Land Transfer, Collective Action and the Implementation of Soil and Water Conservation Measures in the Loess Plateau of China

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Abstract:

Based on the data of rural households in the Loess Plateau of China, this paper uses exploratory factor analysis to measure the degree of participation of farmers in collective action from the information, participation, organization and effect of action. Through Bootstrap mediation effect test, this paper tests the direct impact of land transfer area and period on farmers' implementation of soil and water conservation measures, and the indirect impact of transfer area and period on the implementation of soil and water conservation measures by changing the participation of farmers in collective action. The result shows: transfer area has a direct impact on the using of terraced fields, plastic film and afforestation. The transfer period has a direct impact on the implementation of terraced fields, plastic film, afforestation and water-saving irrigation techniques. While collective action plays a mediating role in the process of transfer area affecting farmers' use of terraced fields, afforestation and water-saving irrigation techniques, its mediating role in the use of plastic film is not significant. While the mediating role of collective action is significant in the transfer period affecting the implementation of terraced field and water-saving irrigation techniques, it is not significant in using plastic film and afforestation.

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Keywords: land transfer; collective action; soil and water conservation; mediation effect; Loess Plateau; China

1. Introduction

Soil and water loss is an epitome of ecological problems in China, especially in Loess Plateau. Due to soil erosion, China annually loses 67 thousands ha of cultivated land, five billion tons of soil and 40 million tons of nitrogen, phosphorus and potassium, resulting in an economic loss of 2.4 billion yuan each year. The practice shows that measures (engineering, biological and water storage measures) of soil and water conservation can serve to prevent soil erosion, increase land productivity, relieve poverty and transform farming and thus benefit both economy and ecology [1], but they have rarely been used by farmers [2-3].

In view of the low implementation rate of soil and water conservation measures, scholars have done many researches. The following factors are taken into consideration: individual characteristics (gender, age, education background, ecological cognition, etc.), household characteristics (income, planting system, concurrent employment, risk and uncertainty), circumstances (promotion system, rainfall and pests, government support), etc [4-6]. Recently, some studies have begun to focus on the impact of land transfer on the implementation of soil and water conservation measures for farmers. However, due to differences in the research area and data, conclusive consensus has not yet been made. Some scholars believe that the transfer of land contractual management right in rural areas is not only the key to optimizing the allocation of rural resources, improving agricultural productivity and facilitating the transformation of traditional farming into a specialized and large-scale modern farming production and management mode, but also an important way to increase the enthusiasm of farmers for soil and water management and encourage farmers to invest manpower, materials and finance on land [7-8]. Others maintain that while large-scale planting resulted from the land transfer creates conditions for centralized management of soil and water erosion, the large-scale reclamation of land gives rise to more serious human-made soil and water erosion [9].

Although some scholars have discussed the impact of the land transfer on the implementation of soil and water conservation measures for farmers, there are still two gaps in the following aspects. First, little literature involves the impact of land transfer on collective action. In fact, the transfer of land contractual management right can change the distribution of land resources and increase the

heterogeneity. At the same time, it can speed up the transfer of rural surplus labor force, reduce the size of villages, cultivate elite farmers, and resolve the "dilemma of collective action", so as to promote the formation of the mutual-aid and cooperation mechanism among farmers. Second, the impact of collective action on implementing soil and water conservation measures is uncommon in literature and its mechanism and influential effect has not been explored in the framework of land transfer. The output of implementing water and soil conservation measures includes both agricultural products and ecological products. Agricultural products are valuable commodities sold in the market, while ecological products are public and cannot realize market value automatically. As a result, measures of soil and water conservation with characteristics of positive externality are often implemented through collective action [5].

The main work and contribution of this paper are as follows. First, based on the data of 849 households in Loess Plateau of China, this paper uses exploratory factor analysis to measure the degree of participation of farmers in collective action from the information, participation, organization and effect of action. Second, through the Bootstrap mediation effect method, this paper analyzes the direct impact of land transfer area and period on the implementation of soil and water conservation measures frequently applied in the terraced field, plastic film, afforestation, and water-saving irrigation techniques, and the indirect impact of land transfer area and period on the implementation of soil and water conservation measures by changing the participation of farmers in collective action.

2. Conceptual Framework

2.1. The Direct Impact of the Land Transfer on the Implementation of Soil and Water Conservation measures

Through the scale economy, land transfer increases the expected yield of land, and promotes the implementation of soil and water conservation measures. Pender and Kerr analyzed the factors affecting the implementation of soil and water conservation measures for farmers in semi-arid areas in India [10]. The result indicates that, because of the irreversibility of investment in soil and water conservation measures, more active land lease and sale means higher probability of recovering the investment through land lease (sale) for the transferor (seller) and thus more active implementation of soil and water conservation measures for farmers. Wu et al. and Zhong et al. analyzed the implementation of water and soil conservation measures in red soil areas in Jiangxi Province of China [11,7]. The results confirm that the expansion of land scale in the transfer of land management right can effectively promote the implementation of soil and water conservation measures like constructing terraced filed and planting grass and trees.

While the transfer area of land positively promotes the implementation of soil and water conservation measures, the short-term action in production for the land transferee caused by the short-term transfer period or the uncertainty of the operating period may lead to predatory operation and thus undermine soil fertility [12]. An empirical analysis by Pender and Kerr found that the two-year transfer period between farmers in India's semi-arid areas limited the continued implementation of soil and water conservation measures [10]. Based on the empirical study in 15 counties and cities of China, Yu et al. found that short-term and informal land transfer among farmers was not conducive to motivating their investment in improving long-term soil fertility [13]. Thus, the impact of land transfer on the implementation of soil and water conservation measures for farmers needs to be further tested. In addition to the transfer area, the period of transfer may also be an important factor affecting the implementation of water and soil conservation measures.

2.2. The Indirect Impact of the Land Transfer on the Implementation of Soil and Water Conservation Measures through Collective Action

The land transfer has a direct impact on farmers' implementation of soil and water conservation measures. Besides, it affects farmers' enthusiasm of participating in collective action by changing the resource endowment and increasing heterogeneity, thus changing farmers' implementation of soil and water conservation measures. First of all, the traditional fragmented land operation often leads

to contradictions and disputes among farmers due to problems such as irrigation in the dry season, drainage in rainy seasons and pesticide spraying. In contrast, the orderly integration and convergence of rural land may improve the productivity, resolve disputes, increase the income of farmers and thus make mutual help and cooperation possible [14]. Second, land transferees and large land farmers are more likely to be the village elites, with competent and elite farmers being usually the initiators or organizers in the collective action, representing the precondition of successful collective action [15]. Third, the land transfer significantly differentiates farmers' field. Non-farm employees, large land farmers and family farm owners coexist, and the heterogeneity among farmers is increasing. "Selective incentives" proposed by Olson (1965) can be used to prevent "free riding" in the collective action [16,17].

