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The Impact of Farmers' Perception on Their Cultivated Land Quality Protection Behavior: A Case Study of Ningbo, China

Xiaoying Wang, Hangang Hu, Aifeng Ning *, Guan Li and Xueqi Wang

Law School, Ningbo University, Ningbo 315211, China; wangxiaoyingzj@126.com (X.W.); huhangang@nbu.edu.cn (H.H.); liguan@nbu.edu.cn (G.L.); wangxueqi@nbu.edu.cn (X.W.)

* Correspondence: ningaifeng@nbu.edu.cn

Abstract: Farmers' protection behavior largely depends on their perceived value of cultivated land quality protection. However, existing research shows that the impact path of these perceived factors on farmers' cultivated land protection behavior is not clear. Based on the survey data of 288 farmers in Ningbo City, this study empirically analyzed the impact of farmers' perception on their cultivated land quality protection behavior through structural equation modeling (SEM). The results showed that farmers' cultivated land quality protection behavior largely depended on perceived value, and they followed the logic paradigm of "perceived tradeoff→perceived value→behavioral intention→behavioral response". Among them, farmers' perceived value comes from farmers' comprehensive tradeoff of benefits and risks in the process of cultivated land quality protection. In other words, improving farmers' perceived benefits and reducing perceived risks is conducive to improving farmers' perceived value of cultivated land quality protection. The above findings are helpful to improve farmers' behavior of farmland land quality protection and provide new ideas and empirical basis for the design and improvement of cultivated land quality protection policies.

Keywords: cultivated land quality protection; farmer's behavior; perceived value; structural equation model (SEM)

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1. Introduction

Cultivated land is the essential resource and condition for human survival, the basis of national economic development and social stability, and the fundamental guarantee for realizing people's food security [1–4]. The quantity and quality of cultivated land are closely related to sustainable human development [5–7]. Governments worldwide have long attached great importance to farmland protection [8–10]. However, the vast population and the excessive expansion of cities have caused enormous demand pressure on limited cultivated land resources [11,12]. Cultivated land resources have been continuously reduced, and many high-quality cultivated land areas have been occupied [9,13]. The contradiction among food security, economic development, and cultivated land resource protection have become increasingly prominent [14,15]. In the process of meeting the needs of rapid population and urbanization for grain size and structure, long-term problems, such as the excessive application of chemical fertilizers, insufficient organic recycling, and unreasonable farming methods, have emerged, thus leading to the deterioration of cultivated land quality [16].

To this end, countries worldwide have made many efforts to actively explore practical ways to protect arable land [17]. On a global scale, farmland protection is usually implemented through government intervention [18], mainly including demarcating agricultural protected areas through planning means [19], implementing compulsory agricultural land protection policies through legal means [20], and promoting agricultural land development rights trading through market means [21,22]. However, the protection of cultivated land quality is a systematic project. The government's participation alone is not enough to solve the problem [19].

As the direct users of cultivated land, farmers play an essential role in protecting such land and significantly improving its quality [23]. They are the last barrier to protecting arable land quality through the quality of cultivated land protection and soil improvement. Previous studies indicated that farmers' land-use behavior, including the choice of land-use type, plantation structure [24], land-related inputs [25], the use of fertilizers and pesticides [26], and agricultural waste resource utilization [27], have significant impacts on the cultivated land quality [28]. However, in practice, the consciousness of farmers about the quality of cultivated land protection policies and measures is generally not high [29]. Therefore, effectively improving farmers' enthusiasm in assuming their role as protectors of cultivated land quality is critical.

At present, the research on farmland protection from farmers' perspectives has achieved fruitful results, mainly focusing on the empirical analysis of demographic characteristics, socioeconomic characteristics, and institutional environment characteristics [30,31]. Recently, some scholars began paying attention to the influence of psychological factors at the microlevel on farmers' willingness and behavior toward farmland quality protection [32]. However, the explanations for farmers' behavioral decisions on farmland quality protection from the perspective of farmers' perception are limited, and only a few studies have taken this as one of many observed variables [33]. According to the theory of a farmer's behavior, the perceived value is the most direct cause of the formation of a farmer's behavioral attitude [34,35]. In other words, farmers' protection behavior largely depends on their perceived value of cultivated land quality protection [36].

In addition, perceived value also includes two different dimensions, perceived benefit and perceived risk. Compared with perceived benefits, perceived risk is also an essential factor affecting farmers' cultivated land protection behavior. Risk perception is the perceived probability that a specific (environmental) phenomenon (risk) will have negative consequences for individuals and society [37], and it is influenced by the subjective interpretation of risk bearers. Empirical studies showed that risk aversion significantly impacts pesticide use in Yunnan, China [38]. Therefore, one should carefully evaluate and deal with farmers' risk perception by applying appropriate strategies [39]. Farmers' perception of risk will directly impact farmland protection behavior, and agricultural production is usually characterized by significant risk and considerable government intervention [40]. As farmers are the direct subject of the implementation of cultivated land quality protection, the design of cultivated land quality protection policies should closely focus on farmers' behavior characteristics and the laws protecting cultivated land quality [41]. If the policy mechanism cannot conform to the motivation of farmers in the protection of cultivated land quality, the effect of the policy will be significantly reduced [42]. However, previous studies focused more on the promotion effect of perceived benefits on farmers' cultivated land protection behavior while ignoring the potential impact of perceived risks [43].

Given the weak links in the research into farmers' cultivated land quality protection behavior and the fact that the existing policy guidance is weak, in the current study, we take the theory of perceived value as a basis and include two antecedent variables of perceived value, namely perceived value benefit and perceived risk. Because of a high level of urbanization and industrialization in China, as well as the presence of relatively rich types of farmers still engaged in traditional agricultural production activities at the present stage, such as pure agricultural farmers, agriculture-oriented and part-time farmers, and pure migrant farmers, Ningbo city was taken as a case study. Heterogeneous farmers have significant differences in perceived value of cultivated land quality protection, which also shows an inconsistent influence path on cultivated land quality protection behavior. Therefore, the study on the effect path and influence degree of farmers' perceived value on their cultivated land quality protection behavior in developed areas will have wider application value for the formulation of targeted cultivated land quality protection policies for other developing countries and regions.

On the basis of survey data of 288 farmers in Ningbo City and the establishment of a structural equation model, in this study, we comprehensively clarify the psychological mechanism and behavioral logic behind farmers' cultivated land quality protection to provide a reference for improving the policy of farmland quality protection and standardizing farmers' cultivated land quality protection behavior. The aims of this study were as follows: (1) to build an overall model of farmers' cultivated land quality protection decision on the basis of benefit–risk balance; (2) to measure farmers' perceived benefits and risks of farmland quality protection; (3) to determine the influence of identifying perceived value on farmers' cultivated land quality protection behavior, with Ningbo, China as an example; and (4) to promote some suggestions on the construction of farmland protection hospitals and implementation of behaviors.

