Has Collective Action Improved the Sustainable Livelihood Level of Farmers in Underdeveloped Areas ? —Empirical Evidence from Shanxi Province

Xuesong He , Yawei Wu * , Jianzhi Wei

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Article

Has Collective Action Improved the Sustainable Livelihood Levelof Farmers in Underdeveloped Areas？ ——Empirical Evidence from Shanxi Province

He Xuesong, Wu Yawei * and Wei Jianzhi

Taiyuan University of Technology, Address: Yuci District, Jinzhong , Shanxi 030600, China
* Correspondence: w18335858827@163.com

Abstract: Improving the level of farmers' participation in collective action is an important way to promote rural revitalization and improve the sustainable livelihood level of farmers in underdeveloped areas. Based on 312 questionnaires of farmers in Shanxi Province, this paper investigates the status of farmers' participation in collective action, their sustainable livelihood level and the sustainable livelihood effect of collective action participation. The results show that: farmers' willingness to participate in collective action is strong, and the participation effect is obvious, but the participation frequency is low, and the participation time is less; The farmers' sustainable livelihood level is relatively low, Empirical research shows that the level of collective action participation will have a significant positive impact on Farmers' livelihood risk prevention, livelihood capital accumulation, livelihood mode selection and livelihood income improvement, and the frequency, time and value perception of participation in collective action will have varying degrees of impact on Farmers' sustainable livelihoods. In order to promote farmers' active participation in collective action, it is proposed to strengthen the construction of collective organizations Provide incentives and improve the quality and skills of farmers to enhance the collective concept and other policy recommendations.

Keywords: collective action; sustainable livelihood level; farmers; underdeveloped areas

1. Introduction

The contradiction between small production and large market has always been an important factor restricting the development of modern agriculture and the improvement of farmers' income level. Promoting farmers' cooperative production and collective cooperation is an important way to solve the contradiction between small production and large market. Actively organizing farmers to participate in collective activities in rural areas can not only form professional cooperatives and mutual aid organizations, improve the bargaining power with the market and enterprises, seek to maximize interests, but also promote resource sharing among farmers and promote the upgrading and transformation of rural industries. Especially in less developed areas, farmers' resource endowment is poor and their livelihood environment is poor, so their sustainable livelihood is more difficult. It is more necessary to participate in collective action to prevent risks, obtain resources and improve farmers' sustainable livelihood level. In recent years, in order to promote farmers' cooperation, the government has issued a series of policies and measures, such as the measures for the management of the development funds of farmers' professional cooperative organizations of the central government, several opinions on carrying out the standardization and upgrading action of farmers' cooperatives, the implementation plan for supporting the development of farmers' cooperatives in 2022, and the implementation plan for supporting farmers' cooperatives, family agriculture and agricultural production trusteeship by the central government in 2022. However, the implementation effect of these policies and measures, the collective action status of farmers,

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especially in underdeveloped areas, and whether farmers' participation in collective cooperation has improved their sustainable livelihood level are major issues that need to be answered urgently.

Collective action refers to the process in which interdependent individuals form concerted action through negotiation in order to achieve common interests [1]. Many scholars have conducted in-depth research on the level and function of farmers' participation in collective action. Lixuefeng and qijunkai [2] used the output method, that is, the results and intensity of collective action, to measure the level of participation in collective action. Fujiie and others [3] used the number of successfully organized collective activities (such as collective lobbying) to measure the ability level of rural collective action. Some scholars used typical collective actions such as rural irrigation behavior to characterize the level of participation in collective action [4,5]. Research on the functions of collective action has found that the risk-sharing mechanism of collective action promoted land transfer by farmers [6], the agricultural science and technology extension mechanism promoted the development of rural collective economy [7], the improvement of disaster avoidance capacity improved farmers' livelihood [8], and technical training and organization coordination enhanced the mutually beneficial cooperation among farmers, thereby improving the income level [9]. Tu Shengwei [10] believed that ensuring the sustainability of the livelihood of relocated farmers in poverty alleviation in different places could not rely entirely on government assistance, nor could they rely solely on the relocated people to fight alone to "find a way out", but must form a strong collective organization system. In underdeveloped rural areas, farmers' vulnerability to sustainable livelihoods is generally high [11]. Farmers can promote the sustainable development of livelihoods by enjoying assistance measures, optimizing family livelihood strategies [12], improving their income level and learning ability, and improving social security [13].

