sustainability

MDPI

Article

Mechanisms and Empirical Analysis of the Impact of Soil and Water Conservation on the Livelihood and Well-Being of Farmer Households: A Case Study in Desert–Loess Transition Zone of China

Biyao Jiang, Xingmin Shi * and Yuhan Qin

School of Geography and Tourism, Shaanxi Normal University, Xi'an 710119, China
* Correspondence: realsimon@163.com or sleepings@snnu.edu.cn; Tel.: +86-131-8606-8586

Abstract: Climate change brings great uncertainty to the sustainable livelihood of farmers. Soil and water conservation measures are the key measures to adapt to climate change, and studying their effects is of great significance to formulating and adjusting future work. Based on the analysis framework of sustainable livelihood, this study constructed a path model to analyze the influence path among soil and water conservation, farmers' livelihood and well-being from the perspective of model integration and discussed the mechanism of the effect of soil and water conservation well-being. The results show that (1) soil and water conservation has a significant effect on both the livelihood and well-being of farmer households. Soil and water conservation has a positive effect on farmer households' livelihood capital, and farmers who participated in soil and water conservation prefer to engage in agricultural activities, with a cumulative effect of livelihood capital and livelihood strategies dependence. However, the direct effect of soil and water well-being is not significant, but only in terms of farmers' security and health. (2) Through the "livelihood capital accumulation mechanism", "livelihood strategies dependence mechanism" and "livelihood chain mechanism", soil and water conservation affects the basic material needs, safety and health, freedom of choice and movement of farmers' well-being. (3) In order to further promote soil and water conservation measures, relevant policy makers can indirectly enhance the soil and water conservation well-being effect by optimizing the livelihood portfolio of farmers, thus attracting the extensive participation of farmers. This study provides analytical ideas for exploring the role of the relationship between soil and water conservation, livelihood and well-being, and offers suggestions for increasing the participation of farmers in soil and water conservation.

Keywords: climate change; soil and water conservation; sustainable livelihood; farmers' well-being

Citation: Jiang, B.; Shi, X.; Qin, Y. Mechanisms and Empirical Analysis of the Impact of Soil and Water Conservation on the Livelihood and Well-Being of Farmer Households: A Case Study in Desert–Loess Transition Zone of China. *Sustainability* **2023**, *15*, 6569. https://doi.org/10.3390/su15086569

Academic Editor: Hossein Azadi

Received: 21 March 2023
Revised: 7 April 2023
Accepted: 11 April 2023
Published: 12 April 2023

1. Introduction

Soil and water are indispensable resources for agricultural and environmental sustainability, and climate change will put additional pressure on the land as the population grows and the need for significant agricultural production per unit area in the 21st century increases [1,2]. Reports and studies have shown that the impacts of climate change and extreme events (e.g., floods, periods of severe drought) are already affecting the most sensitive agroecosystems [1], and the implementation of soil and water conservation is essential to maintain soil productivity and adapt to the impacts of climate change [3].

Soil and water conservation can effectively reduce erosion and soil loss by increasing surface vegetation cover, changing local microtopography or surface structure and improving ecosystem services by changing the structure and function of the regional ecosystem [4]. Benefiting from the improvement of regional ecosystems, the benefits that humans can derive from the ecosystem increase, and the well-being of farmer households are enhanced [5,6]. Well-being is a multidimensional concept that characterizes the state

and level of human life [7], and improving well-being is the core of sustainable development [8]. A large number of studies have focused on the well-being effect of soil and water conservation, and overall, soil and water conservation improves regional agricultural productivity and has a positive impact on ensuring food security, increasing crop yields and agricultural income [2,9,10], as well as playing a role in mitigating natural disasters, improving the rural industrial structure and raising people's living standards [11,12]. However, existing studies on the well-being effect of soil and water conservation have mainly focused on the contribution of soil and water conservation to society, with limited evidence on the combined well-being effect on actors. At the same time, as an adaptive behavior and production strategy, soil and water conservation is closely related to farmers' livelihood and has a significant impact on changing the structure and level of farmers' livelihood capital and shifting agricultural production [13]. As the most basic socioeconomic unit and the main subject of behavioral decisions in rural areas, the livelihood of farmers embodies both the processes, ways and means by which economic actors use natural resources and ecosystem services and directly determines the sustainability of ecological conservation and economic development [14,15], which is a key link in resolving the relationship between the supply of ecosystem services and human well-being demand [15]. However, existing studies have paid less attention to the intrinsic linkages between farmers' well-being and their livelihood in the framework of sustainable livelihood analysis, and there is a lack of studies on the integration of soil and water conservation adaptation behaviors with farmers' livelihood and well-being.

The Chinese Desert–Loess Belt is located in the transition zone between the Mawusu Sands and the semi-arid and semi-humid zone of the Loess Plateau and is a sensitive zone for monsoon climate change in East Asia [16]. The regional ecological environment is fragile, and natural disasters such as drought and soil erosion are frequent, affecting the production and life of farmers. The city of Yulin is located in the core area of the Desert–Loess Belt and is a typical microcosm of the Belt. Since the 1960s and 1970s, Yulin has achieved remarkable results in soil erosion control and made important contributions to the emergence, promotion and development of soil and water conservation in China [17]. Therefore, in order to better understand the relationship between soil and water conservation and livelihood and well-being, this paper integrated soil and water conservation, livelihood and well-being based on a sustainable livelihood analysis framework using Yulin as the study area and proposed corresponding hypotheses. A path analysis model was constructed using data from 485 farm households in Yulin, and model estimation and hypothesis testing were conducted to analyze the relationships among the variables. The aim of this study is to investigate the mechanism of action of the well-being effect of soil and water conservation and to provide theoretical references for further promotion of soil and water conservation.

2. Literature Review

2.1. Establishment of the Theoretical Analysis Framework

The livelihood analysis framework developed by the UK Department for International Development (DFID) provides a systematic way of thinking and a normative tool for farmer household livelihood research [18]. In this framework, the human, physical, natural, financial and social capital possessed by farmer households is the basis for their adoption of livelihood strategies. Livelihood outcomes are the result of a combination of livelihood capital and livelihood strategies, including aspects of well-being, food security and natural resource accessibility [18]. In the context of climate change, farmers' choice to engage in soil and water conservation can be seen as an adaptive behavior of farmers surviving in a vulnerable context. Soil and water conservation achieves soil erosion reduction through engineering, biological and tillage measures, and regional ecosystem service capacity is increased [4], while the condition and changes in ecosystems are closely related to human well-being [6]. Livelihood is the basic way and ability of farmers to maintain their own survival by relying on ecological resources and the environment [19], and the adaptation

behavior of farmers will inevitably affect their livelihood capital and livelihood strategies. Therefore, the well-being of farmers involved in soil and water conservation is the result of their livelihood obtained from the optimization of regional ecosystem services and the readjustment of household livelihood capital and livelihood strategies under their adaptation behavior to climate change (Figure 1).