2. Theoretical Analysis and Research Hypothesis

2.1. Theoretical Analysis

Perceived value theory originated from the research on customer willingness and behavior in the field of product marketing. Zaithaml proposed that perceived value is based on the perspective of individual cognition, from the perspective of individual experience, the interests of a specific commodity, service or behavior [44]. The subjective comprehensive evaluation was formed by the trade-off comparison with the effort. Regarding the formation mechanism of perceived value, the "trade-off model" believes that perceived value depends on the individual's trade-off between the corresponding relationship between the benefits obtained and the costs paid. When the perceived benefits are higher than the perceived losses, the individual's perceived value level will be higher the more obvious its behavioral tendency is, and the possibility of actual behaviors will be greater [45,46]. It can be seen from the above analysis that the theory of perceived value clarifies the logic mechanism of the individual behavior decision-making process, that is, "cognitive weighing→perceived value→behavior willingness→behavior performance".

In the study of farmers' economic behavior, perceived value is also considered to be an essential basis for behavior [47]. Farmer behavior theory, focusing on the attitude of farmers, is the primary factor that affects farmers' behavior intention [34,40]. Perceived value is the most direct driver of peasant households' behavioral attitude as the "rational economic individual", and the microscopic operators of agricultural production continuously pursue the most significant benefits with the minimum cost [26]. This provides theoretical support for the research on farmers' behavior from the perspective of perceived value.

In fact, in the behavioral decision-making process for cultivated land quality protection, farmers also have a relatively comprehensive perception. Their perceived value is a subjective evaluation formed after weighing and comparing the perceived benefits and risks of cultivated land quality protection on the basis of their resource endowment and livelihood strategies [34,36,48]. When the perceived benefit is higher and the perceived risk is lower, their perceived value will increase [46]. Generally speaking, a higher perceived value of an individual toward a certain behavior stimulates a greater psychological intention. The willingness to engage in the behavior will also be higher. In other words, a higher perceived benefit of farmers' cultivated land protection behavior leads to higher cultivated land quality protection behavior [26]. Individual behavior is dominated by perceived value and is also affected by perceived level (the source of perceived value) [46]. The difference of individual's perceived level of a certain thing determines its different behavioral responses.

2.1.1. Factors Influencing Farmers' Perceived Value of Cultivated Land Quality Protection

As far as cultivated land quality protection is concerned, the production practice of cultivated land quality protection may produce many benefits. Among them, the perception of economic benefits is the most intuitive feeling of farmers on farmland input and output [31]. With the progress of industrialization and urbanization, cultivated land utilization has changed. However, the economic benefits such as increased yield and planting income are still the most intuitive feelings of farmers [32]. As human civilization entered the stage of ecological civilization, farmers gradually began to pay attention to the externalities brought by cultivated land protection, such as soil and water conservation, climate improvement, biodiversity protection, national food security, agricultural product security, and other ecological and social benefits [1,34,49]. All the above externalities of cultivated land protection can be captured by the brain of farmers to form the perception of benefits and evaluate possible benefits and their expectations of cultivated land protection behavior [21]. When perceived benefits can be generated and meet their expectations, their perceived value will increase [50]. Perceived risk also plays a decisive role in farmers' decision-making processes for farmland quality protection. Scott (1976) proposed that farmers in most developing countries take "safety first" as the principle of production and life. Under the survival ethics of "safety first", farmers do not pursue income maximization as they seek low risk distribution and high survival guarantee [51]. Farmers are very risk averse in agricultural production, and the improved family life brought by a higher-than-expected income is not enough to compensate for the devastating impact of a lower-than-expected income on families [52].

Farmers' perceived risk of cultivated land quality protection mainly comes from factor cost, inner anxiety, and worry about uncertainty [53]. Liu (2013) found a close connection between perceived risk and perceived value [54]. Among all factors influencing perceived value, perceived risk has a negative effect [55]. Therefore, higher perceived risk of farmers results in greater loss or concern related to cultivated land quality protection; hence, their perceived value of cultivated land quality protection is reduced. Therefore, this study proposes Hypothesis H1 and H2.

Hypothesis 1 (H1). *Farmers' perceived benefits in cultivated land quality protection positively impact their perceived value.*

Hypothesis 2 (H2). *Farmers' perceived risk of cultivated land quality protection has a negative impact on their perceived value.*

2.1.2. Impact of Farmers' Perception on Their Willingness to Protect Cultivated Land Quality

Protecting cultivated land quality refers to farmers' psychological intention to protect cultivated land quality. Generally, a significant positive correlation exists between an individual's perceived value and behavioral intention. This conclusion has been confirmed by many research results [36]. Studies on farmers' economic behaviors show that a higher perceived value level of behavior stimulates greater psychological intention and a higher willingness to engage in the behavior [26]. In addition, as rational economic individuals, farmers' behavioral intentions are driven by benefits [50]. Khamfeua and Toshiyuki (2012) studied the relationship between farmers' perceived benefits and their willingness to protect surrounding national reserves in Laos, and they found that farmers' perceived benefits of protection had a positive and significant relationship with their willingness to protect [56]. Moreover, rational individuals tend to increase returns and avoid risks [40].

The fundamental reason for farmers' implementing cultivated land quality protection is the value that farmers can perceive through the total balance between the perceived benefits and risks of cultivated land quality protection. If the expected benefits are greater than the expected costs, then the perceived benefits are higher than the perceived risks; a higher perceived value of cultivated land quality protection results in a stronger willingness to implement cultivated land quality protection. Therefore, Hypotheses H3, H4, and H5 are proposed in this study.

Hypotheses 3 (H3). *Farmers' perceived benefits in cultivated land quality protection positively impact their willingness to protect.*

Hypotheses 4 (H4). *Farmers' perceived risk of cultivated land quality protection has a negative impact on their willingness to protect.*

Hypotheses 5 (H5). *Farmers' perceived value of cultivated land quality protection positively impacts their willingness to protect.*

2.1.3. Impact of Farmers' Perception on Their Cultivated Land Quality Protection Behavior

Cultivated land quality protection behavior refers to the production behaviors taken by farmers in the process of agricultural production to maintain or improve the quality of cultivated land [50]. Such behavior includes returning straw to the field, planting green fertilizer, applying farm manure, using commercial organic fertilizer, testing soil formula fertilization, and other measures to improve barren cultivated land. These measures include those for improving the soil's ability to retain water, soil, and fertilizer; some examples are canal repair, land leveling, and deep plowing [40,48,52]. In this study, farmers' perceived value, its two antecedents (perceived benefits and perceived risks), and willingness to protect cultivated land quality jointly affect cultivated land quality protection behaviors. Wang and Guo (2020) found that perceived benefits positively impact farmers' cultivated land quality protection behavior when discussing the influence of perceived benefits and social networks on farmers' cultivated land quality protection behavior [33]. However, when farmers make accurate decisions, perceived risks significantly impact farmers' green agricultural production behaviors [26]. In addition, relevant studies have found that individual behavioral decisions result from perceived values formed after weighing and comparing perceived benefits and risks [57]. Therefore, in the decision-making process for farmland quality protection, if the expected protection benefits of farmers are more significant than the expected cost, then the farmers' perceived value of farmland quality protection will be high, and the condition becomes conducive to the implementation of farmland quality protection behavior by farmers. As a prevariable affecting the generation of specific behaviors, behavioral intention is shown as the possibility or tendency of individuals to choose specific behaviors and thus plays a vital role in predicting the generation of behaviors [36]. Behavioral intention reflects the degree to which an individual is willing to pay when choosing a particular behavior. A stronger individual's behavioral intention indicates a higher possibility of taking practical actions [58]. Similarly, in the decision-making process for farmland quality protection, a stronger farmers' behavioral intention toward farmland quality protection results in a greater probability of farmland quality protection in production practice. Therefore, we propose Hypotheses H6–H9.