The existing achievements have laid a solid theoretical foundation and scientific methodological guidance for this study, but there are also limitations of focusing on the construction of index system to measure the level of farmers' collective action and only examining the unilateral impact on Farmers' sustainable livelihood mode or income. Therefore, based on 312 questionnaires in Shanxi Province, this paper focuses on the participation status of farmers' collective action from the three dimensions of participation frequency, participation time and participation value perception, analyzes farmers' sustainable livelihood status from four aspects of livelihood risk, livelihood capital, livelihood mode and livelihood income, and empirically analyzes the impact of collective action participation on Farmers' sustainable livelihood level, in order to provide practical basis and decision-making reference for promoting farmers' collective action and improving farmers' sustainable livelihood level in underdeveloped areas.

2. Collective Action Participation and Sustainable Livelihood Level of Farmers

2.1. Participation in Collective Actions

2.1.1. Strong Willingness to Participate

Table 1 shows that the sampled households have a high willingness to participate in seven collective activities, including village cadre elections, collective labor, and joining farmers' professional cooperatives. In terms of proportions, the proportion of households that are willing or very willing to participate reaches 46.83%. The overall mean value is 3.32. The three collective actions that households are most willing to participate in are participating in the selection of village cadres, participating in collective labor, and engaging in sharing and communication with others about work opportunities, with participation rates reaching 59.29%, 55.45%, and 52.88% respectively. The corresponding mean values are 3.64, 3.59, and 3.49. The three collective actions that households are relatively less willing to participate in are joining five-person (or ten-person) joint guarantee loan groups, participating in productive and profitable activities in partnership with others, and joining farmers' professional cooperatives, with participation rates of 19.55%, 41.03%, and 40.70% respectively. The corresponding mean values are 2.60, 3.23, and 3.26. The above data indicate that

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compared to financial mutual assistance cooperation, households are more inclined towards productive mutual assistance cooperation.

Table 1. Willingness of farmers to participate in collective actions.

Questionnaire items	Very unwilling=1,	relatively unwilling=2	Generally=3	more willing=4	very willing=5	Scale mean
1.Participate in village cadre elections	11/3.63	29/9.29	87/27.88	121/38.78	64/20.51	3.64
2. Participate in collective labor (such as agricultural water conservancy construction)	6/1.92	47/15.06	86/27.56	103/33.01	70/22.44	3.59
3.Join the Farmers Professional Cooperative	21/6.73	47/15.06	117/37.50	83/26.60	44/14.10	3.26
4.Partnership with others for production and business activities	21/6.73	53/16.93	110/35.26	88/28.21	40/12.82	3.23
5.Join a five person (or ten person) joint guarantee loan team	52/16.67	97/31.09	102/32.69	47/15.06	14/4.49	2.60
6.Communicate and share with others the technology, information, and experience related to one's own production and operation activities	9/2.88	47/15.06	96/30.77	115/36.86	45/14.42	3.45
7.Communicate and share with others about earning opportunities such as working, developing production, and doing business	15/4.81	40/12.82	92/29.49	107/34.29	58/18.59	3.49
The average willingness to participate in the above 7 items	19/6.39	51/16.35	99/31.73	95/30.45	48/15.38	3.32

2.1.2. Low Frequency of Participation

Table 2 shows that the frequency of households participating in collective activities organized by village committees, residential groups, and farmers' professional cooperatives is relatively low. In terms of proportions, the proportion of households participating in collective activities 1-3 times a year reaches 49.57%, while the proportion of households participating 11 times or more is only 4.59%. The proportion of households not participating in any collective activities reaches 10.36%. The overall mean value is only 2.48. Among the three types of activities, the proportion and frequency of households participating in collective activities organized by residential groups are the highest, with participation proportions reaching 93.27% and the proportion of participating 11 times or more reaching 5.77%. The corresponding mean value is 2.62. The proportion and frequency of households participating in technical learning, collective procurement and sales, and other activities organized by farmers' professional cooperatives are the lowest, with participation proportions of 83.33% and the proportion of participating 11 times or more only reaching 3.21%. The corresponding mean value is only 2.32. This may be due to the relative lack of farmers' professional cooperatives in some rural areas.