Theoretical studies show that the collective action functions to mobilize resources, share costs, coordinate supervision and attain scale economy, and it may also influence the supply of public goods through cooperative mechanism [18]. First, the farmer self-governance organization has a more efficient supply incentive than the government [19]. Participatory supply based on self-selection may fully mobilize private resources and encourage farmers to invest manpower, materials and finance in the framework of collective cooperation, so as to alleviate the current shortage of supply and imbalanced supply and demand of public goods in rural areas [20,21]. Second, in case of uneven distribution of income and wealth, highly paid "elite" farmers in collective action are generally willing to share more costs to facilitate the co-supply of public goods [22,23]. Third, the internal supervision and restraint mechanism based on mutual understanding and trust can significantly reduce the information search cost of external supervision and avoid inefficient supply caused by corruption such as power rent-seeking by external regulators [19]. Finally, the participatory supply mode can not only increase the supply of public goods in rural areas and ease government pressure, but also reverse efficiency loss and uneconomical scale due to difficulty in targeting the demand of rural public goods [24]. In practice, the measures of soil and water conservation with property of quasi-public goods are often implemented as collective action.

In summary, this paper attempts to bring the land transfer, collective action and farmers' implementation of soil and water conservation into an analytical framework to test the mediating role of collective action in the process of land transfer affecting the implementation of soil and water conservation measures. By doing so, this paper aims to provide a new perspective for the management of soil erosion in the Loess Plateau of China. The logic of this paper is shown in Figure 1.

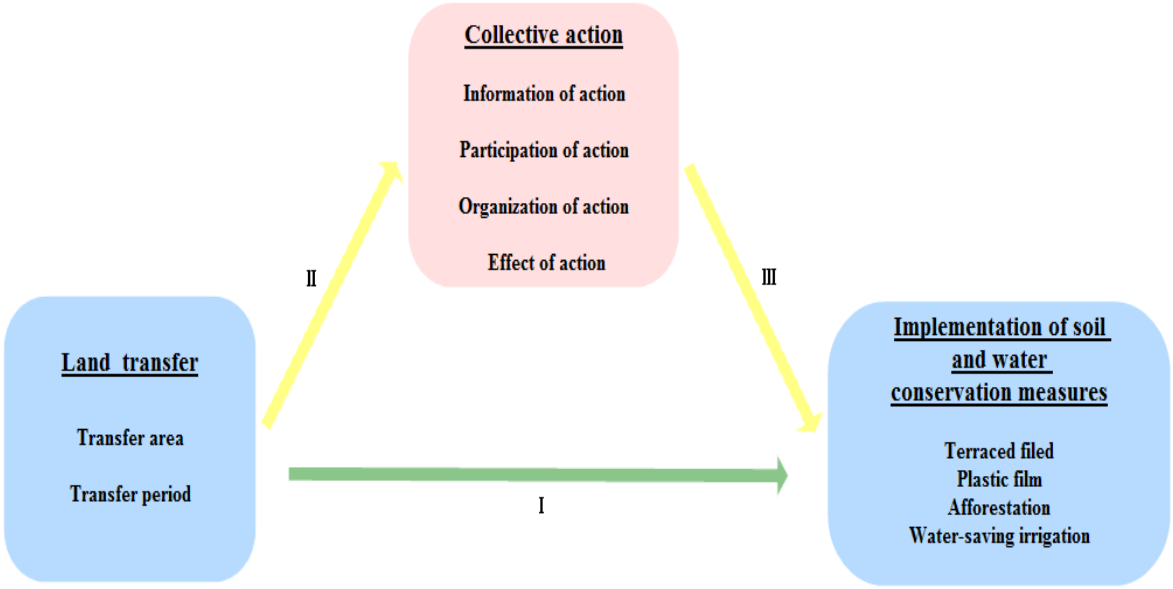

Figure 1. Theory analysis framework.

3. Data and Variables Description

3.1. Data Collection

The Loess Plateau, located in the northeast of central China, is among the four plateaus in China. It is also the largest loess area with most centralized distribution on the earth, including most of Shaanxi Province, Ningxia Autonomous Region, Gansu Province and Shanxi Province and part of Qinghai Province, Inner Mongolia Autonomous Region and Henan Province, covering an area of 64 million ha. However, it suffers 45 million ha of soil erosion. The terrain in this area is inclined from northwest to southeast with low vegetation coverage. Except for stony mountain, most of the loess is covered by thick loess with loose soil and large porosity, and the soil particle is easily dispersed and suspended. In addition, due to the monsoon climate, most of the precipitation in the Loess Plateau is in July, August and September, accounting for 60%-80% of the annual precipitation, and is extremely prone to heavy rain. The Long-term erosion of rainwater and wind gradually shape fragmented landscape of the Loess Plateau, making it one of the regions with the most serious soil erosion and the most vulnerable ecological environment in the world.

The data of this paper mainly comes from the field investigation in Shaanxi, Gansu and Ningxia in October and November 2016. The investigation combined the typical survey, stratified sampling and simple random sampling methods. First, Yulin in Shaanxi, Qingyang in Gansu and Guyuan in Ningxia are similar in the degree of soil and water erosion, economic development and population density, so they were selected through the typical survey method and the influence of economic and social factors on the research conclusion was controlled. Second, combined stratified sampling and random sampling method was used to randomly select 2-3 counties (Mizhi, Yuyang and Suide in Yulin, Xifeng and Huanxian in Qingyang, and Yuanzhou Pengyang and Xiji in Guyuan were selected. Sample county distribution is shown in Figure 2) in each city, 10-15 villages in each county, and 10-15 farmers with good communication skill in each village for interview. The questionnaire covers aspects such as characteristics of householder and family, planting conditions, disasters, social networks, participation in collective action and implementation of soil and water conservation measures. A total of 1,254 questionnaires were collected from 8 counties and 849 of them were valid.

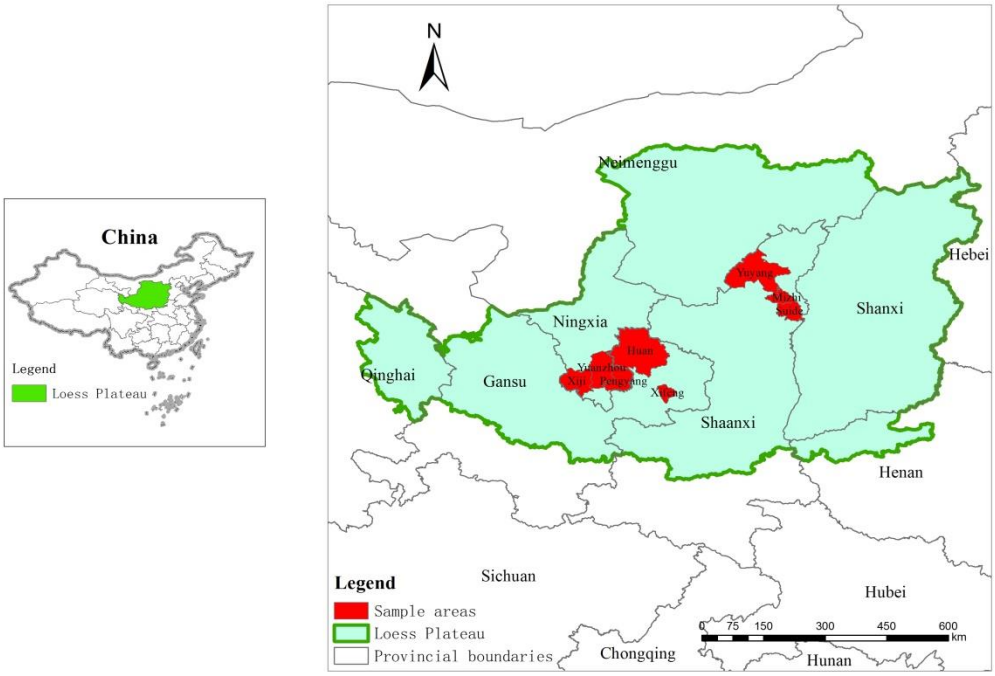

Figure 2. Area distribution of samples.