Hypothesis 6 (H6). *Farmers' perceived benefits in cultivated land quality protection positively impact their behavior.*

Hypothesis 7 (H7). *Farmers' perceived risk of cultivated land quality protection has a negative impact on their protection behavior.*

Hypothesis 8 (H8). *Farmers' perceived value of cultivated land quality protection positively impacts their behavior.*

Hypothesis 9 (H9). *Farmers' willingness to protect cultivated land quality positively impacts their protection behavior.*

2.2. Model Design

Behavioral economics points out that behavioral decisions result from individuals' comparison of benefits and risks. Rational individuals always pursue maximum benefits with minimum risks, thus providing a theoretical basis for studying farmers' behavior of farmland investment from the perspective of perceived value theory. The "overall decision-making model of farmers' cultivated land quality protection behavior" was constructed (Figure 1). As shown in Figure 1, the overall decision-making model of farmers' cultivated land quality protection includes perceived benefits (PB), perceived risks (PR), perceived value (PV), behavior intentions (BI), and behavior responses (BR). The causal path relationship constitutes the internal logical mechanism of peasant household's behavior decision making for cultivated land quality protection. To reflect the overall composition of farmers' perception, we use the research results of previous studies on the multifunctional value of cultivated land to measure perceived benefits from three dimensions: perceived economic benefits (PEB), perceived ecological benefits (PECB), and perceived social benefits (PSB) [59,60]. Combined with the definitions of perceived risk by Sanjeev and Kenneth (2001), Zander et al. (2019), and Li et al. (2020), perceived risk herein is measured from three dimensions: perceived economic risk (PER), perceived psychological risk (PPR), and perceived situational risk (PSR) [26,41,55].

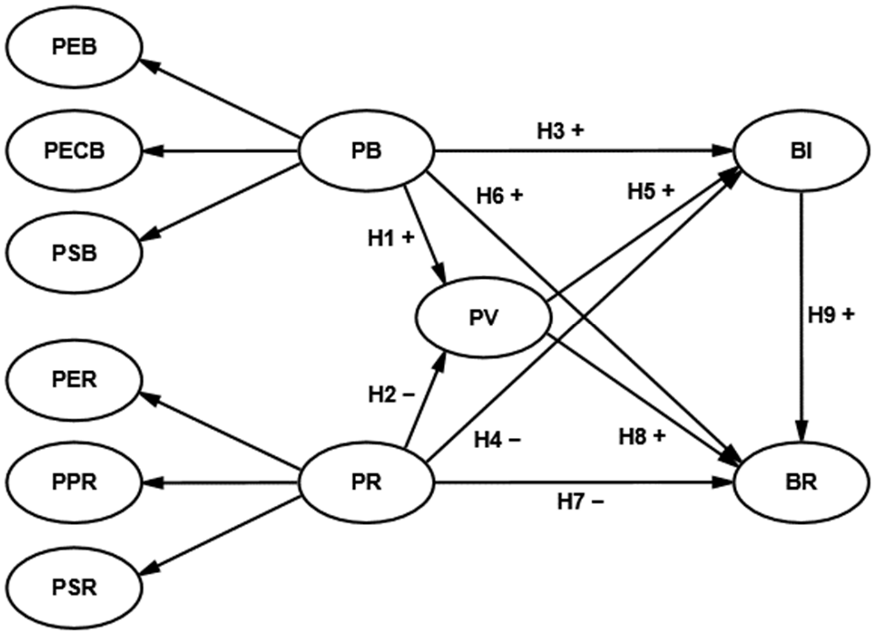

Figure 1. Overall decision-making model of farmers' cultivated land quality protection behavior.

In this study, the perceived benefits, risks, values, and willingness pertaining to farmers' cultivated land quality protection are latent variables that are difficult to predict directly and can be quantified using a structural equation model. At the same time, the structural equation model can deal with the measurement error in the analysis process, thus making the research result increasingly reliable. Therefore, the structural equation model was selected in this study, expressed as follows:

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

$$X = \Lambda_X \xi + \delta \quad (2)$$

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

Equations (1) and (2) are measurement models describing the relationship between latent and observed variables. X is the observed variable of the exogenous latent variable ξ, Y is the observed variable of the endogenous latent variable η, Λ_X and Λ_Y, respectively, represent the factor loading matrix from latent variable ξ and η to the observed variables, and δ and ε, respectively, represent the residual term of exogenous and endogenous variables. Equation (3) is a structural model describing the relationship between latent variables, where η is the endogenous latent variable, ξ is the exogenous latent variable, β denotes the relationship matrix between the endogenous latent variable and the endogenous latent variable, Γ denotes the relationship matrix between the exogenous latent variable and the endogenous latent variable, and ζ is the residual term.

2.3. Variable Selection and Scale Design

In this study, the measurement dimensions and item setting principles of farmers' perceived value of cultivated land quality protection include the following: full reflection of the research question, i.e., the impact of farmers' perceived value on cultivated land quality protection behavior; dimension and item setting to avoid repetition and internal correlation; easily understandable questions; reduction in error due to misunderstanding. On the basis of the analytical and theoretical model of several concepts and constituent dimensions mentioned above, two subscales of willingness and behavior measurement and three subscales of perception measurement are constructed: perceived benefit, perceived risk, and perceived value.

(1) Perceived benefit measurement scale. The multifunctional attribute of cultivated land determines that the protection of cultivated land quality has multiple benefits [60]. Farmers protect cultivated land quality because doing so can bring benefits or values. Theoretically speaking, the production practice of cultivated land protection may produce many results; for example, the improvement of cultivated land fertility increases cultivated land yield and farmers' planting income, the alleviation of soil erosion and pollution improves farmers' production and living environment, and the protection of cultivated land quality boosts the health of agricultural products and national food security.

(2) Perceived risk measurement scale. According to Zeithamld's research, an individual's perceived risk includes perceived monetary risk and perceived nonmonetary risk [44]. Scholars have designed measurement items from two aspects: risk loss of input and expected loss of income. In addition, some scholars measured perceived risk from psychological risk [38,40,43,52]. Therefore, we measured farmers' perceived economic risk of farmland quality protection from three aspects: perceived economic risk, psychological risk, and situational risk. Perceived economic risk mainly refers to the factor cost farmers need to pay for farmland quality protection. Psychological risk mainly refers to the inner anxiety of farmers in the protection of cultivated land quality. Scenario risk mainly refers to farmers' concern about the input uncertainty of farmland quality protection.

