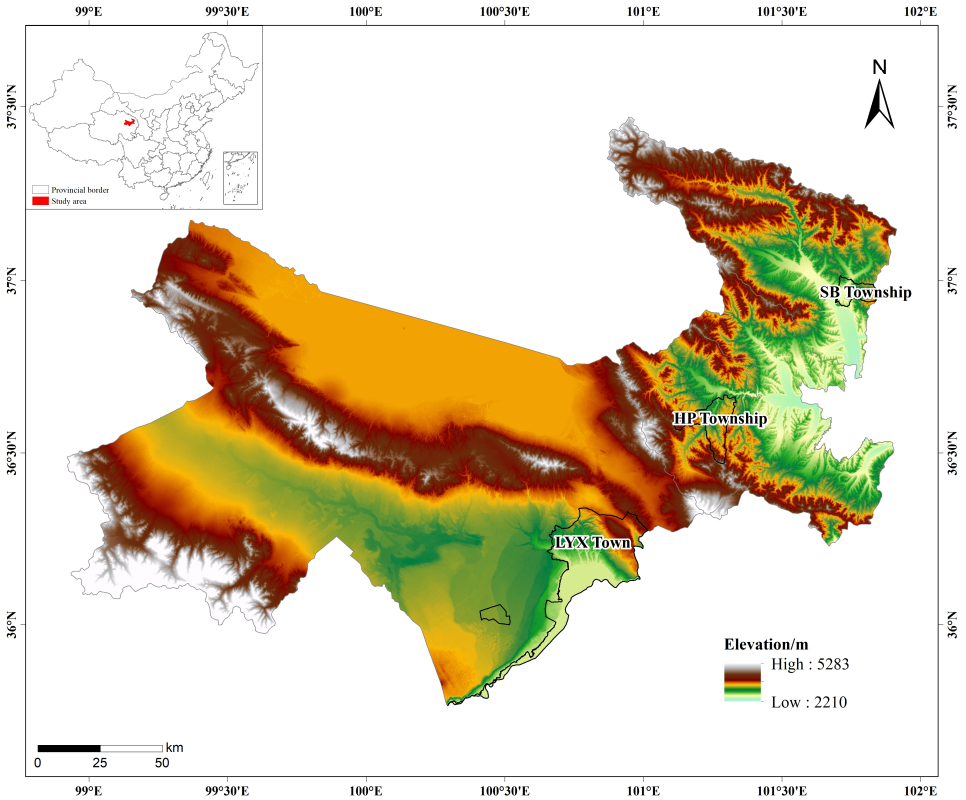


Figure 2. Study area.

4.2. Data Sources

In this study, we carefully considered data representativeness and independence, consulting relevant experts to select SB Township in D County, HP Township in H County, and LY Town in G County, Qinghai Province, as the sample areas. Based on household registration data from the *China County Statistical Yearbook* (*Township Volume*), compiled by the Rural Socio-Economic Survey Department of the National Bureau of Statistics in 2020, a stratified sampling method was applied. In July 2023, the research team conducted face-to-face interviews and administered online questionnaires, targeting household heads

to ensure data quality. The specific sampling data are shown in Table 1. After excluding outliers and missing values, a total of 326 valid questionnaires were collected, achieving an effective sample rate of 93.14%. Among the respondents, 286 households expressed a willingness to participate in high-standard farmland construction, resulting in a participation intention rate of 87.73%. These results indicate that farmers in Qinghai Province generally exhibit a strong willingness to engage in high-standard farmland development.

Table 1. Sample distribution table.

Sample Point	Registered Household Population	Number of Questionnaires	Number of Effective Samples	Number of Willing Participants	Proportion of Willingness
D County SB Township	19,680	155	148	134	90.54%
H County HP Township	13,986	111	101	65	84.42%
G County LY Town	10,581	84	77	87	86.14%
Total	44,247	350	326	286	87.73%

Table 2 summarizes the demographic characteristics collected from respondents, including their gender, age, ethnicity, education level, health condition, household size, number of labor force members, and the frequency of their social interactions with neighbors, village committee, and relatives.

Table 2. Demographic information of respondents.