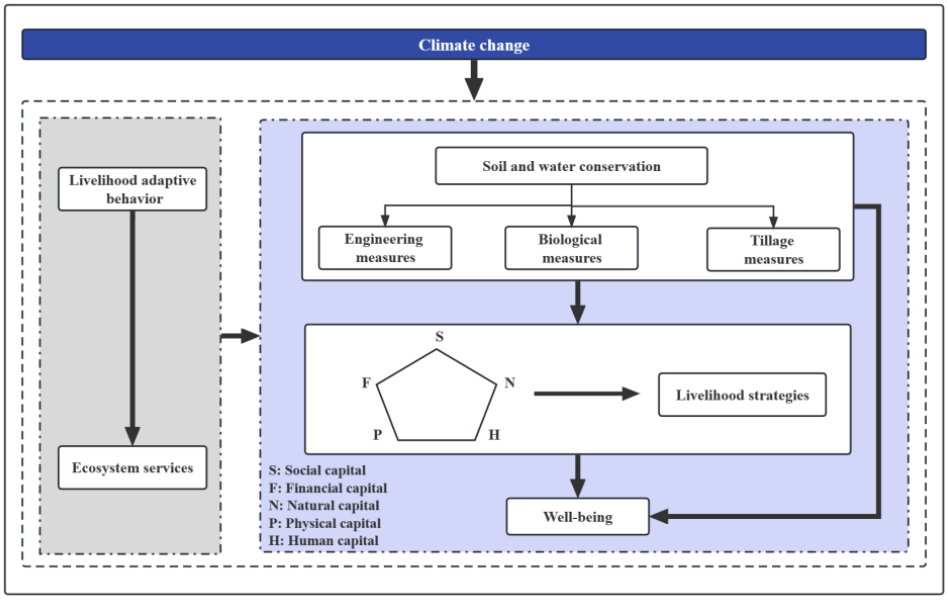

Figure 1. Theoretical analysis framework.

2.2. Research Hypotheses

2.2.1. Impact of Soil and Water Conservation on Livelihood Capital

The transformation of the land through soil and water conservation measures has resulted in a change in the structure and type of land [4] and, thus, a significant change in the natural capital of the farmers. Soil and water conservation can improve production conditions, which are beneficial for increasing crop yields and agricultural productivity [9,10], and the increased crop yields and the various received policy subsidies act directly on financial capital. As a productive adaptation behavior, farmers can strengthen their communication and contact with others during the implementation process and expand their social network, which in turn contributes to the improvement of social capital. Human capital and physical capital also tend to change for the better by benefiting from the improvement of other capital endowments. In addition, government training for soil and water conservation skills improves the quality of farmers' human capital. Overall, the livelihood capital status of farmers who adopt soil and water conservation technology is better than those who do not [13,20]. Accordingly, the following hypothesis is proposed.

Hypothesis 1 (H1). *Soil and water conservation has a positive effect on the livelihood capital of farmer households.*

2.2.2. Impact of Soil and Water Conservation on Livelihood Strategies

Soil and water conservation affects the choice of livelihood strategies of farmer households through direct and indirect effects. Livelihood strategies refer to people's choice of asset utilization allocation and business activities [21]. Different types of livelihood can be classified according to the livelihood of farmer households and the structure of household income sources [22]. Farmer household livelihood strategies can be divided into agricultural-based livelihood strategies based on the share of household agricultural income in the total household income and non-farm livelihood strategies based on non-farm activities [23]. On the one hand, there is a path dependence phenomenon in the process of farmers' livelihood strategy selection, preferring to engage in their original livelihood

activities [24]. Thus, farmers who adopt soil and water conservation measures will invest more time and energy in agricultural production and continue agricultural activities. On the other hand, farmers' livelihood strategies are influenced by livelihood capital, which is a livelihood choice under the livelihood capital portfolio [18], and the accumulation of livelihood capital endowment will drive the transformation of farmers' livelihood strategies [25] so that farmers' livelihood will be diversified and non-farmed [23,26]. Soil and water conservation can improve the livelihood environment and effectively enhance the livelihood capital endowment of farmer households; therefore, influenced by the mediating variable of farmer household livelihood capital, soil and water conservation promotes the non-farming of farmer households' livelihood strategies through livelihood capital. Accordingly, the following hypotheses are proposed.

Hypothesis 2a (H2a). *Farmers' participation in soil and water conservation will directly promote the farming activities of farmer households.*

Hypothesis 2b (H2b). *Soil and water conservation indirectly promotes farmer households' participation in non-farm production activities through livelihood capital.*

2.2.3. Impact of Soil and Water Conservation on Well-Being

Soil and water conservation contributes to the well-being of farmer households through direct and indirect effects. Soil and water conservation measures increase the sustainable services capacity of regional ecosystems through the transformation of land, and the regional supply, regulation, culture and support services capacity is improved [27,28], which in turn improves the well-being of farmer households. With the effect of soil and water conservation measures, the supply services capacity of land production is improved, the support services capacity is increased and the food security, as well as the basic material needs of farmer households, are guaranteed [29,30]. Ecosystem regulation services of soil and water conservation measures include maintenance and improvement of soil fertility, water conservation, air purification, etc. [27]. The implementation of soil and water conservation can increase regional ecological security [11] and to a certain extent alleviate regional soil erosion, environmental pollution and water shortage, and the safety and health of farmers are guaranteed. Cultural services are associated with the maintenance of social relations, with special emphasis on promoting social cohesion, supporting spiritual expression and practices and helping to preserve culture and traditions [31]. The land carries the local sentiment of farmers, and the improvement of land conditions and the regional environment is beneficial to cultivate the local sentiment of farmers, developing good social relationships with neighboring farmers and integrating into community building. On this basis, it benefits the improvement of the quality of life of the farmers and to a certain extent provides the possibility of the farmers' needed and valuable life opportunities.

People's ability to achieve well-being depends to a large extent on their ownership of assets, and different combinations of assets can achieve different livelihood outcomes [18]. The land is the means of production on which farmer households depend; capital accumulation can improve well-being, and people will engage in different activities to achieve desired livelihood outcomes by extracting livelihood capital [32,33]. Livelihood capital is an important determinant of livelihood outcomes, and well-being is related to household capital [34–36]. In addition, there are group differences in the impact of ecosystem services on human well-being [37], and different types of farmer households are affected differently by soil and water conservation. Accordingly, the following hypotheses are proposed.

Hypothesis 3a (H3a). *Soil and water conservation directly improves the well-being of farmer households.*

Hypothesis 3b (H3b). *Soil and water conservation indirectly improves the well-being of farmer households through livelihood capital.*

Hypothesis 3c (H3c). *Soil and water conservation indirectly affects the well-being of farmer households through livelihood strategies.*

Hypothesis 3d (H3d). *Livelihood capital and livelihood strategies together mediate the impact of soil and water conservation on well-being.*

In summary, the path of action of the soil and water conservation well-being effect is shown in Figure 2.