(3) Perceived value measurement scale. Farmers' perceived value of cultivated land quality protection refers to the subjective evaluation of farmers' perceived benefits and contributions in cultivated land quality protection decision making [26]. This study draws lessons from the current research results. First, for the protection of farmers' cultivated land quality, it is reflected in the comparison of farmers' perceived benefits and efforts obtained by their behavioral decisions [32]. Second, farmers evaluate whether their cultivated land quality protection behavior meets individual needs [61].

(4) Behavior intentions measurement scale. Farmers' willingness to invest in quality protection of farmland reflects farmers' willingness to protect farmland quality to a certain extent. The level of each factor cost payment that farmers are willing to accept reflects the degree of willingness.

(5) Behavior responses measurement scale. According to the National Agricultural Sustainable Development Plan (2015–2030) and Action Plan for the Protection and Improvement of Cultivated Land Quality, referring to the study of Liu (2018) and Wang (2020) [33,50], the cultivated land quality protection behavior was measured from three aspects: implement conservation farming methods, implement measures to improve soil fertility, and take pollution control and restoration measures.

On the basis of perceived value theory, the variable selection and scale design of existing studies were used for reference, and the results of semi-structured interviews with farmers in the surveyed region were combined. Moreover, the interview results show that farmers generally have a complex of concealing benefits and exaggerating risks. Therefore, in the process of questionnaire design, the variable connotation of perceived benefit was set conservatively, while the variable connotation of perceived risk was relatively radical. In this study, 29 items were designed to measure 11 variables in farmers' land input behavioral decision models using a five-point Likert scale. The specific variable selection and scale design results and their meanings are shown in Table 1.

Table 1. Measurement scale of peasant households' cultivated land quality protection perception.

Variables		Indicators	Questions	Scale Sources	Assignment
Perceived benefits (PB)	Perceived economic benefits (PEB)	Increase in grain output	(PEB1) Quality protection of cultivated land can improve crop yield.	[26,33]	1 = strongly disagree; 2 = don't quite agree; 3 = in general; 4 = agree; 5 = completely agree
		Continued increase in agricultural income	(PEB2) Quality protection of cultivated land can increase agricultural income continuously.		
		Comprehensive cost savings	(PEB3) The comprehensive cost can be reduced by the quality protection of cultivated land.		
	Perceived ecological benefits (PECB)	Improved soil fertility	(PECB1) It is beneficial to improve soil fertility to protect cultivated land quality.		
		Improved ecological environment	(PECB2) Protecting cultivated land quality is beneficial to improving the ecological environment.		
		Reduced water pollution	(PECB3) Quality protection of cultivated land can reduce soil and water pollution.		
	Perceived social benefits (PSB)	Safety and health of agricultural products	(PSB1) Quality protection of cultivated land is beneficial to guarantee the quality and safety of agricultural products.		
		Food security	(PSB2) Quality protection of cultivated land is beneficial to food security.		
		Living security	(PSB3) Quality protection of cultivated land plays an important role in ensuring life in the future.		
Perceived Risks (PR)	Perceived economic risk (PER)	Capital consumption	(PER1) More money is needed to protect the quality of arable land.	[26,62,63]	1 = strongly disagree; 2 = don't quite agree; 3 = in general; 4 = agree; 5 = completely agree
		Labor cost	(PER2) More labor is needed to protect cultivated land quality.		
		Economic benefits	(PER3) The benefits of arable land quality protection appear too slow.		
	Perceived psychological risk (PPR)	Behavior expected	(PPR1) Protection requires participation and the fear that one's own efforts won't work		
		Behavior consequences	(PPR2) Farmland is difficult to improve once it is destroyed.		
		Knowledge of technology	(PPR3) I worry that I can't master relevant knowledge and technology.		
	Perceived situational risk (PSR)	Policy scenarios	(PSR1) I am concerned that relevant policies are not in place.		
		Uncertainty	(PSR2) I am afraid to try for fear of failure.		
		Disaster risk	(PSR3) Fear of losses due to sudden weather disasters and pests.		

Table 1. *Cont.*

Variables	Indicators	Questions	Scale Sources	Assignment
Perceived value (PV)		(PV1) Protecting cultivated land quality is of great significance. (PV2) I hold a positive attitude toward the protection of cultivated land quality. (PV3) Carrying out cultivated land quality protection brings me certain benefits.	[26,64]	1 = strongly disagree; 2 = don't quite agree; 3 = in general; 4 = agree; 5 = completely agree
Behavior intentions (BI)		(BI1) I am willing to put in work to protect the quality of cultivated land. (BI2) I am willing to invest energy and time to protect the quality of cultivated land. (BI3) I am willing to invest money to protect the quality of cultivated land.	[26,50]	1 = strongly disagree; 2 = don't quite agree; 3 = in general; 4 = agree; 5 = completely agree
Behavior responses (BR)		(BR1) Implement conservation farming methods. (BR2) Implement measures to improve soil fertility. (BR3) Take pollution control and restoration measures.	[25,50]	1 = never; 2 = rarely; 3 = sometimes; 4 = often; 5 = always

3. Variable Measurement and SEM Model Data Verification

3.1. Data Sources

Ningbo City is located at 120°55′ to 122°16′ E longitude and 28°51′ to 30°33′ N latitude. It is located in the middle of China's coastline in the southern wing of the Yangtze River Delta, and it is responsible for the jurisdiction of Haishu, Jiangbei, Zhenhai, Beilun, Yinzhou, Fenghua (six districts), Ninghai, Xiangshan (two counties), Cixi, and Yuyao (two county-level cities). The terrain is high in the southwest and low in the northeast. The city's geomorphology is divided into mountains, hills, platforms, valleys (basins), and plains, of which the plains account for 40.3%. The region has a subtropical monsoon climate, mild and humid, with four distinct seasons. The city's annual average temperature is 16.4 °C, the average yearly precipitation is about 1480 mm, and the average annual sunshine duration is 1850 h, which is suitable for the growth of crops. Ningbo is the main distribution area of cultivated land resources in Zhejiang Province. It is an essential commercial grain production base and the main supply base of crops, such as grain, oil, vegetables, tea, and fruit. Hence, it has a good representation in the selection of research areas.

The data used in this study come from the survey of farmer households conducted by the research team in Ningbo from May to August 2021. A stratified proportional random sampling method was adopted for experimental investigation sampling. Given the comprehensiveness of the data and the authenticity of the reflections, three ecological civilization areas and two common areas were randomly selected from six ecological civilization demonstration areas and four common areas. The ecological civilization demonstration areas were Zhenhai District, Beilun District, and Xiangshan County, while the ordinary districts were Yinzhou District and Yuyao District, indicating a total of five counties (districts). Then, three administrative villages were selected from each county (district) with 15 villages, and 20 farmers were randomly selected from each village as survey samples. To improve the accuracy of data collection, data collection was conducted by investigators trained by the research group in a one-to-half structured interview. After eliminating the samples with contradictory and incomplete information, 288 effective samples were obtained, with an efficiency rate of 96%. The characteristics of the sample farmers are shown in Table 2.

Table 2. Characteristics of sample farmers.