3.2. Variables Description

3.2.1. Dependent Variables

Soil and water conservation refers to the ecological restoration project that effectively conserves soil and water and improves soil and technical efficiency of agricultural production through engineering, biotechnology and farming techniques of water and soil conservation. The measures in practice include engineering such as terraced filed, platform field, horizontal ditch, fish-scale pit, silt dam, and check dam to change slope, increase the roughness of the ground and control trench, biotechnology such as soil cover, sand barrier construction, afforestation and grass planting to prevent and control soil, as well as other measures in farming such as construction of reservoir and water cellar and the use of water-saving irrigation techniques and plastic film. During the field research, we found that because of the low cost of implementation and maintenance and good effect, the adoption rates of measures like terraced filed, plastic film, afforestation and water-saving irrigation are relatively high. Therefore, in this paper, the implementation of the four measures is set as the dependent variable, and binary choice method frequently used in choice behavior research is applied. 1 means the measure is implemented, while 0 means the measure is not implemented.

As shown in Table 1, in the 849 samples, farmers using plastic film is the most, accounting for 60.9%; the number of farmers using terraced field and afforestation accounts for 50.41% and 36.51%; those using water-saving irrigation techniques are relatively few, accounting for only 26.86%. Our sample data show higher construction proportions of terraced filed in Xifeng, Huan County, Yuanzhou, Pengyang and Xiji, while the proportions in Mizhi, Yuyang, and Suide are lower. The proportions of plastic film are relatively high in all regions. The proportions of afforestation in Mizhi, Yuyang and Suide are near or over 50%, while the proportions in Yuanzhou, Pengyang and Xiji are even less than 30%. The adoption proportions of water-saving irrigation techniques are less than 25% in most counties, except Xifeng and Huan County.

Table 1. Implementation proportions of soil and water conservation measures.

County	Terraced filed	Plastic film	Afforestation	Water-saving irrigation
Mizhi	17.84%	56.76%	56.22%	6.49%
Yuyang	11.63%	32.56%	48.84%	2.33%
Suide	13.04%	42.03%	63.77%	4.35%
Xifeng	61.72%	42.97%	30.47%	61.72%
Huan county	60.14%	83.22%	33.57%	60.14%
Yuanzhou	76.99%	69.03%	10.62%	12.39%
Pengyang	77.63%	70.39%	25.00%	21.71%
Xiji	68.75%	62.50%	25.00%	0.00%
Total	50.41%	60.90%	36.51%	26.86%

3.2.2. Independent Variables

The area and period of land transfer are selected as the core variables. If the land is transferred in, the area and period value is set as positive, while the land is transferred out, the area and period value is set as negative. As shown in Table 2, the transferred-in land area is 0.7853 ha and the period is 6 years on average. The transferred-out land area is 0.5176 ha and the period is 5 years on average.

Table 2. Variable description and descriptive statistics.

Variable	Transferred-in household			Transferred-out household		
	Mean	Std. dev.	Number of obs	Mean	Std. dev.	Number of obs
Transfer area(*ha*)	0.7853	0.7370	145	-0.5176	0.4799	117
Transfer period(*year*)	6.0552	3.9154	145	-4.8547	4.3831	117

3.2.3. Mediation Variables

The mediation variable in this paper is the degree of participation of farmers in collective action. Through interviewing farmers about their understanding of the village collective action system, rules, funding, content and meaning, the proportion of participating in meetings, the role in public affairs, training participation rate, the proportion of money investment and labor investment, as well as their value judgments on the effect of collective action on improving income, environment, relations and infrastructure, we obtain relevant variables of participation in collective action (Table 3). Collective action can function to mobilize resources, share cost, supervise organization and achieve scale economy [18]. First, the degree of understanding of the collective action system, rules, funding, content and meaning can represent the degree of voluntary acceptance of collective-action-related information, and the effect of being mobilized. Second, the participation rate in technical training and the contribution of village public affairs in funding and labor can represent the participation of farmers in the village cost-sharing activities. Third, the role of farmers in public affairs and the proportion of participating in collective meeting can effectively reflect the role of farmers in public supervision. Finally, the value judgment on the effect of collective action on increasing income, and improving environment, relations and infrastructure can indicate the realization of the scale economy function.

Table 3. Descriptive statistics of variables of collective action participation.

Variable	Description	Mean	Std. dev.
Understanding system	Degree of understanding collective action system: 1=know nothing 2=know little 3=know something 4=know well 5=know everything	2.7633	1.1793
Understanding rules	Degree of understanding collective action rules: 1=know nothing 2=know little 3=know something 4=know well 5=know everything	3.0177	1.1770
Understanding funding	Degree of understanding collective action funding: 1=know nothing 2=know little 3=know something 4=know well 5=know everything	2.4912	1.1887
Understanding content	Degree of understanding collective action content: 1=know nothing 2=know little 3=know something 4=know well 5=know everything	3.2768	1.1064
Understanding meaning	Degree of understanding collective action meaning: 1=know nothing 2=know little 3=know something 4=know well 5=know everything	3.1307	1.1977
Meeting-participating proportion	Participation times each year on average/total times of meeting each year on average	0.4488	0.2849
Role in public affairs	Role of family members in collective action: 1=onlooker 2=participator 3=manager 4=leader 5=initiator	2.5819	0.9063
Training participation	Participation times of attending training each year on average/total training times each year on average	0.7132	0.3761
Proportion of funding investment	Funding investment in 2015/required funding investment in 2015	0.7154	0.3758
Proportion of labor investment	Working days for public affairs in 2015/required working days for public affairs in 2015	0.7264	0.3690
Income increasing	Effect of collective action on increasing farmers' income: 1=really bad 2=bad 3=fine 4=good 5=very good	3.0801	1.1246

Environment improving	Effect of collective action on improving environment: 1=really bad 2=bad 3=fine 4=good 5=very good	3.2862	1.0758
Relations improving	Effect of collective action on improving farmers' relations: 1=really bad 2=bad 3=fine 4=good 5=very good	3.4111	1.0126
Infrastructure improving	Effect of collective action on improving infrastructure: 1=really bad 2=bad 3=fine 4=good 5=very good	3.5230	1.0617

In order to initially judge the relation between the area and period of transfer land and the degree of participation in collective action, farmers are respectively classified into different groups according to the transfer area and period: less than 0, equal to 0 and more than 0. Based on the groups, the Kernel density curve of participation in collective action is drawn. As shown in Figure 3a, as the land transfer area turns from negative to positive, the Kernel density curve of participation degree of collective action gradually moves to the right, and the participation degree of collective action increases continuously, indicating a positive correlation between the participation degree of collective action and the land transfer area. As shown in Figure 3b, as the land transfer period of farmers' shifts from negative to positive, the Kernel density curve of participation degree of collective action gradually moves to the right, and the participation degree of collective action increases, indicating a positive correlation between the participation degree of collective action and the land transfer period.