Basic Characteristics	Category	Frequency	Total	Percentage
Gender	Male	264		80.86%
	Female	62	326	19.14%
Age	Under 18 years	0		0.00%
	18–35 years	23		7.03%
	36–65 years	246		75.39%
	Above 65 years	57	326	17.58%
Ethnicity	Han	224		68.75%
	Tibetan	28		8.59%
	Hu	74	326	22.66%
Education Level	Illiterate	73		22.27%
	Primary education	89		27.34%
	Secondary eeducation	156		47.85%
	Higher education	9	326	2.73%
Health Condition	Poor	28		8.59%
	Average	53		16.41%
	Good	124		37.89%
	Excelent	121	326	37.11%
Household Size	3 people or fewer	74		22.66%
	4–6 people	246		75.39%
	7–9 people	5		1.56%
	More than 9 people	1	326	0.39%
Household Labor Force(Age 16–65 years)	2 people or fewer	87		26.56%
	3–4 people	202		62.11%
	5–6 people	36		10.94%
	More than 6 people	1	326	0.39%
Frequency of Conversations with Neighbors	Rarely	1		0.39%
	Occasionally	1		0.39%
	Often	72		22.09%
	Very freduently	251	326	76.99%

Table 2. *Cont.*

Basic Characteristics	Category	Frequency	Total	Percentage
Frequency of Conversations with committee	Rarely	0		0.00%
	Occasionally	66		20.31%
	Often	126		38.67%
	Very freduently	134	326	41.10%
Frequency of Conversations with Relatives	Rarely	0		0.00%
	Occasionally	124		37.89%
	Often	93		28.52%
	Very freduently	109	326	33.44%

4.3. Indicator Construction

The theoretical analysis indicates that farmers' willingness to participate in high-standard farmland construction is influenced by individual cognition, current farmland conditions, and trust in information. Based on this, drawing from existing research findings and preliminary survey analysis, we selected a total of 25 questions. The dependent variable is farmers' willingness to participate, while the independent variables are farmers' cognition and farmland conditions. Farmers' cognition is measured across three dimensions: behavioral attitudes, perceived behavioral control, and subjective norms, comprising 17 indicators. Farmland conditions are measured using three indicators. The mediating variable is information trust, which is measured by four indicators. The description and descriptive statistics of each variable are presented in Table 3.

Table 3. Indicator system for farmers' willingness to participate in high-standard farmland construction.

Variable	Indicator	Variable Name	Measurement Items	Mean	Variance
Dependent Variable	Willingness	Y	Willingness to participate in HSFC.	0.867	0.116
Independent Variable	Attitude Toward Behavior (ATB)	ATB1	Compared with ordinary farmland, HSF can improve agricultural economic benefits.	4.168	0.234
		ATB2	Compared with ordinary farmland, HSF has strong ecological functions.	4.266	0.298
		ATB3	Compared with ordinary farmland, HSF provides many social benefits.	4.164	0.232
		ATB4	Participating in HSFC is beneficial for the development of agricultural production.	4.203	0.257
		ATB5	Participating in HSFC contributes to optimizing the farmland environment.	4.184	0.260
		ATB6	Participating in HSFC is a meaningful endeavor.	4.188	0.255
		ATB7	I feel obligated to participate in HSFC.	4.168	0.329
	Subjective Norm (SN)	SN1	The village organization will value the contributions I make to HSFC.	4.113	0.179
		SN2	My family strongly supports my participation in HSFC.	4.168	0.360
		SN3	Participating in HSFC is beneficial for gaining others' approval.	4.055	0.279
		SN4	My willingness to participate in HSFC is influenced by my neighbors.	3.824	0.914
		SN5	The nation and government call for the upgrading of HSFC.	4.125	0.220
		SN6	If HSFC is not implemented, it would be a loss for us as farmland will not be sustainably utilized in the future.	4.145	0.234

Table 3. *Cont.*

Variable	Indicator	Variable Name	Measurement Items	Mean	Variance
Independent Variable	Perceived Behavioral Control (PBC)	PBC1	I can fully understand the gap between the current farmland and HSF.	3.945	0.264
		PBC2	I am fully aware of the barriers to farmland utilization in my village and can grasp ideas for improvement.	3.957	0.465
		PBC3	I understand the content and related policies of HSFC.	3.809	0.430
		PBC4	I have sufficient energy and time to participate in HSFC.	3.797	0.492
	Farmland Condition (FC)	FC1	Soil quality of the farmland.	4.105	0.212
		FC2	Farmland yield.	4.168	0.266
		FC3	The level of farmland infrastructure construction.	4.102	0.209
Mediating Variable	Information Trust (IT)	IT1	I trust the HSFC information provided by the village committee as highly authoritative.	4.129	0.246
		IT2	I believe the HSFC project information conveyed by the village committee is clear.	3.207	1.192
		IT3	The HSFC project information provided by the village committee is beneficial to me	3.066	1.419
		IT4	I believe that HSFC aligns with collective interests.	2.922	1.382

Note: HSF refers to high-standard farmland; HSFC refers to high-standard farmland construction.