Variable	Classification Criteria	Frequency (Times)	Frequency (%)	Variable	Classification Criteria	Frequency (Times)	Frequency (%)
Sex	Male	218	75.69	Age	Under 35	2	0.7
	Female	70	24.31		35–45	19	6.62
Identity	Ordinary villager	217	75.35		45–55	63	21.95
	Village cadres	40	13.89		55–65	100	34.84
	Party member	31	10.76		Over 65	103	35.89
Education	Primary and below	144	50	Scale of contracted land	2 acres and below	116	40.28
	Junior high school	85	29.51		2–5 acres	87	30.21
	Vocational high school or high school	42	14.58		5–10 acres	24	8.33
	College	15	5.21		10–20 acres	20	6.94
	Bachelor's degree and above	2	0.69		Over 20 acres	41	14.24
Type of employment	Agriculture	160	55.56	Share of agricultural labor force	0–25%	156	54.2
	Agriculture-oriented and part-time	47	16.32		26–50%	63	21.9
	Job-oriented and part-time	75	26.04		51–75%	26	9
	Retired	6	2.08		76–100%	43	14.9

3.2. Cultivated Land Quality Protection Perceived Value Scale and Its Statistical Description

On the basis of the theory of perceived value, drawing on the variable selection and scale design results of existing research, and combining the results of semi structured interviews with farmers in the survey area, we adopted a 5-point Likert scale, where 1 = "completely disagree", 2 = "disagree", 3 = "general", 4 = "agree", and 5 = "completely agree", to measure the variables in the decision-making model of the cultivated land quality protection behavior of farmers. The cultivated land quality protection behavior was measured from three aspects, namely, "I implement conservation farming methods", "I implement measures to improve soil fertility", and "I take pollution control and restoration measures". According to farmers' responses to the frequency of relevant measures, the same five-level assignment of "1–5" denoting "never", "rarely", "sometimes", "often", and "always", respectively, was adopted. The specific variable selection, scale design results, and their descriptive statistical results are shown in Table 3.

Farmers generally have a relatively high-interest perception of cultivated land quality protection. The average scores of economic interest, ecological interest, and social interest perception were all at a high level: 3.74, 3.79, and 3.86, respectively. The scores of the perceived social and ecological benefits were higher than those of the perceived economic benefits. Specifically, farmers' perception of the benefits of cultivated land quality protection behavior mainly focuses on its essential role in ensuring future life, ensuring the quality and safety of agricultural products, improving the ecological environment, and improving crop yield. This shows that farmers subconsciously recognize cultivated land quality protection behavior and think that its value lies in economic benefits. They also consider the positive externalities of cultivated land quality protection behavior from social and ecological aspects.

Table 3. Variable table and its descriptive statistics.

Variables	Items	Mean	Standard Deviation
Perceived economic benefits (PEB)	Carrying out cultivated land quality protection can increase crop yields.	3.889	0.938
	Carrying out cultivated land quality protection can continuously increase agriculture income.	3.667	1.029
	Carrying out cultivated land quality protection can save comprehensive costs.	3.667	0.933
Perceived ecological benefits (PECB)	Carrying out cultivated land quality protection is conducive to improving soil fertility.	3.771	1.000
	Protecting the quality of cultivated land is conducive to improving the ecological environment.	3.806	1.007
	Carrying out cultivated land quality protection can reduce water and soil pollution.	3.788	1.026
Perceived society benefits (PSB)	Protecting the quality of cultivated land is conducive to ensuring the quality and safety of agricultural products.	3.899	1.002
	Protecting the quality of cultivated land is conducive to national food security.	3.729	1.051
	Carrying out the protection of cultivated land quality has an essential role in ensuring future life.	3.941	1.002
Perceived economic risks (PER)	More money is needed to protect the quality of cultivated land.	3.708	1.110
	More labor is needed to protect the quality of cultivated land.	3.694	1.119
	The benefits of cultivated land quality protection appear too slow.	3.677	1.152
s	Implementation of protection requires joint participation in the fear that self-effort will not be effective.	3.194	1.017
	Worried that once the cultivated land is destroyed, it will be difficult to improve.	3.656	1.188
	Worried about not being able to master relevant knowledge and technology.	3.337	1.151
Perceived scenario risk (PSR)	I am worried about the inadequate implementation of relevant policies.	3.941	0.998
	I am afraid to try fear of failure.	3.913	1.044
	I am worried about losses due to sudden weather disasters and pests.	3.663	1.016
Perceived value (PV)	Protecting the quality of cultivated land is of great significance.	3.483	0.805
	I am optimistic about protecting the quality of cultivated land.	3.424	0.840
	Carrying out cultivated land quality protection has brought me certain benefits.	3.302	0.897
Behavior intentions (BI)	I am willing to put in work to protect the quality of cultivated land.	3.462	0.906
	I am willing to invest energy and time to protect the quality of cultivated land.	3.378	0.994
	I am willing to invest money to protect the quality of cultivated land.	3.083	0.977
Behavior responses (BR)	I implement conservation farming methods.	2.646	1.052
	I implement measures to improve soil fertility.	2.642	1.133
	I take pollution control and restoration measures.	2.670	1.001

In terms of risk perception, farmers' risk perception of cultivated land quality protection behavior was relatively high. The average economic risk, psychological risk, and situational risk perception scores were 3.69, 3.4, and 3.84, respectively. The scores of situation risk and economic risk were higher than those of psychological risk. Specifically, farmers' risk perception of cultivated land quality protection behavior mainly comes from their concerns about the prospect and sustainability of relevant policies and the failure of decision making on cultivated land quality protection behavior to cope with the uncertainty of the future, which is a high error cost. The scores of these two perceived scenario risk options were 3.94 and 3.91, respectively. This situation also shows that at this stage, situational risk is a factor that cannot be ignored. In the face of future and policy uncertainties, farmers, as rational people, will preferentially choose to avoid risks.

The scores of perceived value, intention, and behavior showed a trend of gradual decline, with the average scores being 3.4, 3.31, and 2.65, respectively. Although farmers recognize and perceive the value of cultivated land quality protection behavior, a sign of "fading enthusiasm" is reflected in the willingness to engage in cultivated land quality protection. In choosing specific protection behavior, farmers show a prominent characteristic of "do not mind". In short, farmers subconsciously recognize cultivated land quality protection behavior and its significance. However, they have many concerns related to internal and external factors in the actual cultivated land quality protection behavior. In this study, the probability of choosing cultivated land quality protection behavior was low, and the overall score was >3.

3.3. Scale Reliability and Validity Test

To measure the reliability and correctness of the data, we tested the reliability and validity of the survey data. The results are shown in Table 4. In the reliability test, Cronbach's coefficient value of each latent variable was between 0.804 and 0.892, thus meeting the required value greater than 0.7. The combined reliability (CR) was more significant than 0.7, indicating that the scale had good internal consistency. The KMO value of each latent variable in the validity test was between 0.677 and 0.736, thus meeting the required value greater than 0.5. The significance level of the chi-square value in the Bartlett sphere test was significant. The load coefficients on the common factors of all observed variables ranged from 0.720 to 0.915, thus meeting the required value greater than 0.6. The above results show that the model data had good reliability and validity and that the data quality passed the test.