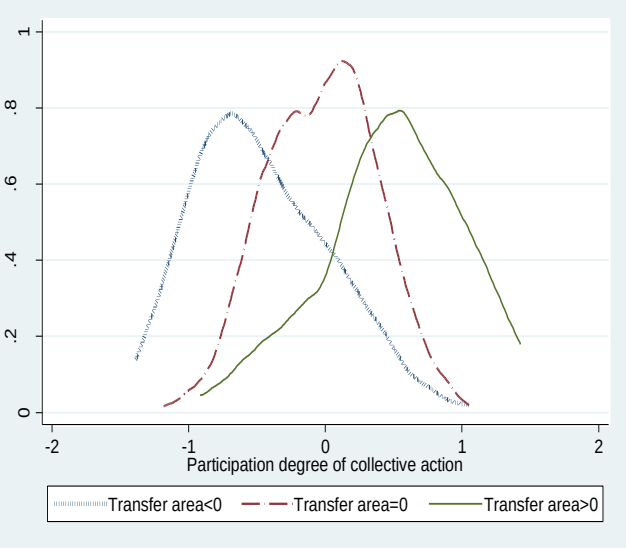

Figure 3a. Kernel density curve of participation degree of farmers with different land transfer area in collective action.

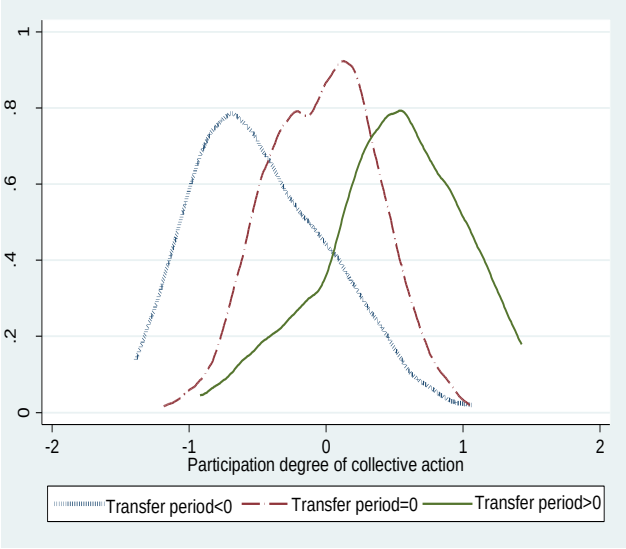

Figure 3b. Kernel density curve of participation degree of farmers with different land transfer period in collective action.

In order to further judge the correlation between land transfer, the participation degree of collective action and the implementation of soil and water conservation measures, the sample farmers are classified into different groups based on the implementation of measures such as terraced field, plastic film, afforestation and water-saving irrigation techniques. As shown in Table 4, the significant differences identified by T test, exist in transfer land area and period and participation degree of collective action between farmers implementing measures and not implementing measures. Besides, the means of transfer land area and period and participation degree of collective action for farmers implementing measures are higher than the means of those without implementing measures. All these indicate positive correlations between the land transfer, participation degree of collective action and the implementation of soil and water conservation measures.

Table 4. Grouping Descriptive statistics of land transfer and participation of collective action.

Soil and water conservation measures	Implementation or not	Mean			Numble of obs
		Transfer area	Transfer period	Participation degree of collective action	
Terraced filed	Yes	0.1999	1.4813	0.1959	428
	No	-0.0766	-0.7696	-0.1991	421
	Difference	0.2765***	2.2509***	0.3950***	
	t	8.1645	8.9692	12.2674	
Plastic film	Yes	0.1392	0.9168	0.0573	517
	No	-0.0562	-0.4940	-0.0892	332
	Difference	0.1954***	1.4108***	0.1464***	
	t	5.5188	5.3306	4.1317	
Afforestation	Yes	0.1292	1.0581	0.0326	310
	No	0.0246	-0.0334	-0.0187	539
	Difference	0.1045***	1.0915***	0.0513*	
	t	2.8762	4.0407	1.4166	
Water-saving irrigation	Yes	0.3258	2.4825	0.3763	228
	No	-0.0338	-0.4122	-0.1382	621
	Difference	-0.3596***	-2.8947***	-0.5145***	
	t	9.5377	10.3734	14.6045	

Note: ***, ** and* mean significance levels in 1%, 5% and 10%, respectively.

3.2.4. Control Variables

In order to avoid other interference on the participation degree of collective action and the implementation of soil and water conservation measures, age, education, per capita asset, farming income, subsidy, family member's cadre position, disaster suffering times, social network and location variables are set as control variables (Appendix Table A1).

4. Research Methods

4.1. The Measure Method of Participation Degree of Collective Action

In order to avoid the multicollinearity between variables, this paper uses SPSS 21.0 software to conduct exploratory factor analysis on the participation degree variables of collective action. The common factors are extracted as the following steps to calculate the index of the farmers' participation degree.

First of all, the KMO value of the participation variables of farmers' collective action is 0.769, and the approximate Chi-Square of Bartlett sphericity test is 11934.809 (sig=0.000), indicating that the participation degree variables of collective action are suitable for factor analysis.

Second, in order to make the result of factor analysis secure more reasonable economic effect, this paper conducts factor rotation through the maximum variance method, and extracts four common factors with characteristic roots over one through extracting principal components. The cumulative variance contribution rate is 79.484%. Among them, the variance contribution rate of common factor 1 is 23.768%, including variables of understanding the system, rule, funding, content and meaning. This type of variables is related to farmers' understanding degree of

collective action information, so they are named as action information. The variance contribution rate of common factor 2 is 21.312%, including variables such as training participation rate, the proportion of funding investment and the proportion of labor investment. These variables are related to farmers' participation rate of collective action, so they are named as action participation. The variance contribution rate of common factor 3 is 20.665%, including variables of increasing income, improving environment, relations and infrastructure. These variables reflect the satisfaction of farmers in the effect of collective action, so they are named as action effect. The variance contribution rate of common factor 4 is 13.738%, including variables of the proportion of participating in meetings and the role in public affairs. The two variables can reflect farmers' status and role in public affairs, so they are named as action organization.

Finally, we take the variance contribution rate of each common factor as the weight, and sum the factor (Factor1~Factor4) scores of participation degree of collective action to calculate the index of participation degree of collective action. The specific calculation formula is:

Index of participation degree=（23.768×Factor1+21.312×Factor2+20.665×Factor3+13.738×Factor4）/79.484 （1）

4.2. The Test Method of Mediation Effect

In this paper, Bootstrap-based mediation effect test method proposed by Preacher and Hayes (2004) is selected to test the mediation effect of collective action in the process of land transfer affecting the implementation of soil and water conservation measures. Compared with the Stepwise Regression frequently used to analyze mediation effect (Baron and Kenny, 1986), Bootstrap has some advantages. First, Bootstrap can test the mediation effect of the dependent variable as the dichotomous variable, while the Stepwise Regression can only analyze the continuous dependent variable. Second, Bootstrap does not take the significance of direct effect (*c*) of independent variables on dependent variables as the precondition of existing mediation effect, but directly tests the significance of mediation effect (ab). It can effectively avoid the "shadowing effect" (two parallel mediation paths with similar sizes and opposite directions offset each other's effect on dependent factors) on the test result.