4.4. Methods

Structural equation modeling (SEM) is a multivariate statistical analysis technique used to explore the logical relationships among multiple factors, particularly for analyzing the structural relationships between latent variables that cannot be directly observed [36]. In this study, we constructed an SEM composed of two parts: a measurement model and a structural model. The SEM is used to analyze the multiple causal relationships influencing farmers' willingness to participate in green farmland construction. The specific model is as follows:

$$Y = \Lambda_y \eta + \varepsilon \quad (1)$$

where Y represents the vector of observed variables for endogenous latent variables; Λ_y is the coefficient matrix of the relationship between endogenous latent variables and observed variables; η represents the endogenous latent variables; and ε denotes the error term.

$$X = \Lambda_x \xi + \sigma \quad (2)$$

Similarly, X represents the vector of observed variables for exogenous latent variables; Λ_x is the coefficient matrix of the relationship between exogenous latent variables and observed variables; ξ represents the exogenous latent variables; and σ denotes the error term. Equations (1) and (2) are measurement models that reflect the relationship between the observed variables and the latent variables.

$$\eta = B\eta + \Gamma\xi + \zeta \quad (3)$$

where η denotes the endogenous latent variables; ξ denotes the exogenous latent variables; and B and Γ are the coefficient matrices corresponding to endogenous and exogenous latent variables, respectively. ζ represents the residual term in the structural equation. Equation (3) is the structural equation model [37].

5. Results

5.1. Indicator Screening

To more accurately identify the factors influencing farmers' participation in high-standard farmland construction, 24 independent variable indicators were screened. SPSS software was used to calculate the correlation coefficients between the 24 independent variables and the dependent variable. Indicators with a correlation coefficient of less than 0.3, indicating low correlation, were excluded. Ultimately, 16 indicators were identified as influencing farmers' participation in high-standard farmland construction. These include four indicators for attitude toward behavior, three for subjective norms, three for perceived behavioral control, three for information trust, and three for farmland conditions (Table 4).

Table 4. Indicator screening.

Variable	Indicator	Variable Name	Correlation Coefficient	Result
Dependent Variable	willingness	Y	1	Retain
Independent Variable	Attitude Toward Behavior (ATB)	ATB1	0.247 *	Exclude
		ATB2	0.290 **	Exclude
		ATB3	0.264 **	Exclude
		ATB4	0.425 **	Retain
		ATB5	0.524 **	Retain
		ATB6	0.494 **	Retain
		ATB7	0.332 **	Retain
	Subjective Norm (SN)	SN1	0.265 **	Exclude
		SN2	0.534 **	Retain
		SN3	0.463 **	Retain
		SN4	0.271	Exclude
		SN5	0.638 **	Retain
		SN6	0.258 **	Exclude
	Perceived Behavioral Control (PBC)	PBC1	0.129 *	Exclude
		PBC2	0.387 **	Retain
		PBC3	0.411 **	Retain
		PBC4	0.522 **	Retain
	Farmland Condition (FC)	FC1	−0.321 **	Retain
		FC2	−0.310 **	Retain
		FC3	−0.531 **	Retain
Mediating Variable	Information Trust (IT)	IT1	0.476 **	Retain
		IT2	0.339 *	Retain
		IT3	0.565 **	Retain
		IT4	0.131 *	Exclude

Note: HSF refers to high-standard farmland; HSFC refers to high-standard farmland construction; ** and * indicate that the estimation results are significant at the 1% and 5% levels, respectively.