Table 2. Frequency of Farmers' Collective Action Participation.

Questionnaire items	0times =1	1-3times =2	4-6times =3	7-10times =4	11times or more=5	Scale mean
1. Participate in various activities organized by the village committee every year (elections, training, forest protection, etc.)	24/7.69	168/53.84	75/24.04	30/9.62	15/4.81	2.50

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2. Participate in various activities organized by residential groups every year (such as agricultural water conservancy construction, forest protection, etc.)	21/6.73	142/45.51	102/32.69	29/9.29	18/5.77	2.62
3.Participate in various activities organized by farmer professional cooperatives every year (such as technical learning, collective procurement, collective sales, etc.)	52/16.67	154/49.36	69/22.12	27/8.65	10/3.21	2.32
The average participation frequency of the above three items	32/10.36	155/49.57	82/26.28	29/9.19	14/4.59	2.48

2.1.3. Limited Time of Participation

Table 3 shows that households spend relatively little time participating in various collective activities organized by village committees, residential groups, and farmers' professional cooperatives. 48.72% of households participate for 1-5 days, and the sample mean value is 2.48. Among the three types of activities, households spend the most time participating in various activities organized by residential groups, with a mean value of 2.62. They spend the least time participating in various activities organized by farmers' professional cooperatives, with a mean value of 2.30. The above data indicate that residential groups are the primary venues for the collective activities of households.

Table 3. Time status of collective action participation by farmers.

Questionnaire items	0days =1	1-5 days =2	6-10 days =3	11-15 days =4	16 days and above=5	Scale mean
1.Farmers invest in various activities organized by the village committee every year, which is equivalent to the number of days invested	24/7.69	162/51.92	83/26.60	24/7.69	19/6.09	2.53
2. Farmers invest in organizing various activities in residential groups (production teams) every year, which is equivalent to the number of days	23/7.37	136/43.59	108/34.62	26/8.33	19/6.09	2.62
3.Farmers invest in various activities organized by farmer professional cooperatives every year, which is equivalent to the number of days invested	56/17.95	157/50.32	59/18.91	28/8.97	12/3.85	2.30
The average participation time of the above three items	34/10.89	152/48.72	83/26.71	26/8.33	17/5.34	2.48

2.1.4. Obvious Effects of Participation

Table 4 shows that households highly evaluate the effects of participating in village collective activities in terms of gaining production and business market information, improving production and business skills, and preventing dual risks. The proportion of households that consider the effects to be relatively large or very large reaches 38.09%, and the scale mean value is 3.18. The three main effects are gaining production and business information, expanding social networks, and improving production and business skills, with mean values of 3.36, 3.27, and 3.27, respectively. The average evaluations for expanding income sources, increasing income scale, preventing dual risks, and enhancing the perception of social fairness and justice are 3.05, 3.07, and 3.12, respectively.

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Table 4. Effectiveness of Collective Action Participation by Farmers.

Questionnaire items	Very small=1	Relatively small=2	general=3	relatively large=4	very large=5	scale mean
1. Obtain production and operation market information (such as job opportunities, market conditions, bank loans, etc.)	15/4.81	48/15.38	106/33.97	97/31.09	46/14.74	3.36
2. Improve production and management skills and level (such as production technology and professional knowledge)	13/4.17	60/19.23	117/37.50	86/27.56	36/11.54	3.23
3. Preventing losses in production and operation caused by natural disasters or declining prices of agricultural products	26/8.33	68/21.79	117/37.50	60/19.23	41/13.15	3.07
4. Expand revenue sources and increase revenue scale	20/6.41	81/25.96	109/34.94	69/22.12	33/10.58	3.05
5. Expand social relationships (such as getting to know more people, enhancing mutual understanding, etc.)	12/3.85	54/17.31	115/36.86	99/31.73	32/10.26	3.27
6. Enhance the perception of social fairness and justice	22/7.05	63/20.19	113/36.22	84/26.92	30/9.62	3.12
The average participation effect of the above 6 items	18/5.77	62/19.98	113/36.16	83/26.44	36/11.65	3.18