Based on this, the specific conceptual model is designed as follows:

$$Y_i = cX + \mu_1 \quad (2)$$

$$M = aX + \mu_2 \quad (3)$$

$$Y_i = c'X + bM + \mu_3 \quad (4)$$

In the above formula, X refers to land transfer, including transfer area and period; Y_i refers to the implementation of the i th measure of soil and water conservation; M refers to the degree of participating in collective action; a, b, c and c' are the solve-for parameter; μ_1, μ_2 and μ_3 are the stochastic error terms. Equation (2) represents Path Ⅰ in Figure 1, meaning that the land transfer directly affects the implementation of soil and water conservation measures; equation (3) and (4) represent Path Ⅱ and Ⅲ, meaning that the land transfer indirectly affect the implementation of soil and water conservation measures through collective action.

5. Results and Discussion

In this paper, the Process procedure of the SPSS software is used to test the correlation between the variables in the model. Bootstrap's test of direct effect (indirect effect) is judged by the significance level of the Z test or whether the 95% confidence interval containing the "0" value. If the confidence interval contains a "0" value, the lower limit value is set as negative and the upper limit value is set as positive, and the direct effect (indirect effect) is not significant. If both the upper and lower limit values are positive, the direct effect (indirect effect) is significantly positive. If the upper and lower limit values are negative, the direct effect (indirect effect) is significantly negative.

5.1. Direct Effect Test of Land Transfer on the Implementation of Soil and Water Conservation Measures (Path Ⅰ)

As shown in Table 5, the direct effects of the transfer land area and period on the implementation of measures like terraced filed, plastic film and afforestation respectively pass the 10% significance test, and the directions are positive. That is, the larger the transfer-in land area and the longer the transfer-in period, the greater the probability of using the terraced field, plastic film and afforestation. Conversely, larger transfer-out land area and longer transfer-out period mean less probability of applying the terraced field, plastic film and afforestation. The effect of the land transfer period on the adoption of water-saving irrigation techniques passes the 10% significance test, and the direction is positive. In contrast, the effect of the transfer area on the adoption of water-saving irrigation techniques is not significant. This may be due to the high unit cost of water-saving irrigation equipment, and farmers usually equip the land with high fertility, so the size of transfer land has no direct impact on farmers' intent of equipping water-saving irrigation.

Table 5. Results of direct effect test

Path Ⅰ	Effect	Z	LLCI	ULCI
Transfer area→ Terraced filed	1.2251***	3.6587	0.5688	1.8814
Transfer period→ Terraced filed	0.1778***	3.7921	0.0859	0.2697
Transfer area→ Plastic film	1.1304***	4.5957	0.6483	1.6125
Transfer period→ Plastic film	0.1070***	3.7835	0.0516	0.1624
Transfer area→ Afforestation	0.9937***	3.8546	0.4884	1.4989
Transfer period→ Afforestation	0.1861***	5.5596	0.1205	0.2517
Transfer area→ Water-saving irrigation	0.3108	0.8172	-0.4346	1.0561
Transfer period→ Water-saving irrigation	0.0883*	1.7688	-0.0095	0.1861

Note: Deviation-corrected non-parametric percentile Bootstrap method is used here with a repetition number of 5,000. ***, ** and * mean significance levels in 1%, 5% and 10%, respectively. The regression results of control variables are showed in appendix table A2-A5.

5.2. Indirect Effect Test of Land Transfer on the Implementation of Soil and Water Conservation Measures through Collective Action (Paths II and III)

Table 6 shows the indirect effect test result. First, the transfer land area and period indirectly affect the adoption of terraced field and water-saving irrigation techniques through collective action. That is, the collective action plays a positive mediation role in the land transfer affecting the adoption of terraced field and water-saving irrigation techniques. The larger transfer-in land area and the longer transfer-in period mean the higher enthusiasm of participating in collective action, and the higher probability of adopting terraced field and water-saving irrigation techniques through collective action. Conversely, the larger transfer-out land area and the longer transfer-out period lead to the less participation of collective action and less probability of using terraced field and water-saving irrigation equipment through collective action. The result shows that due to the difficulty of terracing by single farmer, the high cost of searching and recognizing the providers of water-saving irrigation techniques and the poor skill of negotiation and bargain with providers, farmers are more likely to collectively use the terraced filed and water-saving irrigation techniques through mutual aid and cooperation.

Second, the effect of the transfer land area and period on the participation degree of collective action passes the 1% significance test, but the effect of collective action on using plastic film is not significant. Thus, the indirect effect of the land transfer on the use of plastic film through collective action does not pass the significance test, and it means collective action is not the mediation in the transfer land area and period affecting the use of plastic film. This may due to the relatively small difficulty of using the plastic film, and farmers may use the plastic film by themselves or with machines instead of cooperation.

Finally, the indirect effect of the land transfer area on afforestation through collective action is significant, but the indirect effect of the land transfer period on afforestation through collective action is not significant. It means the positive mediation role of collective action in the transfer land area affecting afforestation, and the non-significant mediation effect in the transfer period affecting afforestation. The result shows that larger transfer-in land area and higher enthusiasm of participating in collective action lead to greater probability of afforestation through collective action, and larger transfer-out land area and lower enthusiasm of participating in collective action lead to smaller probability of afforestation through collective action. Meanwhile, the effect of the land transfer period on afforestation does not change with the participation degree of collective action. This may be caused by the function of collective action in sharing cost and resources. The larger the transfer-in land area means the larger land for tree planting. In order to eliminate the adverse effect of rising cost of planting, farmers are usually willing to collectively buy saplings and working tools through collective action, so as to reduce the negotiation and transportation cost in the process of procurement. However, the length of the land transfer period has no direct impact on the cost of afforestation, and it does not change farmers' willingness to plant trees through collective or independent action.

Table 6. Results of indirect effect test

Path Ⅱ	Coeff.(Std. dev.)	PathⅢ	Coeff.(Std. dev.)	Indirect effect	Z	BootLLCI	BootULCI
Transfer area→	0.3582***	Collective action →	1.5568***	0.5576***	5.3404	0.3213	0.8580
Collective action	(-0.0295)	Terraced filed	(-0.2609)				
Transfer period→	0.0521***	Collective action →	1.5204***	0.0792***	5.3443	0.0476	0.1116

Collective action	(-0.0038)	Terraced filed	(-0.2609)				
Transfer area→	0.3582***	Collective action	0.0848	0.0304	0.4162	-0.1138	0.1991
Collective action	(-0.0295)	→Plastic film	(-0.2029)				
Transfer period→	0.0521***	Collective action	0.1779	0.0093	0.8864	-0.0117	0.0308
Collective action	(-0.0038)	→Plastic film	(-0.1997)				
Transfer area→	0.3582***	Collective action →	0.5672**	0.2031**	2.2976	0.0124	0.4100
Collective action	(-0.0295)	Afforestation	(-0.2416)				
Transfer period→	0.0521***	Collective action →	0.4015	0.0209	1.6181	-0.0083	0.0479
Collective action	(-0.0038)	Afforestation	(-0.2457)				
Transfer area→	0.3582***	Collective action→	3.2384***	1.1599***	6.7028	0.7099	1.6945
Collective action	(-0.0295)	Water-saving irrigation	(-0.4014)				
Transfer period→	0.0521***	Collective action→	3.0619***	0.1594***	6.5551	0.1067	0.2133
Collective action	(-0.0038)	Water-saving irrigation	(-0.4081)				

Note: Deviation-corrected non-parametric percentile Bootstrap method is used here with a repetition number of 5,000. ***, ** and * mean significance levels in 1%, 5% and 10%, respectively. The regression results of control variables are showed in appendix table A2-A5.