5.2. Results of Structural Equation Model Testing

In this study, SPSS 24.0 software was used to conduct Bartlett's test of sphericity and the KMO (Kaiser–Meyer–Olkin) test on the data (Table 5) [38]. The results showed that the *p*-value of Bartlett's test of sphericity was less than 0.05, leading to the rejection of the null hypothesis, which suggests that there is no correlation between the variables. The KMO value was 0.899, which is significantly higher than the threshold value of 0.6, indicating that the data are suitable for factor analysis. Cronbach's alpha reliability coefficient reached 0.70, demonstrating good internal consistency [39]. The reliability analysis results indicated that Cronbach's alpha coefficients for all latent variables exceeded 0.75, confirming the good internal consistency and reliability of the data.

Table 5. Factor analysis and reliability test.

Indicator	Variable Name	Standardized Factor Loadings	Cronbach's Alpha	Average Variance Extracted	Composite Reliability
Attitude Toward Behavior (ATB)	ATB4	0.918	0.951	0.831	0.952
	ATB5	0.922			
	ATB6	0.925			
	ATB7	0.881			
Subjective Norm (SN)	SN2	0.886	0.867	0.695	0.872
	SN3	0.798			
	SN5	0.835			
Perceived Behavioral Control (PBC)	PBC2	0.865	0.914	0.785	0.916
	PBC3	0.934			
	PBC4	0.858			
Information Trust (IT)	IT1	0.815	0.889	0.733	0.892
	IT2	0.882			
	IT3	0.870			
Farmland Condition (FC)	FC1	0.753	0.778	0.583	0.799
	FC2	0.956			
	FC3	0.518			

Note: HSF refers to high-standard farmland; HSFC refers to high-standard farmland construction.

AMOS 24.0 statistical software was employed to test the validity of the data. The results showed that the standardized factor loadings for the latent variables ranged from 0.55 to 0.65, indicating good convergent validity. The average variance extracted (AVE) values were all greater than the threshold of 0.50, and the composite reliability values exceeded 0.60, further confirming good convergent validity. Additionally, the AVE values for each latent variable were greater than the correlations between latent variables (Table 6), indicating good discriminant validity, making the data suitable for further analysis.

Table 6. Results of the discriminant validity test.

Variable	ATB	SN	PBC	IT	FC
ATB	0.912				
SN	0.678	0.833			
PBC	0.508	0.533	0.886		
IT	0.501	0.578	0.541	0.856	
FC	0.260	0.125	0.275	0.396	0.764

Note: the values on the diagonal represent the square root of the average variance extracted (AVE), while the other values indicate the correlation coefficients among the variables.

Using the AMOS 24 software, a structural equation model was constructed based on the data that passed reliability and validity tests. A total of nine fit indices were selected to assess the overall goodness of fit of the model, including the Absolute Fit Index, Incremental Fit Index, and Parsimonious Fit Index. The results indicate that all fit indices of the model fall within the acceptable range (Table 7), demonstrating that the model is well constructed and the results are reliable [40].

Table 7. Overall model adaptability test.

Goodness-of-Fit Index	Absolute Fit Index			Incremental Fit Index			Parsimonious Fit Index		
	GFI	AGFI	RMSEA	NFI	IFI	CFI	X2/DF	PNFI	PGFI
Model Results	0.922	0.911	0.050	0.951	0.975	0.975	1.943	0.746	0.659
Standard Range	>0.900 ideal	>0.900 ideal	<0.050 ideal	>0.900 ideal	>0.900 ideal	>0.900 ideal	<3.00 ideal	>0.500 ideal	>0.500 ideal

Using AMOS 24 software, we calculated and analyzed the relationships among latent variables, resulting in the structural equation model (Figure 3) and path coefficients (Table 8). The specific results are presented below:

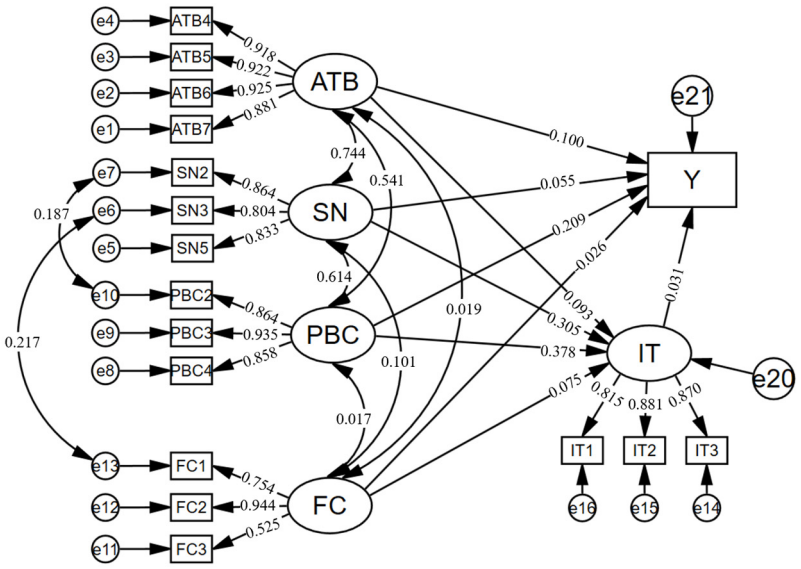


Figure 3. Analysis on the standardized path of the integral structural equation.

Table 8. Structural equation model verification results.

Pathway	Standardized Path Coefficients	Standard Error (SE)	Critical Ratio (CR)
ATB→Y	0.10 *	0.034	1.761
SN→Y	0.055 ***	0.048	3.019
PBC→Y	0.209	0.027	1.128
FC→Y	−0.026 *	0.022	−0.727
ATB→IT	0.093 *	0.048	1.89
SN→IT	0.305 ***	0.064	6.692
PBC→IT	0.378 ***	0.036	7.45
FC→IT	0.075 **	0.031	2.421
IT→Y	0.031 *	0.032	0.586
ATB↔SN	0.744 ***	0.013	14.562
ATB↔PBC	0.541 ***	0.015	12.296
ATB↔FPS	0.019	0.011	0.496
SN↔PBC	0.614 ***	0.014	12.682
SN↔FPS	0.101 **	0.01	2.506
PBC↔FPS	0.017	0.012	0.437
e6↔e13	0.217 ***	0.012	5.126
e7↔e10	0.187 ***	0.005	3.912

Note: ***, ** and * indicate that the estimated results are significant at the 1%, 5%, and 10% levels, respectively.

The cognition of farmers has a significant positive impact on their willingness to participate in high-standard farmland construction, with notable differences across different dimensions influencing their participation intentions. The path ATB→Y is accepted at the 10% significance level, with a path coefficient of 0.10, supporting hypothesis H_{11}. The path SN→Y is accepted at the 1% significance level, with a path coefficient of 0.055, supporting hypothesis H_{12}. However, the path PBC→Y is not accepted, indicating that PBC does not directly influence farmers' willingness to participate, thus rejecting hypothesis H_{13}. Furthermore, a comparison of the path coefficients reveals that the positive impact of ATB on farmers' willingness to participate is greater than that of SN.

The path FC→Y is accepted at the 10% significance level, with a path coefficient of −0.026, supporting hypothesis H_{21}. The path ATB→IT is accepted at the 10% significance

level, with a path coefficient of 0.093. The path SN→IT is accepted at the 1% significance level, with a path coefficient of 0.305. The path PBC→IT is accepted at the 1% significance level, with a path coefficient of 0.378. The path FC→IT is accepted at the 5% significance level, with a path coefficient of 0.075. Lastly, the path from IT→Y is accepted at the 10% significance level, with a path coefficient of 0.031. Therefore, it can be concluded that IT has a partial mediating effect on the relationship between ATB and SN, supporting hypotheses H_{31} and H_{32}. IT shows a full mediating effect on PBC, supporting hypothesis H_{33}. However, IT exhibits a masking effect on FC, leading to the rejection of hypothesis H_{34}.

6. Discussion

This study found that farmers' cognition has a significant positive impact on their willingness to participate in high-standard farmland construction. However, there are differences in the effects of attitudes toward behavior (ATB), subjective norms (SNs), and perceived behavioral control (PBC) on participation willingness. Both ATB and SN have a direct positive influence on farmers' willingness to participate, with ATB exerting the strongest effect, while PBC has no direct influence. In contrast, farmland conditions (FCs) have a directly negative effect on participation willingness. Information trust (IT) produces different mediating effects for various factors: it partially mediates the effects of ATB and SN, fully mediates the effect of PBC, and shows a masking effect on FC.