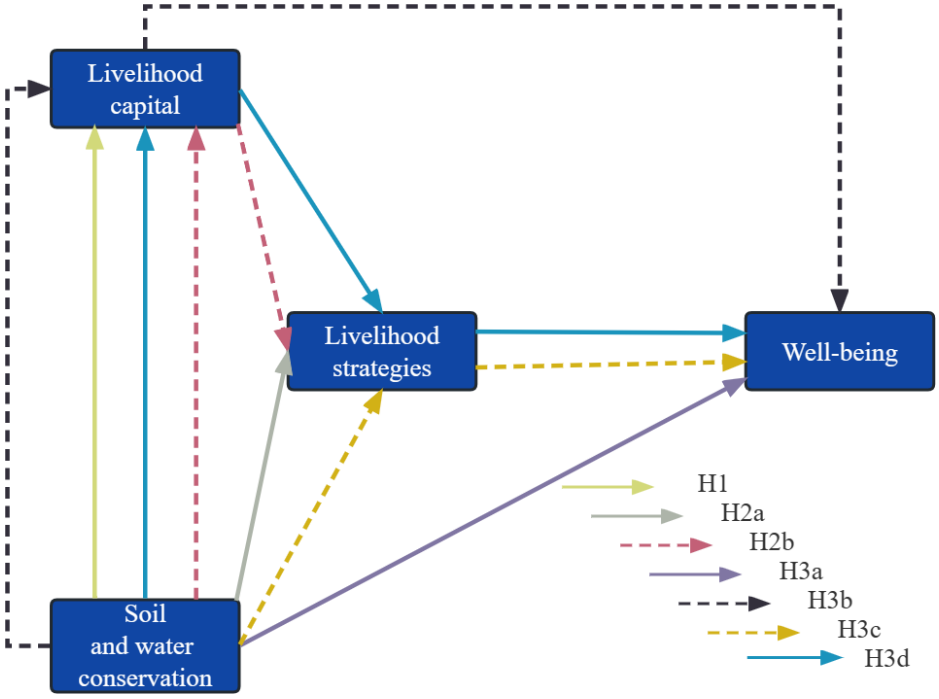

Figure 2. Action path of soil and water conservation well-being effect.

3. Materials and Methods

3.1. Study Area

Yulin is located at 36°57′–39°35′ N latitude and 107°28′–111°15′ E longitude, with a total area of 42,920.2 km^2 (Figure 3) and an average annual precipitation of about 400 mm, which is typical of the climate of the semi-arid region in the northwest. The area is rich in mineral resources and is the main energy base of China. The sensitive ecological environment coupled with human economic activities has exacerbated soil erosion in the area [38], which is one of the most serious areas of soil erosion in China. Yulin is the main production area of miscellaneous grains in Shaanxi Province, mainly growing corn, wheat, rice, potatoes, etc. In 2020, the city's total agricultural output was CNY 29.775 billion, with 0.35 million people in the agricultural industry and a grain output of 253.80 × 104 t [39].

3.2. Data Sources

This study used a combination of questionnaires and household interviews to collect data from a field questionnaire survey conducted in the city of Yulin from August 16 to 24, 2021. First, Yuyang District, Shenmu City and Fugu County were selected as the target districts and counties for this study based on the extensive knowledge of the socioeconomic development of Yulin. Subsequently, two to three townships were selected in each district and county, and two villages were selected in each township, making a total of 14 administrative villages for the questionnaire study. In each village, 30–36 households were randomly selected and 500 questionnaires were distributed and 485 valid questionnaires were obtained.

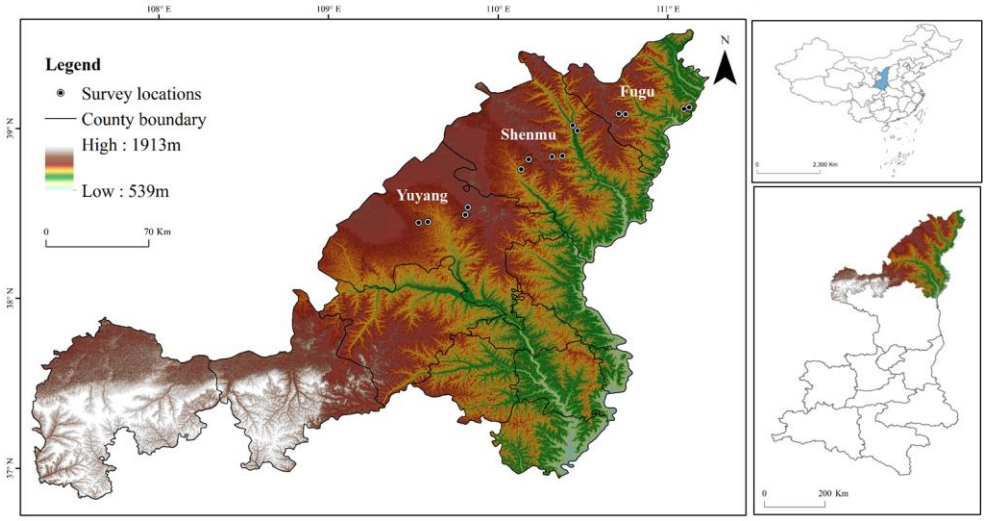

Figure 3. Study area and survey sites.

3.3. Research Methodology

This study used the objective assignment entropy weighting method to calculate the weights of farmers' livelihood capital and their well-being, and the composite score method to measure farmers' livelihood capital and well-being. Path analysis is a form of structural equation modeling that can quantify complex effects between variables, including direct and indirect effects, by measuring the degree of correlation between variables through correlation coefficients or determining causal relationships between variables through path coefficients [40,41]. This study used AMOS 24.0 software to build a path model of multiple observed variables, including the above research hypotheses, reflecting the complex relationships between several different variables of soil and water conservation, farmers' livelihood and well-being, and analyzed the mechanism of action of the well-being effect of soil and water conservation in depth based on the multiple mediated effect analysis method of bootstrap. This method can overcome the shortcomings of the stepwise test and Sobel test in dealing with a small sample size, small mediated effect values, or mediated effect values that are not normally distributed in the statistical efficacy, and can effectively address the measurement error of variables and the problem of multiple mediated models [42]. If the fit of the path model is acceptable, the mediating effect significance is judged based on the estimate of the mediating effect interval obtained from the bias-corrected bootstrap. The mediating effect that is specified to be tested, if the confidence intervals do not contain zero, is significant for the corresponding mediating effect [43,44]. By comparing the results of model fitness and path coefficient significance tests, different patterns of direct and indirect effects of soil and water conservation well-being effects were tested empirically.

3.4. Variable Settings

Soil and water conservation is an exogenous variable of this study, measured by the participation of farmers. Farmers' livelihood capital and well-being were designed based on references to existing research results [23,45–50] and combined with the characteristics of the study area. The livelihood strategies of farmer households are measured by the percentage of the annual farm income of farmer households. When the proportion of agricultural income to total household income is greater than 60%, it means that farmers are engaged in farming-based livelihood strategies, and vice versa, it means that farmers are engaged in non-farming-based livelihood strategies [23]. The specific index system is shown in Table 1.

Table 1. Selection of indicators and definition of variables.