6. Conclusion and Policy Implication

The promotion and implementation of win-win measures of soil and water conservation in the Loess Plateau of China are of great significance for improving farming productivity, regional ecological environment and sustainable development of modern farming. Based on the data of 849 rural households in Shaanxi, Gansu and Ningxia of China, this paper tests the correlation between the land transfer, collective action and the implementation of soil and water conservation measures through Bootstrap mediation test method. The main conclusions are as follows.

The land transfer area has a significantly direct impact on the use of terraced filed, plastic film and afforestation, and has no direct impact on the adoption of water-saving irrigation techniques. Larger transfer-in land area means larger probability of using terraced filed, plastic film and afforestation, and larger transfer-out land area means smaller probability of implementing above measures. The land transfer period has a significantly direct impact on the adoption of terraced field, plastic film, afforestation and water-saving irrigation techniques. Longer transfer-in period means greater probability of implementing the four measures above, and longer transfer-out period means smaller probability of the implementation.

The collective action plays a positive mediation role in the transfer land area and period affecting the adoption of terraced filed and water-saving irrigation techniques. It means larger transfer-in land area and longer transfer-in period lead to greater probability of collectively using terraced field and water-saving irrigation techniques. Conversely, larger transfer-out land area and longer transfer-out period lead to smaller probability of cooperation. The mediation effect of the collective action is not significant in the transfer land area and period affecting the use of the plastic film, but the mediation effect of the collective action is significant in the transfer land area affecting afforestation.

The reform of rural land property right in China should be deepened to speed up the certification of the land right and improve the stability and predictability of property rights in rural areas, so as to eliminate farmers' concern of land transfer. The township-level "land transfer service

platform" should be established, allowing farmers to list their land for sale, and reducing the information search cost and transaction cost in the land transfer market.

The authority should establish a collaboration mechanism for public affairs between local governments and grass-roots village organizations, and assist grass-roots organizations to formulate a scientific and reasonable fund-and-labor-raising system and selective incentive mechanism to increase the participation rate of farmers.

The dangers of soil and water loss, and the function and significance of soil and water conservation should be emphasized and propagated to the public. Based on the different attributes of various water and soil conservation measures, differentiated incentive mechanisms of government subsidies shall be established to enhance the enthusiasm of farmers in participating in soil and water loss treatment.

Appendix A. Description and estimation results of control variables

Table A1. Descriptive statistics of control variables.

Variable	Description	Mean	Std. dev.
Age	Householder's age (year)	52.6855	10.0009
Education	Householders' years of education (year)	5.7503	3.5903
Per capita asset	A total value of family asset (houses + vehicles + farming machinery)/the number of family members (thousand yuan/person)	23.3261	21.6123
Farming income	A total of farming income in 2015 (thousand yuan)	16.1399	22.4248
Subsidy	Agricultural and ecological subsidies received from government in 2015 (thousand yuan)	1.3707	2.6209
Village cadre	Is there a village cadre in family members? (1=Yes, 0=No)	0.1048	0.3065
Disasters	Disaster suffering times in the recent past three years (time)	1.9364	1.8779
Social network	Number of relatives and friends with frequent contacts (person)	51.6561	60.3535
Shaanxi	Whether in Shaanxi? (Yes=1, No=0)	0.3498	0.4772
Gansu	Whether in Gansu? (Yes=1, No=0)	0.3192	0.4664

Table A2. Results of terrace filed.

Variable	Indirect Effect (Collective Action)				Indirect Effect (Terrace filed)				Total Effect (Terrace filed)			
	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI
Constant	-0.2134***	0.0822	-0.3748	-0.0520	1.7763***	0.5990	0.6023	2.9502	1.2628**	0.5798	0.1264	2.3991
Collective action					1.5568***	0.2609	1.0455	2.0681				
Transfer area	0.3582***	0.0295	0.3002	0.4161	1.2251***	0.3349	0.5688	1.8814	2.0738***	0.3339	1.4195	2.7282
Age	0.0002	0.0014	-0.0025	0.0028	-0.0091	0.0097	-0.0281	0.0098	-0.0073	0.0094	-0.0258	0.0111
Education	0.0214***	0.0037	0.0141	0.0288	-0.0248	0.0276	-0.0790	0.0293	0.0056	0.0262	-0.0457	0.0570
Per capita asset	-0.0031***	0.0006	-0.0043	-0.0019	0.0064	0.0047	-0.0028	0.0156	0.0021	0.0043	-0.0064	0.0106
income	0.0064***	0.0007	0.0051	0.0078	0.0251***	0.0065	0.0124	0.0378	0.0351***	0.0066	0.0222	0.0480
Subsidy	0.0156***	0.0051	0.0057	0.0256	-0.2592***	0.0428	-0.3431	-0.1754	-0.2210***	0.0397	-0.2989	-0.1432
Village cadre	0.1478***	0.0454	0.0587	0.2369	-0.2916	0.3470	-0.9718	0.3886	-0.0996	0.3328	-0.7520	0.5527
Disasters	0.0187***	0.0071	0.0047	0.0327	0.0891	0.0547	-0.0182	0.1964	0.1312**	0.0578	0.0179	0.2445
Social network	-0.0002	0.0002	-0.0007	0.0002	-0.0013	0.0016	-0.0044	0.0019	-0.0014	0.0016	-0.0045	0.0016
Shaanxi	-0.0624*	0.0339	-0.1290	0.0042	-3.2720***	0.2651	-3.7915	-2.7524	-3.2038***	0.2579	-3.7092	-2.6984
Gansu	-0.0322	0.0329	-0.0968	0.0324	-0.8903***	0.2301	-1.3412	-0.4393	-0.9079***	0.2198	-1.3387	-0.4771
Constant	-0.2190***	0.0807	-0.3774	-0.0606	1.7761***	0.5962	0.6076	2.9446	1.2230**	0.5736	0.0989	2.3472
Collective action					1.5204***	0.2609	1.0091	2.0317				
Transfer period	0.0521***	0.0038	0.0446	0.0596	0.1778***	0.0469	0.0859	0.2697	0.2822***	0.0440	0.1960	0.3684
Age	0.0002	0.0013	-0.0024	0.0028	-0.0086	0.0097	-0.0275	0.0104	-0.0060	0.0094	-0.0244	0.0124
Education	0.0208***	0.0037	0.0136	0.0280	-0.0271	0.0277	-0.0814	0.0273	0.0028	0.0263	-0.0487	0.0543
Per capita asset	-0.0030***	0.0006	-0.0042	-0.0019	0.0066	0.0047	-0.0026	0.0158	0.0024	0.0044	-0.0061	0.0110
income	0.0066***	0.0007	0.0053	0.0079	0.0249***	0.0065	0.0121	0.0376	0.0346***	0.0065	0.0218	0.0474
Subsidy	0.0152***	0.0050	0.0054	0.0250	-0.2649***	0.0432	-0.3496	-0.1802	-0.2307***	0.0403	-0.3098	-0.1517
Village cadre	0.1085**	0.0449	0.0205	0.1966	-0.3988	0.3506	-1.0859	0.2883	-0.2455	0.3358	-0.9037	0.4127
Disasters	0.0156**	0.0070	0.0020	0.0293	0.0674	0.0532	-0.0368	0.1717	0.0938*	0.0559	-0.0157	0.2034
Social network	-0.0002	0.0002	-0.0006	0.0003	-0.0013	0.0016	-0.0045	0.0018	-0.0013	0.0015	-0.0043	0.0017
Shaanxi	-0.0399	0.0333	-0.1052	0.0254	-3.2282***	0.2630	-3.7437	-2.7126	-3.1670***	0.2578	-3.6722	-2.6617
Gansu	-0.0215	0.0323	-0.0850	0.0420	-0.8354***	0.2294	-1.2850	-0.3857	-0.8170***	0.2189	-1.2460	-0.3879

Note: Deviation-corrected non-parametric percentile Bootstrap method is used here with a repetition number of 5,000. ***, ** and * mean significance levels in 1%, 5% and 10%, respectively.