2.2. Sustainable livelihood Conditions

2.2.1. High Ability to Cope with Livelihood Risks

Farmers can better cope with the production and operation losses caused by medical expenses for general diseases and dual risks (natural risk and market risk), with an average of 3.23. Among them, the ability to cope with medical expenses for general diseases is the highest, accounting for 45.83% of farmers who can cope and fully cope with it. The ability to cope with market risks (falling prices of agricultural products) is weak, accounting for only 33.02% of farmers who can cope and fully cope with it, The average value is 3.16, indicating that the ability of farmers to cope with the impact of the large market under the condition of small production needs to be improved.

Table 5. Farmers' ability to cope with livelihood risksy.

Questionnaire items	Very unnecessary (completely impossible)=1	Relatively unnecessary (relatively impossible)=2	General =3	relatively necessary (relatively capable)=4	very necessary (completely capable)=5	scale mean
1. Ability to cope with medical expenses caused by general diseases	5/1.6	42/13.46	122/39.1	123/39.42	20/6.41	3.36
2. Ability to cope with production and business losses caused by more serious natural disasters	8/2.56	49/15.71	151/48.4	89/28.53	15/4.81	3.17
3. Ability to cope with production and operational losses caused by the decline in agricultural product prices	8/2.56	52/16.67	149/47.76	88/28.21	15/4.81	3.16

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The average of the three risk response capabilities mentioned above	7/2.24	48/15.28	141/45.09	100/32.05	17/5.34	3.23

2.2.2. The Level of Livelihood Capital Accumulation Is Weak

Financial capital is the most important material basis for farmers to develop production and improve their sustainable livelihood level. It is also an important livelihood capital for farmers. This study uses financial capital to represent farmers' livelihood capital. Table 6 shows that the amount of financial assets such as cash, deposits, wealth management, stocks, funds and bonds owned by farmers is low. The proportions of financial assets below 10000 yuan, 10000-30000 yuan and 40000-60000 yuan are 23.40%, 17.13% and 22.12% respectively, and the average value of the scale is only 3.19.

Table 6. Financial Capital Status of Farmers.

	Under 10000=1	**10000-30000 =2**	**40000-60000 =3**	**70000-100000 =4**	**110000-150000=5**	**16000-200000 =6**	**21000-300000 =7**	**310000 or more=8**	**scale mean**
Number of house-holds/proportion	73/23.40	54/17.13	69/22.12	51/16.35	25/8.01	13/4.17	14/4.49	13/4.16	3.19

2.2.3. The Livelihood Mode Is Mainly Small-Scale Farming and Local Labor

It can be seen from Table 7 that the livelihood of farmers is mainly small-scale farming and working. 35.90% of farmers are engaged in small-scale and non professional agricultural planting or breeding, while only 6.41% are engaged in large-scale and professional planting or breeding, 31.41% are local workers, and 11.54% are engaged in part-time farming and part-time work.

Table 7. Livelihood patterns of farmers.

	Small scale farming=1	**Large scale farming=2**	**Local workers=3**	**Non local workers=4**	**Half agriculture and half work=5**	**focusing on doing business=6**	**scale mean**
Number of house-holds/proportion	112/35.90	20/6.41	98/31.41	31/9.94	36/11.54	15/4.81	2.69

2.2.4. Relatively Low Livelihood Income

It can be seen from Table 8 that the total income of rural households is relatively low and the gap is large. The proportion of total household income of farmers below 10000 yuan, 30000 yuan and 60000 yuan reached 4.71%, 20.42% and 49.59%, respectively. The proportion of farmers above 100000 yuan and 200000 yuan reached 24.03% and 3.53%, respectively.

Table 8. Income Status of Farmers.