	Indicators	Definition
Soil and water conservation	Whether farmers participate in soil and water conservation	Yes = 1; No = 0
Livelihood capita		
Natural capital	Arable land area (mu)	≤5 = 1; 5~10 = 2; 10~15 = 3; 15~20 = 4; ≥20 = 5
	Woodland area (mu)	≤5 = 1; 5~10 = 2; 10~15 = 3; 15~20 = 4; ≥20 = 5
Physical capital	Housing type	Shack = 1; Adobe = 2; Brick/wood shingle = 3; Concrete = 4; Building = 5
	Number of household durable goods	— —
	Housing area (m^2)	— —
Financial capital	Annual household income (RMB)	≤50,000 = 1; 50,000~100,000 = 2; 100,000~150,000 = 3; 150,000~200,000 = 4; ≥200,000 = 5
	Household savings (RMB)	≤50,000 = 1; 50,000~100,000 = 2; 100,000~150,000 = 3; 150,000~200,000 = 4; ≥200,000 = 5
	Annual state subsidy (RMB)	≤500 = 1; 500~1000 = 2; 1000~1500 = 3; 1500~2000 = 4; ≥2000 = 5
Social capital	Do any of your family members or friends work in the government departments	Yes = 1; No = 0
	The number of people who can seek help when you encounter difficulties	— —
	Whether to join cooperatives, supply and marketing societies and other associations	Yes = 1; No = 0
Human capital	Number of labor force (60 ≥ age ≥ 16)	No one = 1; One = 2; Two = 3; Three = 4; ≥Four = 5
	Highest level of education among family members	Elementary school and below = 1; Middle school = 2; High school = 3; College = 4; Bachelor's degree and above = 5
	Whether there was participation in skills training organized by the government	Yes = 1; No = 0
Livelihood strategies	Agricultural income	The share of agricultural income is greater than 60 percent = 1; Otherwise = 0
Well-being		
Basic material needs	Engel coefficient	Total food expenditure as a share of total household consumption expenditure
	Water shortage situation	Not serious = 5; Less serious = 4; Fair = 3; More serious = 2; Very serious = 1
	Whether there is internet broadband or WIFI at home	Yes = 1; No = 0
Safety and health	Severity of local soil erosion	Not serious = 5; Less serious = 4; Fair = 3; More serious = 2; Very serious = 1
	Severity of environmental pollution	Not serious = 5; Less serious = 4; Fair = 3; More serious = 2; Very serious = 1
	Family health condition	Overall average family health
Harmonious social relations	The proportion of household consumption expenditure on human kindness	— —
	Degree of trust in neighbors	Do not trust at all = 1; Do not trust much = 2; Fairly trust = 3; Fairly trust = 4; Very much trust = 5
	Frequency of participation in public affairs discussions	Very little = 1; Less = 2; Average = 3; More = 4; A lot = 5
Freedom of choice and movement	Satisfaction with income	Very dissatisfied = 1; Dissatisfied = 2; Average = 3; More satisfied = 4; Very satisfied = 5
	Deposit satisfaction	Very dissatisfied = 1; Dissatisfied = 2; Average = 3; More satisfied = 4; Very satisfied = 5
	Income diversity	Revenue channels

4. Results

4.1. Descriptive Statistics of Variables

Among the interviewed farmers, 306 participated in soil and water conservation, while the remaining 179 did not. The most adopted measures by farmers are stubble mulching, followed by water-saving irrigation and straw return, indicating that tillage measures and engineering measures are the main measures taken by farmers. Table 2 shows the descriptive statistics of the variables. The mean value of farmer households' livelihood capital is 0.234, which is at a low level, and 24% of the farmers with livelihood capital below 0.1 level face a great possibility of unsustainable livelihood. Compared with social, human and financial capital, the natural and physical capital of farmers are relatively scarce. The mean value of farmers' well-being is 0.400, and there is still much room for improvement. The different dimensions of well-being are safety and health > basic material needs > harmonious social relations > freedom of choice and movement. The mean value of livelihood strategies of farming households is 0.239. Farmer households in the study area mostly choose livelihood strategies based on non-farm activities, and farming income is not the main source of income for households.

Table 2. Descriptive statistics of variables.

Variable		Total Sample	Participating Farmers	Non-Participating Farmers	*t*-Value
Livelihood capital		0.234	0.252	0.205	3.130 ***
	Natural capital	0.033	0.037	0.028	2.255 **
	Physical capital	0.021	0.022	0.018	3.501 ***
	Financial capital	0.058	0.056	0.062	−1.059
	Social capital	0.062	0.073	0.043	3.895 ***
	Human capital	0.060	0.063	0.054	1.615
Well-being		0.400	0.417	0.371	3.732 ***
	Basic material needs	0.118	0.122	0.113	1.979 **
	Safety and health	0.127	0.136	0.111	2.677 ***
	Harmonious social relations	0.080	0.081	0.078	0.860
	Freedom of choice and movement	0.075	0.078	0.070	2.414 **
Livelihood strategies		0.239	0.260	0.200	1.539

** and *** indicate significance at the 5% and 1% levels.

There are significant differences in the livelihood capital and well-being between farmers who participated in soil and water conservation and those who did not. Specifically, farmers who participated in soil and water conservation have higher levels of natural capital, physical capital, social capital, basic material needs, safety and health and freedom of choice and movement than those who did not, showing differences in statistical characteristics. However, the mechanism of action of the soil and water conservation measures is unclear, and the pathways through which their well-being effects operate require additional analysis.

4.2. Model Fit

The processed data were put into AMOS 24.0 for modeling. According to the criteria for judging each goodness-of-fit indicator [51–53], the final results after model correction are $X^2/df = 2.563$, which is between 1 and 3; TLI = 0.889, which is greater than the critical value of 0.8; CFI = 0.968, IFI = 0.970, which are both greater than 0.9; and RMSEA = 0.057, which is less than 0.08. This indicates that the model constructed in this study is well-adapted for path analysis.

4.3. Impact Path Analysis

The path results calculated using AMOS 24.0 are as follows (Table 3), and hypotheses H1 and H2a are verified. The standardized path coefficient between soil and water conservation and farmers' livelihood capital is 0.135 ($p < 0.01$), which indicates that farmers' participation in soil and water conservation has a positive effect on their livelihood capital and is important for accumulating capital endowment [13,20]. The standardized coefficient between soil and water conservation and farmers' livelihood strategies is 0.085 ($p < 0.1$), and soil and water conservation can directly act on farmers' livelihood strategies to promote their participation in agricultural activities, confirming the existence of livelihood strategies' path dependence after farmers' participation in soil and water conservation practices. Hypothesis H3a is partially verified; the direct effects of the soil and water conservation well-being effect is only reflected in farmers' safety and health, and the standardized path coefficient between soil and water conservation and farmers' safety and health is 0.090 ($p < 0.05$). The benefits of soil and water conservation in improving the regional ecology and safeguarding the health of the region's farmers have been proven. There is a close linkage between soil and water conservation, livelihood capital, livelihood strategies and well-being, and the significance of the path coefficient laterally reflects the significant indirect effect of soil and water conservation on livelihood strategies and well-being. However, the mechanism of action between them is not yet understood, and the pathway of action of the well-being effect of soil and water conservation needs further analysis.

Table 3. Impact pathways.

Path			Standardization Coefficient
Soil and water conservation	→	Livelihood capital	0.135 ***
Soil and water conservation	→	Livelihood strategies	0.085 *
Livelihood capital	→	Livelihood strategies	−0.127 ***
Soil and water conservation	→	Basic material needs	0.070
Soil and water conservation	→	Safety and health	0.090 **
Soil and water conservation	→	Harmonious social relations	0.002
Soil and water conservation	→	Freedom of choice and movement	0.046
Livelihood capital	→	Basic material needs	0.203 ***
Livelihood capital	→	Safety and health	0.166 ***
Livelihood capital	→	Harmonious social relations	0.278 ***
Livelihood capital	→	Freedom of choice and movement	0.529 ***
Livelihood strategies	→	Basic material needs	−0.092 **
Livelihood strategies	→	Safety and health	0.128 ***
Livelihood strategies	→	Harmonious social relations	−0.011
Livelihood strategies	→	Freedom of choice and movement	−0.121 ***

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

4.4. Analysis of Mediating Effect

To further explore the relationship between soil and water conservation and livelihood and well-being, mediating effect analyses are conducted for all three. Hypotheses H2b, H3b, H3c and H3d are tested. Soil and water conservation affects farmer household livelihood strategies through livelihood capital (−0.017, $p < 0.01$), and the accumulation of livelihood capital promotes a shift in farmer household livelihood activities toward the non-farm, indicating that households with superior livelihood resources are more inclined to choose non-farm employment [25]. Livelihood capital and livelihood strategies play a mediating role in the mechanism of action of the soil and water conservation well-being effect, and there are dimensional differences in the magnitude and significance of the mediating role (Table 4).