Table A3. Results of plastic film.

Variable	Indirect Effect (Collective Action)				Indirect Effect (Plastic film)				Total Effect (Plastic film)			
	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI
Constant	-0.2134***	0.0822	-0.3748	-0.0520	1.8708***	0.4784	0.9331	2.8085	1.8532***	0.4762	0.9198	2.7866
Collective action					0.0848	0.2029	-0.3130	0.4825				
Transfer area	0.3582***	0.0295	0.3002	0.4161	1.1304***	0.2460	0.6483	1.6125	1.1729***	0.2250	0.7318	1.6139
Age	0.0002	0.0014	-0.0025	0.0028	-0.0181**	0.0077	-0.0332	-0.0029	-0.0181**	0.0077	-0.0333	-0.0030
Education	0.0214***	0.0037	0.0141	0.0288	-0.0164	0.0219	-0.0593	0.0265	-0.0146	0.0215	-0.0567	0.0274
Per capita asset	-0.0031***	0.0006	-0.0043	-0.0019	-0.0054	0.0034	-0.0122	0.0013	-0.0057*	0.0034	-0.0123	0.0009
income	0.0065***	0.0007	0.0051	0.0078	-0.0087*	0.0046	-0.0177	0.0003	-0.0082*	0.0044	-0.0168	0.0005
Subsidy	0.0156***	0.0051	0.0057	0.0256	-0.0005	0.0293	-0.0579	0.0570	0.0007	0.0292	-0.0565	0.0579
Village cadre	0.1478***	0.0454	0.0587	0.2369	-0.0681	0.2639	-0.5854	0.4493	-0.0578	0.2628	-0.5729	0.4573
Disasters	0.0187***	0.0071	0.0047	0.0327	0.0537	0.0438	-0.0323	0.1396	0.0559	0.0437	-0.0297	0.1416
Social network	-0.0002	0.0002	-0.0007	0.0002	0.0010	0.0013	-0.0016	0.0035	0.0010	0.0013	-0.0016	0.0035
Shaanxi	-0.0624*	0.0339	-0.1290	0.0042	-0.6960***	0.1931	-1.0743	-0.3176	-0.6997***	0.1927	-1.0774	-0.3220
Gansu	-0.0322	0.0329	-0.0968	0.0324	-0.1214	0.1909	-0.4954	0.2527	-0.1232	0.1908	-0.4972	0.2507
Constant	-0.2190***	0.0807	-0.3774	-0.0606	1.8031***	0.4759	0.8704	2.7358	1.7589***	0.4725	0.8328	2.6851
Collective action					0.1779	0.1997	-0.2136	0.5693				
Transfer period	0.0521***	0.0038	0.0446	0.0596	0.1070***	0.0283	0.0516	0.1624	0.1168***	0.0261	0.0656	0.1680
Age	0.0002	0.0013	-0.0024	0.0028	-0.0174**	0.0077	-0.0325	-0.0023	-0.0174**	0.0077	-0.0325	-0.0023
Education	0.0208***	0.0037	0.0136	0.0280	-0.0178	0.0218	-0.0605	0.0248	-0.0140	0.0213	-0.0558	0.0277
Per capita asset	-0.0030***	0.0006	-0.0042	-0.0019	-0.0051	0.0034	-0.0118	0.0017	-0.0056*	0.0034	-0.0122	0.0010
income	0.0066***	0.0007	0.0053	0.0079	-0.0062	0.0044	-0.0148	0.0023	-0.0050	0.0041	-0.0130	0.0031
Subsidy	0.0152***	0.0050	0.0054	0.0250	-0.0015	0.0291	-0.0586	0.0556	0.0010	0.0290	-0.0559	0.0578
Village cadre	0.1085**	0.0449	0.0205	0.1966	-0.0884	0.2634	-0.6048	0.4279	-0.0681	0.2625	-0.5826	0.4463
Disasters	0.0156**	0.0070	0.0020	0.0293	0.0411	0.0427	-0.0426	0.1248	0.0450	0.0428	-0.0389	0.1288
Social network	-0.0002	0.0002	-0.0006	0.0003	0.0010	0.0013	-0.0015	0.0035	0.0010	0.0013	-0.0015	0.0035
Shaanxi	-0.0399	0.0333	-0.1052	0.0254	-0.6327***	0.1912	-1.0075	-0.2579	-0.6375***	0.1909	-1.0116	-0.2634
Gansu	-0.0215	0.0323	-0.0850	0.0420	-0.0992	0.1895	-0.4706	0.2722	-0.1012	0.1893	-0.4723	0.2698

Note: Deviation-corrected non-parametric percentile Bootstrap method is used here with a repetition number of 5,000. ***, ** and * mean significance levels in 1%, 5% and 10%, respectively.

Table A4. Results of afforestation.