Table 4. Reliability and validity test results.

Variables	Items	Standard Factor Load	Reliability of Questions	Cronbach Coefficient	Component Reliability		Convergent Validity
		Std.	SMC	Cronbach's α	CR	KMO	AVE
PEB	PEB1	0.816	0.666		0.806	0.709	0.582
	PEB2	0.741	0.549	0.804			
	PEB3	0.729	0.531				
PECB	PECB1	0.720	0.518		0.849	0.701	0.654
	PECB2	0.915	0.837	0.844			
	PECB3	0.780	0.608				
PSB	PSB1	0.761	0.579		0.818	0.714	0.600
	PSB2	0.765	0.585	0.817			
	PSB3	0.798	0.637				
PER	PER1	0.864	0.746	0.873	0.874	0.736	0.698
	PER2	0.790	0.624				
	PER3	0.850	0.723				
PPR	PPR1	0.789	0.623	0.819	0.824	0.715	0.610
	PPR2	0.733	0.537				
	PPR3	0.818	0.669				

Table 4. *Cont.*

Variables	Items	Standard Factor Load	Reliability of Questions	Cronbach Coefficient	Component Reliability		Convergent Validity
		Std.	SMC	Cronbach's α	CR	KMO	AVE
PSR	PSR1	0.772	0.596	0.864	0.866	0.729	0.683
	PSR2	0.860	0.740				
	PSR3	0.844	0.712				
PV	PV1	0.742	0.551	0.818	0.828	0.677	0.617
	PV2	0.862	0.743				
	PV3	0.747	0.558				
BI	BI1	0.856	0.733	0.892	0.896	0.729	0.742
	BI2	0.890	0.792				
	BI3	0.837	0.701				
BR	BR1	0.795	0.632	0.852	0.854	0.732	0.661
	BR2	0.836	0.699				
	BR3	0.807	0.651				

3.4. Model Fit Test

AMOS 23.0 and the maximum likelihood method were used to estimate the model's parameters. The fitting indices of the decision-making model of farmland quality protection, including the absolute-fit index, value-added fit index, and reduced-fit index, were calculated. The results are shown in Table 5. All model indicators reached the normal state, and the overall fitting effect was good.

Table 5. Results of overall model fit test.

Categories	Indicators	Adapter Standard	Statistics	Adaptation to Judge
Absolute fit index	χ^2/DF	<3	1.120	Good
	GFI	>0.9	0.919	Good
	AGFI	>0.9	0.901	Good
	RMSEA	<0.5	0.020	Good
	RMR	<0.5	0.035	Good
Value-added compatibility indicators	TLI	>0.9	0.991	Good
	CFI	>0.9	0.992	Good
	IFI	>0.9	0.992	Good
	NFI	>0.9	0.932	Good
	RFI	>0.9	0.922	Good
Simple fit index	PGFI	>0.5	0.749	Good
	PNFI	>0.5	0.817	Good

4. Results and Hypothesis Verification

4.1. Path Result Estimation for Structural Models

The structural equation model results confirmed the Hypotheses H1–H9, thus indicating that farmers' behavior decision for farmland quality protection conforms to the perceived value theory. Farmers' cultivated land quality protection behavior followed the decision logic path of "perceived value→behavioral intention→behavioral expression". Farmers' cultivated land quality protection behavior responses (BR) were influenced by willingness (BI), perceived value (PV), perceived benefit (PB), perceived risk (PR), and other latent variables. Among them, perceived benefit (PB), perceived risk (PV), and perceived value (PV) all directly affected farmers' behavior (BR). At the same time, willingness (BI) played an intermediary role among perceived value (PV), perceived benefit (PB), perceived risk (PV), and behavioral response (BR). Perceived value (PV) played an intermediary role between perceived benefit (PB) and perceived risk (PV).

As shown in Figure 2 and Table 6, perceived benefit (PB) and perceived risk (PR) were the main factors affecting perceived value (PV), and their standardized path coefficients were 0.528 and −0.409, respectively, significant at the statistical level of 1%. The results show that the perceived benefits of farmland quality protection had a significant positive impact on farmers' perceived value. The perceived risk has a significant negative impact on farmers' perceived value. Hypotheses H1 and H2 were thus assumed to be verified.

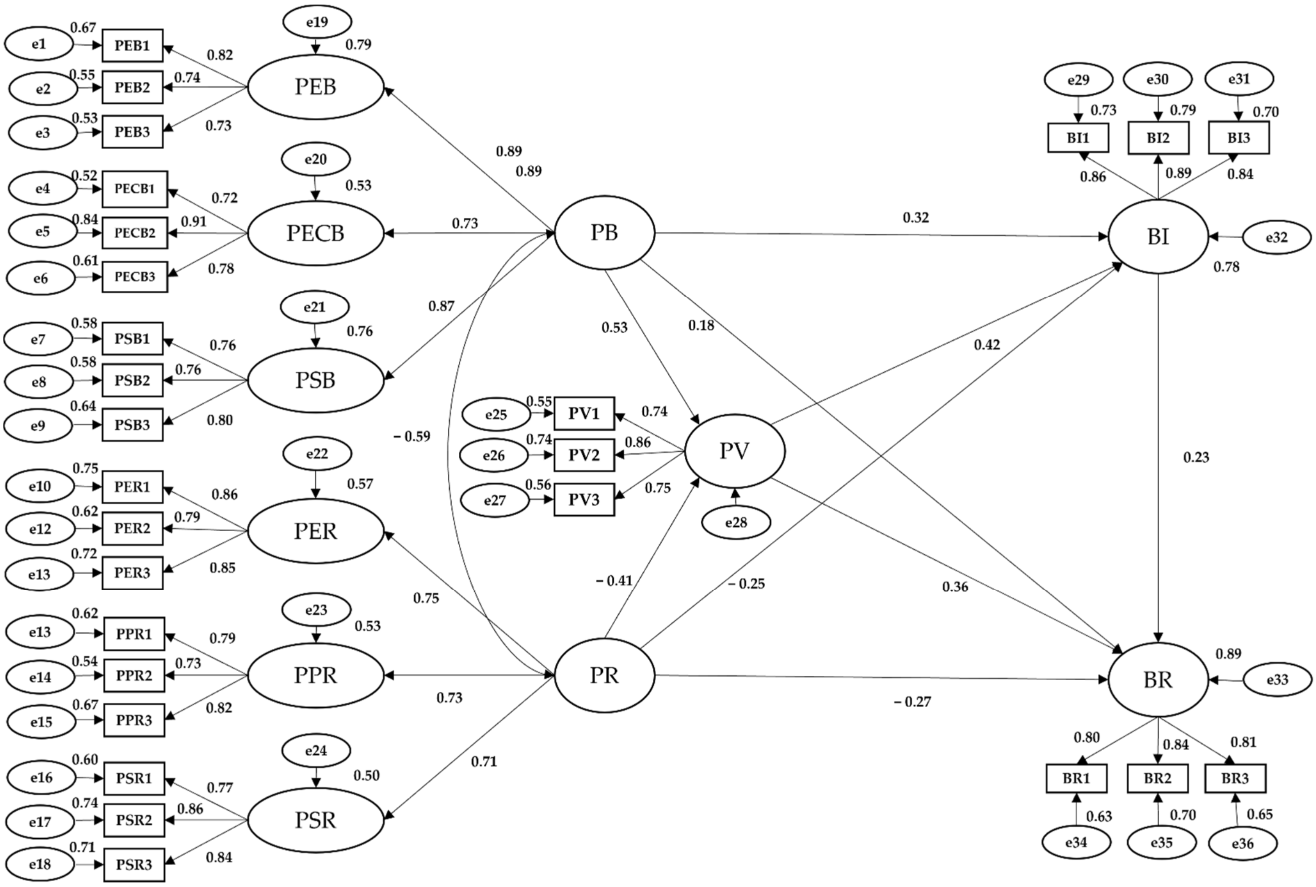

Figure 2. Structural equation model path and coefficient.