Soil and water conservation affects the basic material needs of farmer households through the "livelihood capital accumulation mechanism", "livelihood strategies dependence mechanism" and "livelihood chain mechanism" (Figure 4). Soil and water conservation can easily meet the basic material needs of farmers based on improving their livelihood capital (0.028, $p < 0.01$), but the livelihood strategies based on agricultural activities are not conducive to further improvement of material living standards (−0.008, $p < 0.1$), and the mediating effect of livelihood capital is significantly higher than that of livelihood strategies (0.035, $p < 0.01$). The implementation of soil and water conservation has a positive effect on the basic material needs of farmers through the "livelihood chain mechanism" of livelihood capital acting on livelihood strategies (0.002, $p < 0.05$). Soil and water conservation has an indirect positive effect on the basic material needs of farmers.

Table 4. Mediated pathways of soil and water conservation well-being effect.

Well-Being	Effect	Standardization Coefficient
Basic material needs	Soil and water conservation → Livelihood capital → Basic material needs	0.028 ***
	Soil and water conservation → Livelihood strategies → Basic material needs	−0.008 *
	Soil and water conservation → Livelihood capital → Livelihood strategies → Basic material needs	0.002 **
	Livelihood capital accumulation mechanism − Livelihood strategies dependency mechanism	0.035 ***
Safety and health	Soil and water conservation → Livelihood capital → Safety and health	0.023 ***
	Soil and water conservation → Livelihood strategies → Safety and health	0.011 **
	Soil and water conservation → Livelihood capital → Livelihood strategies → Safety and health	−0.002 ***
	Livelihood capital accumulation mechanism − Livelihood strategies dependency mechanism	0.012
Harmonious social relations	Soil and water conservation → Livelihood capital → Harmonious social relations	0.038 ***
	Soil and water conservation → Livelihood strategies → Harmonious social relations	−0.001
	Soil and water conservation → Livelihood capital → Livelihood strategies → Harmonious social relations	0.000
	Livelihood capital accumulation mechanism − Livelihood strategies dependency mechanism	0.039 ***
Freedom of choice and movement	Soil and water conservation → Livelihood capital → Freedom of choice and movement	0.072 ***
	Soil and water conservation → Livelihood strategies → Freedom of choice and movement	−0.01 **
	Soil and water conservation → Livelihood capital → Livelihood strategies → Freedom of choice and movement	0.002 ***
	Livelihood capital accumulation mechanism − Livelihood strategies dependency mechanism	0.082 ***

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

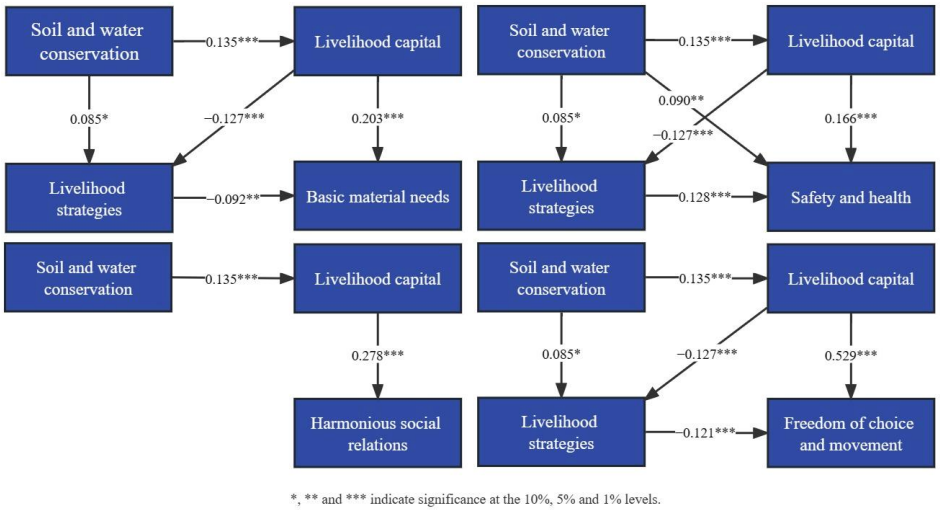

Figure 4. Realization path of soil and water conservation indirect well-being effect.

Soil and water conservation influences farmers' safety and health through "livelihood capital accumulation mechanism", "livelihood strategies dependence mechanism" and "livelihood chain mechanism" (Figure 4b). The accumulation of livelihood capital helps farmers to improve their living conditions and become more capable of coping with the risks and challenges of their environment (0.023, $p < 0.01$). Related studies have pointed out that the livelihood capital of farmer households is important in farmers' reliance on their resilience to the risk of major diseases [54] and has a negative effect on environmental and health risks [55]. In addition, soil and water conservation is closely related to farmers' agricultural production activities. Therefore, farmers benefit from the benefits of soil and water conservation in mitigating regional natural disasters and increasing ecological security by implementing soil and water conservation techniques in the agricultural production process [11], and the safety and health of farmers are guaranteed (0.011, $p < 0.05$). In the livelihood chain pathway, soil and water conservation has a negative

effect on farmers' safety and health when shifted to non-farm activities through livelihood accumulation (−0.002, $p < 0.01$). This result may be due to the fact that farmers with mainly non-farm livelihood activities do not perceive the environmental changes after soil and water conservation implementation due to the shift of livelihood activities.

Soil and water conservation promotes harmonious social relations among farmers through the "livelihood capital accumulation mechanism" (Figure 4c). On the one hand, farmers with better livelihood endowments have a better livelihood adaptation capacity [56], better opportunities to choose livelihood strategies and higher motivation to participate in policies and social interactions [57]. On the other hand, the higher the economic status, the stronger the interpersonal attractiveness and the easier it is to establish certain relationships with others, and the economic status of farmer households depends largely on the livelihood capital they possess [58]. Thus, by increasing the livelihood capital endowment of farmer households, soil and water conservation enhances the well-being of the harmonious social relationship dimension of farmer households (0.038, $p < 0.01$).

Soil and water conservation affects farmers' freedom of choice and movement through the "livelihood capital accumulation mechanism", "livelihood strategies dependency mechanism", and "livelihood chain mechanism" (Figure 4d). The improvement in the living conditions of the farmers promotes the possibility of choosing their desired lifestyle (0.072, $p < 0.01$), but the livelihood strategies based on agricultural activities have a single income and are largely dependent on the natural environment. Thus, soil and water conservation negatively acts on farmers' freedom of choice and movement through the path dependence of livelihood strategies (−0.01, $p < 0.05$). The mediating effect of livelihood capital is significantly stronger than the mediating effect of livelihood strategies, indicating that soil and water conservation has a more positive than negative effect on farmers' choice and freedom of action (0.082, $p < 0.01$). In addition, indirectly through the role of livelihood chains, soil and water conservation has a positive effect on farmers' freedom of choice and movement.