Variable	Indirect Effect (Collective Action)				Indirect Effect (Afforestation)				Total Effect (Afforestation)			
	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI
Constant	-0.2134***	0.0822	-0.3748	-0.0520	-1.1066**	0.5616	-2.2074	-0.0059	-1.1995**	0.5577	-2.2926	-0.1064
Collective action					0.5672**	0.2416	0.0937	1.0406				
Transfer area	0.3582***	0.0295	0.3002	0.4161	0.9937***	0.2578	0.4884	1.4989	1.1772***	0.2484	0.6904	1.6640
Age	0.0002	0.0014	-0.0025	0.0028	-0.0150*	0.0090	-0.0326	0.0026	-0.0153*	0.0089	-0.0328	0.0022
Education	0.0214***	0.0037	0.0141	0.0288	0.0012	0.0257	-0.0491	0.0515	0.0133	0.0251	-0.0359	0.0625
Per capita asset	-0.0031***	0.0006	-0.0043	-0.0019	-0.0059	0.0041	-0.0139	0.0021	-0.0078*	0.0040	-0.0156	0.0000
income	0.0064***	0.0007	0.0051	0.0078	-0.0386***	0.0062	-0.0507	-0.0265	-0.0346***	0.0059	-0.0462	-0.0231
Subsidy	0.0156***	0.0051	0.0057	0.0256	0.4678***	0.0497	0.3703	0.5652	0.4711***	0.0496	0.3738	0.5684
Village cadre	0.1478***	0.0454	0.0587	0.2369	0.2579	0.3068	-0.3435	0.8593	0.3299	0.3050	-0.2680	0.9278
Disasters	0.0187***	0.0071	0.0047	0.0327	-0.0127	0.0528	-0.1163	0.0908	0.0091	0.0497	-0.0883	0.1065
Social network	-0.0002	0.0002	-0.0007	0.0002	0.0001	0.0015	-0.0029	0.0030	0.0000	0.0015	-0.0030	0.0030
Shaanxi	-0.0624*	0.0339	-0.1290	0.0042	2.4584***	0.2567	1.9552	2.9616	2.4052***	0.2542	1.9069	2.9035
Gansu	-0.0322	0.0329	-0.0968	0.0324	1.0609***	0.2505	0.5699	1.5519	1.0295***	0.2497	0.5401	1.5189
Constant	-0.2190***	0.0807	-0.3774	-0.0606	-1.1671**	0.5668	-2.2781	-0.0562	-1.2396**	0.5635	-2.3441	-0.1351
Collective action					0.4015	0.2457	-0.0801	0.8832				
Transfer period	0.0521***	0.0038	0.0446	0.0596	0.1861***	0.0335	0.1205	0.2517	0.2015***	0.0320	0.1388	0.2643
Age	0.0002	0.0013	-0.0024	0.0028	-0.0133	0.0091	-0.0312	0.0045	-0.0134	0.0091	-0.0312	0.0043
Education	0.0208***	0.0037	0.0136	0.0280	-0.0012	0.0260	-0.0522	0.0498	0.0072	0.0255	-0.0428	0.0572
Per capita asset	-0.0030***	0.0006	-0.0042	-0.0019	-0.0063	0.0041	-0.0144	0.0018	-0.0076*	0.0041	-0.0156	0.0004
income	0.0066***	0.0007	0.0053	0.0079	-0.0398***	0.0062	-0.0519	-0.0277	-0.0365***	0.0058	-0.0479	-0.0252
Subsidy	0.0152***	0.0050	0.0054	0.0250	0.4712***	0.0503	0.3726	0.5699	0.4729***	0.0503	0.3744	0.5715
Village cadre	0.1085**	0.0449	0.0205	0.1966	0.1192	0.3161	-0.5003	0.7388	0.1628	0.3152	-0.4550	0.7805
Disasters	0.0156**	0.0070	0.0020	0.0293	-0.0207	0.0540	-0.1265	0.0850	-0.0069	0.0519	-0.1085	0.0948
Social network	-0.0002	0.0002	-0.0006	0.0003	0.0002	0.0015	-0.0028	0.0032	0.0001	0.0015	-0.0028	0.0031
Shaanxi	-0.0399	0.0333	-0.1052	0.0254	2.4872***	0.2594	1.9787	2.9956	2.4570***	0.2579	1.9516	2.9624
Gansu	-0.0215	0.0323	-0.0850	0.0420	1.0473***	0.2520	0.5534	1.5412	1.0265***	0.2513	0.5340	1.5190

Note: Deviation-corrected non-parametric percentile Bootstrap method is used here with a repetition number of 5,000. ***, ** and * mean significance levels in 1%, 5% and 10%, respectively.

Table A5. Results of water-saving irrigation.

Variable	Indirect Effect (Collective Action)				Indirect Effect (Water-saving irrigation)				Total Effect (Water-saving irrigation)			
	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI	Coeff	Std. dev.	LLCI	ULCI
Constant	-0.2134***	0.0822	-0.3748	-0.0520	-3.2542***	0.8126	-4.8469	-1.6614	-3.5823***	0.7626	-5.0770	-2.0876
Collective action					3.2384***	0.4014	2.4517	4.0251				
Transfer area	0.3582***	0.0295	0.3002	0.4161	0.3108	0.3803	-0.4346	1.0561	1.3961***	0.3089	0.7906	2.0016
Age	0.0002	0.0014	-0.0025	0.0028	-0.0154	0.0133	-0.0414	0.0107	-0.0020	0.0120	-0.0255	0.0215
Education	0.0214***	0.0037	0.0141	0.0288	-0.0013	0.0364	-0.0726	0.0701	0.0403	0.0329	-0.0242	0.1048
Per capita asset	-0.0031***	0.0006	-0.0043	-0.0019	-0.0067	0.0062	-0.0189	0.0055	-0.0120**	0.0057	-0.0233	-0.0008
income	0.0064***	0.0007	0.0051	0.0078	0.0368***	0.0066	0.0239	0.0497	0.0515***	0.0064	0.0390	0.0641
Subsidy	0.0156***	0.0051	0.0057	0.0256	-0.0697*	0.0393	-0.1467	0.0072	-0.0176	0.0367	-0.0895	0.0543
Village cadre	0.1478***	0.0454	0.0587	0.2369	-0.1829	0.3934	-0.9540	0.5882	0.1790	0.3643	-0.5351	0.8931
Disasters	0.0187***	0.0071	0.0047	0.0327	0.1527**	0.0612	0.0328	0.2726	0.1425***	0.0526	0.0394	0.2456
Social network	-0.0002	0.0002	-0.0007	0.0002	-0.0017	0.0023	-0.0061	0.0028	-0.0017	0.0020	-0.0056	0.0023
Shaanxi	-0.0624*	0.0339	-0.1290	0.0042	-0.2812	0.4045	-1.0740	0.5117	-0.5737	0.3903	-1.3386	0.1913
Gansu	-0.0322	0.0329	-0.0968	0.0324	4.1655***	0.3744	3.4317	4.8992	3.1825***	0.3022	2.5903	3.7748
Constant	-0.2190***	0.0807	-0.3774	-0.0606	-3.3120***	0.8194	-4.9180	-1.7061	-3.5704***	0.7803	-5.0998	-2.0410
Collective action					3.0619***	0.4081	2.2621	3.8616				
Transfer period	0.0521***	0.0038	0.0446	0.0596	0.0883*	0.0499	-0.0095	0.1861	0.2619***	0.0481	0.1676	0.3563
Age	0.0002	0.0013	-0.0024	0.0028	-0.0140	0.0133	-0.0401	0.0122	-0.0021	0.0122	-0.0261	0.0218
Education	0.0208***	0.0037	0.0136	0.0280	0.0013	0.0366	-0.0704	0.0729	0.0415	0.0335	-0.0243	0.1072
Per capita asset	-0.0030***	0.0006	-0.0042	-0.0019	-0.0074	0.0063	-0.0197	0.0050	-0.0128**	0.0060	-0.0245	-0.0011
income	0.0066***	0.0007	0.0053	0.0079	0.0364***	0.0066	0.0235	0.0493	0.0500***	0.0064	0.0375	0.0625
Subsidy	0.0152***	0.0050	0.0054	0.0250	-0.0677*	0.0394	-0.1449	0.0096	-0.0243	0.0382	-0.0992	0.0506
Village cadre	0.1085**	0.0449	0.0205	0.1966	-0.2336	0.3991	-1.0159	0.5486	-0.0380	0.3781	-0.7792	0.7031
Disasters	0.0156**	0.0070	0.0020	0.0293	0.1513**	0.0613	0.0310	0.2715	0.1306**	0.0545	0.0237	0.2374
Social network	-0.0002	0.0002	-0.0006	0.0003	-0.0017	0.0023	-0.0061	0.0028	-0.0019	0.0020	-0.0059	0.0021
Shaanxi	-0.0399	0.0333	-0.1052	0.0254	-0.2937	0.4072	-1.0917	0.5043	-0.5749	0.3959	-1.3508	0.2010
Gansu	-0.0215	0.0323	-0.0850	0.0420	4.1561***	0.3747	3.4217	4.8905	3.2954***	0.3104	2.6870	3.9039

Note: Deviation-corrected non-parametric percentile Bootstrap method is used here with a repetition number of 5,000. ***, ** and * mean significance levels in 1%, 5% and 10%, respectively.

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