Table 6. Model path coefficient and hypothesis testing.

Influence Path	Estimate	S.E.	C.R	P	Hypothesis Testing
Perceived benefit→perceived value	0.528	0.073	6.357	***	Accepted H1
Perceived risk→perceived value	−0.409	0.070	−4.847	***	Accepted H2
Perceiving interest→willingness	0.361	0.096	3.771	***	Accepted H3
Perceived risk→willingness	−0.249	0.087	−3.086	**	Accepted H4
Perceived value→willingness	0.416	0.136	3.988	***	Accepted H5
Perceived benefit→behavior	0.177	0.101	2.157	*	Accepted H6
Perceived risk→behavior	−0.273	0.095	−3.336	***	Accepted H7
Perceived value→behavior	0.363	0.147	3.448	***	Accepted H8
Willingness→behavior	0.232	0.112	2.232	*	Accepted H9

Note: Significant at the * 10%, ** 5%, and *** 1% levels.

Farmers' perceived benefit (PB), perceived risk (PR), and perceived value (PV) were the main factors affecting farmers' willingness (BI); the standardized path coefficients were 0.361, −0.249, and 0.416, respectively, significant at the statistical level of 1%. The results show that farmland quality protection's perceived benefits and values significantly influence farmers' willingness. By contrast, the perceived risks had a significant negative impact on farmers' willingness. Thus, Hypotheses H3, H4, and H5 were verified.

Farmers' perceived benefit (PB), perceived risk (PR), perceived value (PV), and willingness (BI) were the main factors affecting farmers' behavior (BR). The standardized path coefficients were 0.177, −0.273, 0.363, and 0.232, significant at the statistical levels of 5%, 1%, 1%, and 5%, respectively. Hence, Hypotheses H6–H9 were verified.

In sum, the causal relationship between potential variables was significant. The behavioral decision model constructed in this study could effectively explain the internal mechanism of farmers' cultivated land quality protection behavior.

4.2. Mediation Effect Analysis

The potential variables' direct, indirect, and total effects were summarized to indicate the interaction between potential variables. The results after standardized treatment are shown in Table 7.

Table 7. Direct effect, indirect effect, and total effect among latent variables.

Latent Variables	Direct Effect	Indirect Effect	Total Effect
Perceived benefit→perceived value	0.528	-	0.528
Perceived risk→perceived value	−0.409	-	−0.409
Perceiving interest→willingness	0.316	0.220	0.536
Perceived risk→willingness	−0.249	−0.170	−0.420
Perceived value→willingness	0.416	-	0.416
Perceived benefit→behavior	0.177	0.316	0.493
Perceived risk→behavior	−0.273	−0.246	−0.519
Perceived value→behavior	0.363	0.096	0.459
Willingness→behavior	0.232	-	0.232

Regarding the perceived value of farmland quality protection, perceived benefit significantly affected perceived value. By contrast, perceived risk had a significant negative effect on perceived value. Farmers' perceived value of cultivated land quality protection resulted from a two-way tradeoff between perceived benefit and risk. The impact of farmers' perceived benefit (0.528) on their perceived value was greater than that of perceived risk (−0.409). The standardized path coefficients of perceived benefits and the next three endogenous variables, namely, farmers' perception of economic, ecological, and social benefits, were 0.89, 0.73, and 0.87, respectively. The result shows that farmers' stronger perceived benefits would improve their perceived value. The standardized path coefficients of perceived risk and its next three endogenous variables reflecting farmers' perception of economic, psychological, and psychological risks were 0.75, 0.73, and 0.71, respectively. The result indicates that farmers still had some worries in the decision-making process for cultivated land quality protection. When farmers protect farmland, uncertain factors such as capital cost, inability to master relevant technologies, and fear of losses would have the greatest impact on them, thus reducing farmers' value perception.

From the relative magnitude of each factor on farmers' willingness to protect cultivated land quality, the direct effects of perceived benefits and perceived risks were 0.316 and −0.249, and the indirect effects were 0.220 and −0.170, respectively. Both had important direct and indirect effects on farmers' willingness to protect cultivated land quality. The absolute value of perceived benefits was greater than the absolute value of perceived risks. This result shows that the impact of perceived benefits on farmers' willingness to protect cultivated land quality was greater than that of perceived benefits. The same was true for the impact on perceived value. This proves that farmers are sensitive to the benefits of cultivated land quality protection in the early stage of behavioral decision making. Before making the behavioral decision for cultivated land quality protection, farmers preliminarily assess the possible benefits and their expectations. Greater perceived economic benefits of cultivated land lead to a greater willingness to protect cultivated land quality. This result is in line with the hypothesis of "rational economic individuals", that is, as rational economic individuals, farmers aim to maximize interests. In addition, the direct effect of perceived value on farmland quality protection was the largest (0.416). This indicates that farmers' strong perceived value would enhance the willingness to protect cultivated land quality.

From the behavioral effects of each factor on the actual farmland quality protection of farmers, the direct effects of perceived benefits and perceived risks were 0.177 and −0.273, and the total effects were 0.493 and −0.519, respectively. Farmers' perceived benefits and perceived risks exert significant effects on their cultivated land quality protection behaviors, and the absolute value of perceived risks was greater than that of perceived benefits. This result indicates that perceived risk had a greater impact on farmers' cultivated land quality behavior than perceived benefit. Compared with the benefits of cultivated land quality protection, the possible risks and losses in the actual behavior stage pose a greater concern for farmers. Farmers generally have "risk aversion" psychology when faced with the choice of whether to protect cultivated land quality, and they are typical "risk avoiders" in the behavior of protecting cultivated land quality. This result also explains why the value of farmers' cultivated land quality protection behavior was lower than their value and willingness in previous variable statistics. Meanwhile, the direct effect of perceived value was 0.363, which was the largest among all factors. The results show that perceived value was the most important direct factor affecting farmers' cultivated land quality protection behavior.

5. Discussion

Although farmers' cultivated land quality protection behavior is affected by many factors, one should clarify the formation of farmers' perceived value and recognize the role of perceived factors in it. Studies have shown that farmers' perceived value of cultivated land quality protection results from a comprehensive tradeoff between perceived benefits and perceived risks. Wang and Guo (2020) pointed out that when farmers participate in cultivated land quality protection, the first consideration is whether they can obtain considerable benefits [33].