4.5. Soil and Water Conservation Well-Being Effect

The well-being effect of soil and water conservation is reflected in the basic material needs, safety and health and freedom of choice and movement of farmers, among which, the well-being effect of safety and health is the largest, followed by freedom of choice and movement and basic material needs. From the analysis of specific impact pathways, the direct mode of action of the well-being effect of soil and water conservation is only reflected in the safety and health dimensions of well-being, and the well-being effect of other dimensions of soil and water conservation is realized through mediating variables. Through the paths of action of livelihood capital, livelihood strategies and the livelihood chain, the indirect well-being effect of soil and water conservation is selected with freedom of choice and movement > safety and health > basic material needs. Although soil and water conservation has an indirect well-being effect on the harmonious social relations dimension of well-being, its total effect is not significant (Table 5).

Table 5. Soil and water conservation well-being effect.

Well-Being	Hypothetical Effect	Standardization Coefficient
Basic material needs	Direct effect	0.070
	Total mediating effect	0.021 *
	Total effect	0.091 **
Safety and health	Direct effect	0.090 **
	Total mediating effect	0.031 ***
	Total effect	0.121 ***
Harmonious social relations	Direct effect	0.002
	Total mediating effect	0.037 ***
	Total effect	0.039
Freedom of choice and movement	Direct effect	0.046
	Total mediating effect	0.063 ***
	Total effect	0.109 **

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

5. Discussion

There is a strong link between soil and water conservation, farmers' livelihood and well-being. This study used path analysis to confirm the existence of the well-being effect of soil and water conservation measures. Soil and water conservation affects farmers' well-being through direct and indirect effects, in which farmers' livelihood capital and their livelihood strategies play a mediating role. Specifically, the direct effect of the soil and water conservation well-being effect is not obvious, and only significant in terms of farmers' safety and health. Soil and water conservation has improved regional ecosystem services [4], the improvement of regulating services is greater, regional ecological security is ensured [11] and the living environment of farmers is improved, bringing tangible benefits to farmers and reflecting side-by-side that the basic objectives of implementing soil and water conservation are achieved. The results of path analysis indicate that there is a livelihood capital accumulation effect and livelihood strategies dependence effect on the well-being of soil and water conservation, and soil and water conservation increases the well-being of farmers by accumulating livelihood capital. However, the path-dependent effect of livelihood strategies, where farmers tend to engage in traditional low-risk livelihood [24], is not conducive to livelihood diversification and livelihood transformation, inhibiting the realization of the multidimensional well-being of farmers.

In the context of climate change, the involvement or non-involvement in soil and water conservation can be considered a livelihood adaptation behavior. In order to continue promoting soil and water conservation for the sustainability of farmers' livelihood, on the one hand, the well-being effect of soil and water conservation can be expanded based on the cumulative effect of livelihood capital by improving the well-being of farmers through improving their livelihood capital endowment. Human and financial capital is important for well-being [59]. Human capital symbolizes the collection of capabilities, such as knowledge, skills, health and talents, that enable households and individuals to meet livelihood needs in a context of vulnerability [60], and financial capital is the accumulation and mobility that people need in the consumption and production process to achieve their livelihood goals [18]. These important components of livelihood capital are believed to be effective in improving the standard of living and quality of life of individuals or families, which largely affects the state of well-being [59]. Therefore, training participating farmers in skills related to soil and water conservation techniques through soil and water conservation projects can help farmers to better understand the significance of soil and water conservation and improve household livelihood capacity and production skills to increase the likelihood of valuable livelihood opportunities for farmer household activities. There is a positive correlation between income and well-being [59], and in addition to the increased income from improved productive environments resulting from soil and water conservation, appropriate policy subsidies play an important role in maintaining a certain level of well-being. Related, access to financial resources and agriculture-related training has been noted as a positive factor in farmers' adaptation decisions [61], which is equally important for the diffusion of soil and water conservation technologies. In addition, the cumulative effect of livelihood capital has the effect of optimizing farmers' livelihood strategies, which can be mediated through a chain of livelihood capital and livelihood strategies to optimize livelihood and thus improve farmers' well-being.

On the other hand, the dependency effect of livelihood strategies can play a positive role when the specialization of the original livelihood approach is enhanced [24], again indicating the need for technical training for farmers involved in soil and water conservation. In addition to training in soil and water conservation techniques, agricultural training related to increasing farmers' production skills should also appeal to the widespread participation of households involved in soil and water conservation, with appropriate subsidies to encourage farmers to engage in large-scale operations and promote their production specialization, thus achieving positive effects on livelihood sustainability.

This study can improve the well-being of farmers involved in soil and water conservation from the perspective of livelihood and provides references for the further promotion

of soil and water conservation practices, which have certain theoretical significance and practical value, but there are also the following shortcomings. First, the livelihood capital of farmers needs to be refined, and the relationship between different types of livelihood capital and different dimensions of well-being needs to be further studied. Second, whether farmers participate in soil and water conservation is influenced by various variables, and this study ignores the problem of sample self-selection, which may lead to an inaccurate estimation of the effect of soil and water conservation on well-being. In order to obtain more accurate results, future studies need to pay attention to the above issues.

6. Conclusions

This study analyzed the relationship between soil and water conservation, livelihood and well-being through path analysis methods and provided insight into the mechanisms of the well-being effect of soil and water conservation, providing ideas for the promotion of soil and water conservation and the sustainable development of farmers' livelihood. Three key findings are obtained in this paper. First, the direct effect of soil and water conservation on well-being is not significant, and soil and water conservation only directly affects the well-being of farmers in terms of safety and health. Second, soil and water conservation has a cumulative effect on livelihood capital and livelihood strategies dependence; soil and water conservation has a positive cumulative effect on farmers' livelihood capital and farmers who participate in soil and water conservation prefer to engage in their original livelihood activities. Third, there is a close relationship between soil and water conservation, livelihood and well-being. Soil and water conservation affects the basic material needs, safety and health and freedom of choice and movement dimensions of farmers' well-being mainly through the "livelihood capital accumulation mechanism", "livelihood strategies dependency mechanism" and "livelihood chain mechanism". To adapt to the livelihood challenges posed by climate change, it is important to continue to promote soil and water conservation to increase the well-being of farmers through the optimization of livelihood portfolios, thus leading to the broad-based participation of farmers.