Regarding the results for attitudes toward behavior (ATB), this reflects farmers' subjective judgment based on their own experiences. When farmers perceive that a particular behavior will yield positive outcomes, they are more likely to engage in that behavior [41]. High-standard farmland, as a critical infrastructure in the process of agricultural modernization [42], ensures stable yields under both drought and flood conditions, improves accessibility with well-developed roads, adopts advanced and appropriate technologies, and offers significant positive benefits such as high-quality, high-yield, and high-efficiency agricultural production [43]. It is this deep recognition of such positive benefits that leads to an increasing willingness among farmers to participate in high-standard farmland construction. A strong positive correlation exists between the depth of this recognition and participation willingness. For instance, in 2020, certain areas of County D successfully implemented dryland agriculture and efficient water-saving projects as part of the high-standard farmland initiative. These projects not only optimized the local agricultural production structure but also enhanced the overall productivity of the farmland. As a result, farmers in County D have significantly deepened their understanding of high-standard farmland construction, leading to an unprecedented level of willingness to participate, with a participation rate as high as 90.54%. This figure is considerably higher than in other sample areas, clearly demonstrating that the deeper farmers recognize the positive benefits of high-standard farmland, the higher their willingness to participate.

Regarding the results for subjective norms (SNs), farmers, as fundamental units of society, are deeply embedded in social networks through which they receive indispensable social support [44]. This system of social support exerts a profound influence on their behavioral patterns, particularly in motivating their willingness to participate in high-standard farmland construction. Geographical relationships typically refer to social relationships that arise from close contact among members of society living in the same geographical area. For rural households, geographical relationships refer to the neighborly relationships within the spatial boundaries of the same natural village [45]. As the saying goes, "a near neighbor is better than a distant relative". Research indicates that in rural areas along the Yellow River in China, geographical relationships play a more prominent role than kinship ties in the social networks of rural households [46]. Data from this survey show that the frequency of interactions between farmers and their neighbors is notably high, with 76.99% reporting frequent communication. This reveals the core structure of farmers' social networks, which are primarily driven by close ties among fellow villagers. When farmers frequently exchange information on the practical outcomes, economic benefits, and government support related to high-standard farmland construction, these information

flows become critical reference points in their decision-making process. In this context, farmers tend to follow socially accepted norms to maintain a sense of belonging and identity within their social groups, making them more likely to participate in high-standard farmland construction. This phenomenon not only reflects farmers' tendency toward conformity within their social networks but also highlights the importance of social networks in advancing agricultural modernization.

In terms of perceived behavioral control (PBC), this concept refers to an individual's perceived self-efficacy and sense of control over executing a behavior [47]. High-standard farmland construction is typically government-led, with funding primarily provided by central and provincial finances [48]. The relevant financial resources are allocated based on considerations of non-profit and public service guarantees, and the construction is supported through government backing. This strong government leadership provides robust policy support and guaranteed resources for high-standard farmland construction. By offering clear policy guidance, financial subsidies, and an optimized agricultural production environment, the government reduces the barriers and risks for farmers to participate. Consequently, farmers, when making decisions, are more likely to consider the favorable policies and feasibility of the project rather than excessively worrying about their own capabilities. As a result, in the context of government-led projects, farmers' self-assessment of their capabilities has no significant influence on their willingness to participate in high-standard farmland construction.

As for farmland conditions (FCs), the analysis reveals that, as agricultural modernization progresses, improvements in farmland biodiversity, monitoring systems, and infrastructure are continually being made. Many farmers, driven by a risk-averse mindset, recognize that while high-standard farmland can potentially increase yields and profitability, it also entails higher investments and associated risks. Thus, those content with the current conditions may prefer to maintain the status quo to avoid potential uncertainties [49]. At the same time, significant advancements in farmland infrastructure and enhancements to the overall appearance of farmland have fostered greater trust in the government among farmers, indirectly influencing their willingness to participate. Scholars describe Chinese rural society as a "society of acquaintances", where trust is primarily based on familiarity and mutual understanding [50]. In such a context, trust develops through long-term cohabitation and ongoing interactions, leading to a deep awareness of each other's behavior and character, which is crucial in rural communities. In the realm of farmland development, farmers' trust in the government emerges from concrete actions, such as improvements in agricultural infrastructure and farmland aesthetics. Once established, this trust can positively influence farmers' willingness to participate, as it signals alignment with their interests. Consequently, farmers are more inclined to respond to government initiatives and engage in public efforts like farmland development.