For farmers, whether they can improve crop yield, continuously increase agricultural income, and save total cost are the primary factors they consider when making decisions on farmland quality protection. The guarantee of future life and the quality and safety of agricultural products are also critical. At the same time, farmers have begun to pay attention to improving soil fertility, ecological environment, and other ecological benefits. Although the reasonable goal of realizing the maximization of economic benefits has not changed, the rational behavior structure of farmers may have begun to change. Economic benefits are no longer the most appealing to farmers; social and ecological benefits are also worthy of attention [59,60].

However, in terms of the quality of the cultivated land protection decisions of farmers, such as the use of organic fertilizers, soil fertilizers, and soil ameliorant, farmers need to pay the cost first. With income uncertainty, farmers, as a "rational economic individuals", avoid actions that may cause maximum welfare loss. In other words. They minimize the maximum welfare loss while making decisions, which tend to follow the "minimum, maximum principle" in the face of risk and uncertainty [36]. Therefore, improving farmers' perceived benefits, especially monetary income benefits, and reducing perceived risks, especially cost input risks, can help improve their perceived value level of cultivated land quality protection [38]. In addition, the direct effect of perceived value on farmers' willingness and behavior of farmland quality protection is far greater than that of perceived benefit and perceived risk. Perceived value is the most critical direct factor affecting farmers' cultivated land quality protection behavior, as confirmed by some research in the field of farmers' behavior [26]. Therefore, improving farmers' perceived value level is helpful to stimulate their willingness to protect cultivated land quality in practice and improve their cultivated land quality protection behavior.

In this study, we integrated farmers' willingness and behavior of farmland protection into a unified analytical framework. The results show that farmers' willingness to engage in farmland quality protection was generally positive, but their actual behavior was significantly lower than their willingness. Some studies on green agricultural production and ecological farming have clarified this point of view [53]. At the same time, the impact of perceived benefits and perceived risks on farmers' willingness and behavior is asymmetrical [26]. According to the calculation results of latent direct effect, indirect effect and total effect, compared with perceived risk, perceived benefit had more influence on the formation of farmers' perceived value (direct effect of perceived benefit 0.528 vs. direct effect of perceived risk −0.409), and perceived benefit has the greatest influence on farmers' willingness to protect cultivated land quality. However, perceived risk had the greatest influence on farmers' cultivated land quality protection behavior. The direct effect of farmers' perceived risk on farmers' behavior was −0.273, higher than that of farmers' perceived benefit (0.177). In the initial stage of farmland quality protection, farmers are highly sensitive to their benefits. Nevertheless, the occurrence of actual behavior is affected by the perceived risk. The possible explanation is that agriculture itself is a high-risk industry [65]. The instability of macro- and microeconomic environments and natural conditions makes agricultural production face many risks and uncertainties. However, in terms of the protection of cultivated land quality, some factors will bring more uncertainty and higher risks to farmers. Examples include whether deep tillage, soil improvement, crop rotation, and other protective tillage methods are adopted; the implementation of organic fertilizer, green fertilizer, or under the soil test formula, and other measures to cultivate fertilizer; and pollution control and remediation measures, such as reducing the amount of fertilizer and applying low-toxicity and low-residue pesticides. Although the first consideration of farmers is to obtain considerable income before taking action, the improvement of family life brought by higher-than-expected income may not be enough to compensate for the devastating impact brought by lower-than-expected income. For farmers, the utility of high income is far below the stability of utility. This view relates to that of Scott (1976), who reported that most farmers in the developing world follow the principle of "safety first" for the production of life [51]. Under the survival ethic of "safety first", farmers do not pursue income maximization. A vast majority of farmers can be said to belong to the risk-aversion type in the protection behavior of cultivated land quality.

The unexpected finding is that having agricultural insurance can significantly reduce farmers' risk perception. In the survey sample, the risk perception of farmers with agricultural insurance is much lower than those without insurance. Their behavior value is also higher, which provides a new idea for us to formulate relevant policies. If only farmers adopted targeted policies or measures, such as subsidies, the regulation of cultivated land quality protection may not be able to achieve the desired effect. To help farmers disperse or transfer risks, they should be encouraged to buy agricultural insurance actively while promoting agricultural insurance premiums and improving their risk defense [38,40,66]. Such support will benefit the quality of farmers' cultivated land protection behavior decisions.

The research offers the following policy enlightenment. First, policymakers and experts should give full play to grassroots initiatives, combine modern science and technology means, increase publicity, and improve farmers' awareness of farmland quality protection so that farmers will have a profound understanding of the ecological and social value of farmland and improve their perceived value level. Second, the intensity of incentives should be increased further by strengthening agricultural subsidies or other preferential policies, as well as the economic interests of farmers. Experts should also improve their awareness and the pricing mechanism for agricultural products and materials. Moreover, they should safeguard farmers' income to ensure latter's motivation toward arable land protection. Third, the coverage and compensation intensity of various kinds of insurance, especially agricultural insurance, in rural areas should be improved. Loss aversion is an important reason for farmers' risk avoidance. Hence, improving insurance coverage can help reduce farmers' losses and improve their ability to cope with risks.

6. Conclusions

To improve the cultivated land quality protection system and improve the system's performance, this study investigates farmers' cultivated land quality protection behavior from the aspect perception. The internal logical mechanism of farmers' cultivated land quality protection behavior is explored. From the perspective of farmers' perception and on the basis of the theory of perceived value and behavior of farmers related to the quality of the sample cultivated land protection area, this study builds the "overall farmers' perceived quality of cultivated land protection behavior decision model" through the internal factors of the model parameter estimation. An analysis of peasant household perception factors and their influence on behavior decisions explains the internal logic of farmers' protection behavior decision-making mechanism in protecting the quality of cultivated land.

On the basis of the analysis, the following conclusions can be drawn. First, the quality of farmers' arable land protection behavior is based on the perceived value of the result of rational decision making. Its action logic follows "perceived balance to perceived value, behavior intention, and behavior response", which is the path to the paradigm of farmers' perception of the quality of cultivated land protection value to protect behavior and produce the critical nature of direct and indirect influence. Second, farmers' perceived value of cultivated land quality protection results from a total balance between their perceived benefits and risks. Improving farmers' perceived benefits, especially monetary income benefits, and reducing perceived risks and significant cost input risks will help improve farmers' perceived value of cultivated land quality protection. Third, farmers' perceived benefits and risks significantly impact their willingness and behavior of farmland quality protection. Farmers are sensitive to benefits in the initial stage of farmland quality protection, but their actual behavior is greatly affected by perceived risks, and they are typical "risk avoiders". The results indicate that most of the surveyed farmers can recognize the basic value of cultivated land quality protection. Farmers have potential enthusiasm for the protection of cultivated land quality. However, in actual decision making, they are often more sensitive to risk factors. Among them, factor cost, inner anxiety and uncertainty are the main inducements hindering their behavior.

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