Author Contributions: B.J.: Conceptualization, Methodology, Writing—original draft preparation, Formal analysis, Visualization. X.S.: Conceptualization, Writing—review and editing, Methodology. Y.Q.: Conceptualization, Investigation, Data curation. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Humanities and Social Sciences Foundation of the Ministry of Education (21YJA840014), the Shaanxi Provincial Social Science Foundation Project (2020F004), the Shaanxi Provincial Natural Science Basic Research Program Project (2022JM-151), and the Shaanxi Province Key Research and Development Program Project (2021ZDLSF05-02).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The authors thank Xueping Li, Yi Fan, Xiao Feng, Xinxin Wang, and Yawei Liu from the School of Geography and Tourism, Shaanxi Normal University for their great help with the questionnaire survey and data collection process.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Delgado, J.A.; Li, R. The Nanchang communication about the potential for implementation of conservation practices for climate change mitigation and adaptation to achieve food security in the 21st century. *Int. Soil Water Conserv. Res.* **2016**, *4*, 148–150. [CrossRef]
2. Choudhary, B.B.; Dev, I.; Singh, P.; Singh, R.; Sharm, P.; Chand, K.; Garg, K.K.; Anantha, K.H.; Akuraju, V.; Dixit, S.; et al. Impact of soil and water conservation measures on farm productivity and income in the semi-arid tropics of Bundelkhand, central India. *Environ. Conserv.* **2022**, *49*, 263–271. [CrossRef]
3. Lal, R.; Delgado, J.A.; Groffman, P.M.; Millar, N.; Dell, C.; Rotz, A. Management to mitigate and adapt to climate change. *J. Soil Water Conserv.* **2011**, *66*, 276–285. [CrossRef]
4. Liu, G.B.; Zhao, G.J.; Wang, G.L.; An, S.S. An overview to ecological services of soil and water conservation. *Sci. Technol. Rev.* **2016**, *34*, 89–93.
5. Jiang, B.Y.; Shi, X.M.; Qin, Y.H. Does soil and water conservation increase the farmer's well-being in desert-loess transition zone? *J. Arid Land Resour. Environ.* **2023**, *37*, 37–44.
6. Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: Synthesis*; Island Press: Washington, DC, USA, 2005.
7. Huang, G.L.; Jiang, Y.Q.; Liu, Z.F.; Nie, M.; Liu, Y.; Li, J.W.; Bao, Y.Y.; Wang, Y.H.; Wu, J.G. Advances in human well-being research: A sustainability science perspective. *Acta Ecol. Sin.* **2016**, *36*, 7519–7527.
8. Wu, J.G.; Guo, X.C.; Yang, J.; Qian, G.X.; Niu, J.M.; Liang, C.Z.; Zhang, Q.; Li, A. What is sustainability science? *J. Appl. Ecol.* **2014**, *25*, 1–11.
9. Masha, M.; Yirgu, T.; Debele, M. Impacts of Soil and Water Management Measures on Crop Production and Farm Income of Rural Households in the Damota Area Districts, Southern Ethiopia. *Int. J. Agron.* **2021**, *2021*, 5526713. [CrossRef]
10. Tesfayohannes, S.; Kassa, G.; Mulat, Y. Impact of soil and water conservation practices on crop income in tembaro district, southern Ethiopia. *Heliyon* **2022**, *8*, e10126. [CrossRef] [PubMed]
11. Gao, C.N.; Cheng, J.H.; Chen, X.B. Application of grey correlation method in evaluation soil and water conservation ecological security in Beijing mountainous area. *J. Nat. Disaster* **2016**, *25*, 69–77.
12. Song, L.L.; Tian, Q.; Li, Z.J.; Zhang, F. Analysis on benefit of soil and water conservation of inland river basin in Gansu province. *Res. Soil Water Conserv.* **2016**, *23*, 33–37.
13. Hishe, S.; Lyimo, J.; Bewket, W. Impacts of soil and water conservation intervention on rural livelihoods in the Middle Suluh Valley, Tigray Region, northern Ethiopia. *Environ. Dev. Sustain.* **2018**, *21*, 2641–2665. [CrossRef]
14. Wang, C.C.; Yang, Y.S. Review of research on mountainous ecological restoration based on farmer household livelihood evolution. *J. Nat. Resour.* **2011**, *26*, 344–352.
15. Wang, F.C.; Zheng, H.; Zhang, W.; Wang, H.; Peng, W.J. Regional differences and the driving mechanism of relationships between rural household livelihood and ecosystem services: A case study in upstream watershed of Miyun Reservoir, China. *J. Appl. Ecol.* **2021**, *32*, 3872–3882. [CrossRef]
16. Wu, L.J.; Bi, Z.W.; Yang, Z.J.; Wang, C.M.; Guo, J. Holocene strata of the Yangqiaopan section in Desert-Loess Transitional Zone and its sedimentary environment. *J. Arid Meteorol.* **2015**, *33*, 777–782.
17. Li, T. Pondering over high quality development path of soil and water conservation in Yulin city. *Soil Water Conserv. China* **2021**, *468*, 18–20.
18. Su, F.; Xu, Z.M.; Shang, H.Y. An overview of sustainable livelihoods approach. *Adv. Earth Sci.* **2009**, *24*, 61–69.
19. Daily, G.C. *Nature's Services: Societal Dependence on Natural Ecosystems*; Island Press: Washington, DC, USA, 1997.
20. Debie, E.; Yayeh, T.; Anteneh, M. The role of sustainable soil management practices in improving smallholder farmers' livelihoods in the Gosho watershed, Northwest Ethiopia. *Cogent Food Agric.* **2022**, *8*, 2097608. [CrossRef]
21. Su, F.; Pu, X.D.; Xu, Z.M.; Wang, L.A. Analysis about the relationship between livelihood capital and livelihood strategies: Take Ganzhou in Zhangye city as a example. *China Popul. Resour. Environ.* **2009**, *19*, 119–125.
22. Ma, C.; Liu, L.M.; Yuan, C.C.; Ren, G.P. The differentiation characteristics of farmer's livelihood capital and their influences on the livelihood strategy in rapid urbanization area: A case study of Qingpu District of Shanghai. *Res. Agric. Mod.* **2018**, *39*, 316–324.
23. Wu, Z.L.; Cao, H.; Jin, M. Influence mechanism of wetland conservation on the livelihood outcomes of farmers': An empirical study based on the survey of rural households in natural reserves. *J. Ecol. Rural Environ.* 2022; *in press*.
24. Wang, H.L.; Zhao, X.Y. Influence of support measures on the livelihood strategy choice of out-of-poverty farming households in mountainous regions: A case study of the Longnan mountainous area. *Prog. Geo.* **2022**, *41*, 2004–2017. [CrossRef]
25. Wang, W.W.; Gong, J.; Wang, Y.; Shen, Y. The causal pathway of rural human settlement, livelihood capital, and agricultural land transfer decision-making: Is it regional consistency? *Land* **2022**, *11*, 1077. [CrossRef]
26. Xie, J.H.; Yang, G.Q.; Xu, Y.G.; Wang, G. Influence mechanism and empirical analysis of rural land consolidation on the income and welfare of rural households. *J. Agrotech. Econ.* **2020**, *308*, 38–54.
27. Sun, L.Y.; Li, Q.Y.; Cai, G.Q.; Chen, L.J.; Wu, H. Recent progress on ecosystem services functions of soil and water conservation measures. *Sci. Soil Water Conserv.* **2020**, *18*, 145–150.
28. Wang, S.Q.; Liu, Y.X.; Li, Y.; Fu, B.J. Research progress on the ecosystem services on the Loess Plateau during the recent 20 years. *Acta Ecol. Sin.* **2023**, *43*, 26–37.
29. Lu, Y.H.; Fu, B.J.; Feng, X.M.; Zeng, Y.; Liu, Y.; Chang, R.Y.; Sun, G.; Wu, B.F. A policy-driven large scale ecological restoration: Quantifying ecosystem services changes in the Loess Plateau of China. *PLoS ONE* **2012**, *7*, e31782. [CrossRef]