Regarding the findings on information trust (IT), farmers' cognition and farmland conditions influence their willingness to participate through the mediating effect of IT. If farmers cannot effectively receive or trust the information provided by the village committee, their participation behavior may not be realized [51]. The village committee, as the main channel for government information dissemination, plays a critical role in influencing farmers' willingness to participate. Survey data show that only 2.73% of the total sample had completed higher education, while the illiteracy rate was as high as 22.27%. This highlights the generally low educational level of farmers, which limits their ability to access information. In this context, the village committee, as the key node for information dissemination, plays an increasingly important role in facilitating farmers' comprehensive understanding and active participation in high-standard farmland projects [52]. This finding underscores not only the importance of improving farmers' educational levels but also the need to enhance the information dissemination functions of village committees to ensure that information is accurately and effectively communicated to every farmer, thereby supporting the smooth progress of high-standard farmland construction.

7. Conclusions and Recommendations

This paper systematically analyzes the pathways through which farmers' cognition (including Subjective Norms, Attitude Toward Behavior, and Perceived Behavioral Control) influences their willingness to participate in high-standard farmland construction. Using structural equation modeling, this study reveals significant differences in the impacts of these various dimensions. These findings not only enrich the theoretical understanding of farmers' behavior but also provide new insights into the psychological mechanisms underlying farmers' participation in high-standard farmland construction. The study shows that the current conditions of farmland have a direct and significantly negative impact on farmers' willingness to participate, offering crucial evidence for policymakers. This finding aids in formulating more precise and effective farmland improvement and incentive policies. Furthermore, information trust exhibits complex mediating effects on the influence pathways: it partially mediates the effects of behavioral attitudes and subjective norms, fully mediates the effect of perceived behavioral control, and shows a masking effect on farmland conditions. This multi-level mediation analysis provides new insights into the complex role of information trust in farmers' decision-making processes and offers strategic guidance for improving information dissemination efficiency and enhancing farmers' trust. In addition to deepening the understanding of the factors influencing farmers' willingness to participate in the construction of high-standard farmland, this study also provides valuable insights into the formulation of international agricultural policies, the advancement of agricultural infrastructure projects, and the promotion of green agricultural development.

Based on these conclusions, the following policy recommendations are proposed:

First, it is essential to strengthen the promotion of high-standard farmland construction and the concept of agricultural green development to enhance farmers' awareness [53]. Strategies for this can draw on the successful experiences of the United States and the Netherlands, where agricultural extension systems not only emphasize technical training but also focus on promoting farmers' cooperatives and community participation to enhance farmers' initiative and collective consciousness [54]. China can adopt the cooperative model to facilitate information exchange and resource sharing among farmers. Through collective training and experience sharing, farmers' understanding and engagement in high-standard farmland construction can be improved.

Second, it is important to deepen the assessment of farmland conditions and implement differentiated strategies [55]. Through the comprehensive analysis of agricultural conditions, personalized development plans that are suitable for different regions and farmers can be developed. For farmers with favorable conditions, local governments should encourage investments aimed at enhancing soil quality and ecological balance [56]. Conversely, for those with suboptimal conditions, the government should provide technical support and financial assistance to help them recognize the necessity and effectiveness of farmland transformation and upgrading, particularly through the implementation of small-scale ecological agriculture projects to enhance their production capacity and sustainability.

Third, constructing a positive image of grassroots governments is crucial for enhancing farmers' trust in project information [57]. Project implementers should consider establishing information disclosure platforms that regularly publish project progress, financial usage, and effectiveness assessments to increase transparency. Additionally, by involving third-party evaluation agencies, the fairness and effectiveness of project implementation can be ensured. Furthermore, encouraging farmers to participate in the policymaking and implementation processes through public hearings and community discussions will enhance their sense of involvement and trust. This, in turn, will provide a solid grassroots foundation for achieving the goals of agricultural green development and ensuring national food security.

8. Limitations and Future Work

Although this study, based on 326 samples from Qinghai Province, employs structural equation modeling to explore the impact of farmers' perceptions and farmland conditions on willingness to participate in high-standard farmland construction and verify the mediating effect of information trust, several limitations remain. These limitations offer avenues for future research. Specifically, this study focuses on the influence of farmers' perceptions, farmland conditions, and information trust on participation willingness. However, other critical factors may not have been considered. For instance, the policy environment, socio-economic conditions, and household resource endowments might also affect farmers' willingness to participate. Future research should delve deeper into these potential factors and investigate how they interact with farmers' perceptions, farmland conditions, and information trust to collectively influence participation willingness.

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