30. Wang, Y.M.; Gao, P.; Mu, X.M.; Zhao, J.M.; Luo, Y.Q. Assessment on comprehensive benefit of soil and water conservation in the small watershed of the southern red soil hilly region—A case study in Yangkeng small watershed in Jingxi province. *Res. Soil Water Conserv.* **2017**, *24*, 6–13.
31. Ciftcioglu, G.C.; Ebedi, S.; Abak, K. Evaluation of the relationship between ornamental plants–based ecosystem services and human wellbeing: A case study from Lefke Region of North Cyprus. *Ecol. Indic.* **2019**, *102*, 278–288. [CrossRef]
32. Farrington, J.; Carney, D.; Ashley, C.; Turton, C. Sustainable livelihoods in practice: Early applications of concepts in rural areas. In *Natural Resource Perspectives*; Overseas Development Institute: London, UK, 1999; Volume 42, pp. 1–15.
33. Ellis, F. Household strategies and rural livelihood diversification. *J. Dev. Stud.* **1998**, *35*, 1–38. [CrossRef]
34. Gautam, Y.; Andersen, P. Rural livelihood diversification and household well-being: Insights from Humla, Nepal. *J. Rural Stud.* **2016**, *44*, 239–249. [CrossRef]
35. Barrett, C.B.; Reardon, T.; Webb, P. Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy* **2001**, *26*, 315–331. [CrossRef]
36. Kimengsi, J.N.; Mukong, A.K.; Balgah, R.A. Livelihood diversification and household well-being: Insights and policy implications for forest-based communities in Cameroon. *Soc. Nat. Resour.* **2020**, *33*, 876–895. [CrossRef]
37. Liu, D.; Chen, H.; Zhang, H.; Shi, Q.Q.; Geng, T.W. The impact of ecosystem services on human well-being and its group differences in the loess hilly and gully region. *Geogr. Res.* **2022**, *41*, 1298–1310.
38. Chen, J.; Wu, K.S.; Yin, S.; Yang, Q. The adaptation of regional human-environment system under the risk of soil erosion: A case study of Yulin city. *J. Nat. Resour.* **2016**, *31*, 1688–1701.
39. Yulin Bureau of Statistics; National Bureau of Statistics Yulin Investigation Team. *Yulin Statistical Yearbook—2021*; China Statistics Press: Beijing, China, 2021.
40. Li, W.D. *Applied Multivariate Statistical Analysis*, 2nd ed.; Peking University Press: Beijing, China, 2015; pp. 335–353.
41. Song, Z.; Shi, X.M. Path analysis of influencing factors of farmers's adaptive behaviors to climate change in the rain-fed agricultural areas. *Prog. Geo.* **2020**, *39*, 461–473. [CrossRef]
42. Zhang, H.; Kang, F. A bootstrap-based approach to multiple mediated effects analysis. *Stat. Decis.* **2016**, *449*, 75–78.
43. Wen, Z.L.; Ye, B.J. Analyses of mediating effects: The development of method and models. *Adv. Psychol. Sci.* **2014**, *22*, 731–745. [CrossRef]
44. Fang, J.; Wen, Z.L.; Zhang, M.Q.; Sun, P.Z. The analyses of multiple mediation effects based on structural equation modeling. *J. Psychol. Sci.* **2014**, *37*, 735–741.
45. Qin, Y.H.; Shi, X.M.; Chen, X.Y. Research on adaptive strategy of geographical indication agricultural products growers to meteorological disasters: A case study of Shaanxi province kiwifruit growers. *J. Catastr.* **2022**, *37*, 211–219.
46. Li, J.; Li, Y.L.; Tai, X.J.; Li, C. On the rural households livelihood in the western poor areas after the slopping land conversion program within the sustainable livelihood analysis framework from the rural households survey in the Zhouzhi county, Shanxi province. *China Rural Surv.* **2009**, *5*, 29–38.
47. Ding, Y.H.; Yao, S.B. A comparative analysis of the impacts of the sloping land conversion program on the well-being of households in the Yellow and Yangtze river basins. *J. Arid Land Resour. Environ.* **2017**, *31*, 45–50.
48. Huang, Z.G.; Li, J. Influence of land acquisition for rural tourism on the well-being of landless farmers based on the empirical analysis of PSM model. *Resour. Sci.* **2021**, *43*, 171–184. [CrossRef]
49. Qiu, J.; Yu, D.Y.; Huang, T. Influential paths of ecosystem services on human well-being in the context of the sustainable development goals. *Sci. Total Environ.* **2022**, *852*, 158443. [CrossRef]
50. Fu, L.R.; Ren, Y.S.; Lu, L.; Chen, H.F. Relationship between ecosystem services and rural residential well-being in the Xin'an river Basin, China. *Ecol. Indic.* **2022**, *140*, 108997. [CrossRef]
51. Wang, C.Y.; Wang, D.P.; Zhao, X.W.; Fang, Q.W.; Liu, Y. The comparison of goodness index of structural equation model. *Mod. Prev. Med.* **2010**, *37*, 7–9.
52. Shan, Y.H.; Wang, L.N. Path analysis of farming household differentiation on the diversification of farmland function supply. *Resour. Sci.* **2020**, *42*, 1405–1415. [CrossRef]
53. Yang, H.; Chen, T.Y.; Zeng, Z.; Mi, F. Does urban green space justly improve public health and well-being? A case study of Tianjin, a megacity in China. *J. Clean Prod.* **2022**, *380*, 134920. [CrossRef]
54. Tang, L.; Luo, X.F. Study on the impact of farmer's livelihood capital on the risk of serious illness in poor areas—Based on the dual perspectives of structure and level. *J. Huazhong Agric. Univ. (Soc. Sci. Ed.)* **2020**, *146*, 49–58, 164.
55. Zhu, H.G.; Zhang, Y.H.; Wan, S.W.; Liu, J.; Wang, X.; Liao, M.S. The impact of ecological rangers' livelihood capital endowments on their livelihood risks—Based on a survey in Qianshan city, Anhui province. *For. Econ.* **2022**, *44*, 71–84.
56. Sun, H.L.; Liu, X.Z. The theoretical logic and realizing path to consolidate and expand the achievements on poverty alleviation: A positive research based on the sustainable livelihood of family out of poorness. *Shandong Soc. Sci.* **2021**, *310*, 116–126.
57. Chen, T.G.; Chen, H.F.; He, Y.F. Livelihood capital and social exclusion: A study on the impact mechanism of the fishing band compensation policy on fishermen's livelihoods in the Yangytze river. *Chin. J. Agric. Resour. Reg. Plan.* 2022; *in press*.
58. Nie, J. Influencing factors and intervention strategies of Ningxia ecological migration social relationship reconstruction. *J. North Minzu Univ. (Philos. Soc. Sci.)* **2020**, *153*, 118–124.
59. Kasim, Y. Impacts of livelihood assets on wellbeing of rural households in Northern Nigeria. *Int. Trans. J. Eng. Manag. Appl. Sci. Tech.* **2019**, *10*, 13.

60. Butt, T.M.; Gao, Q.J.; Hussan, M.Z.Y. An analysis of the effectiveness farmer field school (FFS) approach in sustainable rural livelihood (SRL): The experience of Punjab-Pakistan. *Agric. Sci.* **2015**, *6*, 1164–1175. [CrossRef]
61. Etana, D.; Snelder, D.J.R.M.; Van Wesenbeeck, C.F.A.; Buning, T.D. Dynamics of smallholder farmers' livelihood adaptation decision-making in Central Ethiopia. *Sustainability* **2020**, *12*, 4526. [CrossRef]