	Under 10000 =1	**10000-30000 =2**	**40000-60000 =3**	**70000-100000 =4**	**110000-150000 =5**	**160000-200000 =6**	**210000-300000 =7**	**310000-500000 =8**	**scale mean**
Number of households/proportion	13/4.71	49/15.71	91/29.17	84/26.92	46/14.74	18/5.77	10/3.21	1/0.32	3.64

3. Theoretical Analysis of Collective Action Enabling Farmers' Sustainable Livelihood

Farmers' participation in collective action can improve their livelihood risk prevention ability. By joining collective organizations such as farmers' cooperatives, farmers' professional cooperatives or farmers' mutual aid organizations, farmers can jointly face various risks, such as natural disasters

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and market fluctuations [14]. Collective action enables farmers to disperse risks, help farmers establish a risk sharing mechanism, and reduce the economic pressure of individuals when facing risks. Farmers can enhance their risk resistance ability by taking preventive measures and sharing risk relief. Collective action can also provide farmers with more information and technical support, and enhance their ability to deal with various risks. Therefore, the research hypothesis H1 is put forward: collective action has a positive impact on Farmers' livelihood risk prevention ability.

Farmers' participation in collective action also contributes to their livelihood capital accumulation. Farmers can pool funds and resources, improve agricultural production efficiency and economic scale, and enhance their ability and competitiveness by participating in collective economic organizations' activities such as joint investment, joint management of farmland, and processing of agricultural products. Collective action can also promote technological innovation and knowledge sharing, and improve the scientificity and sustainability of agricultural production. These activities help farmers increase capital accumulation, improve their return on investment, and thus increase their sustainable livelihood income. Accordingly, the research hypothesis H2 is put forward: collective action has a positive impact on Farmers' livelihood capital accumulation level.

Participation in collective action also has an important impact on the choice of farmers' livelihood mode. Under the implementation of rural revitalization, farmers' livelihood mode selection has been effectively expanded, but it is still subject to multiple restrictions [15]. Through collective action, farmers can get more resources and support, understand and learn the emerging production technology, management mode and market trend, and increase the flexibility and diversity of their choice of sustainable livelihood mode. For example, farmers can choose to develop new sustainable livelihood models such as characteristic agricultural products and rural tourism to increase their income. In addition, collective action can also promote the economic interaction between urban and rural areas, promote the transfer of farmers from traditional agriculture to modern agricultural industry, and broaden their sustainable livelihood options. Accordingly, the research hypothesis H3 is put forward: collective action has a positive impact on Farmers' livelihood mode choice.

Actively participating in collective action can help to improve the livelihood income of farmers in underdeveloped areas. Collective action can provide farmers with better technological learning opportunities and market channels, and increase the competitiveness and added value of agricultural products. Through collective management and brand building of agricultural products, farmers can improve product quality and market recognition, and obtain greater profits. In addition, collective action can also provide farmers with services and support in the circulation, sales and logistics of agricultural products, reduce transaction costs and risks, and further improve farmers' sustainable livelihood income. Accordingly, the research hypothesis H4 is put forward: collective action has a positive impact on Farmers' livelihood income level.

4. Research Methods

4.1. Data Sources

The data comes from the questionnaire survey of farmers in Shanxi Province in May 2023. The survey adopts the method of combining simple random sampling and key sampling. It selects 8 cities (districts), 20 counties (districts), 31 towns and 56 administrative villages in Shanxi Province to issue 350 questionnaires. Each researcher is responsible for a certain area, and independently completes his own questionnaire. After self-examination and group review, the database is merged to ensure the authenticity, integrity and scientificity of the data. Finally, 312 valid questionnaires were collected, and the effective rate was 89.14%. The sample content mainly includes the respondents' basic individual and family characteristics, participation in collective activities, livelihood risks, livelihood capital, livelihood strategies and other rural livelihood levels related to rural revitalization. Using Excel and SPSS.26 for data organization and regression analysis

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4.2. Variable Setting

4.2.1. Independent Variable

Level of participation in collective action. Factor analysis was used to measure the participation frequency, participation time and participation value perception. Kmo and Bartlett spherical test results showed that kmo sampling moderate measurement value reached 0.825, Bartlett spherical test was significant at 1% level, indicating that the data were suitable for factor analysis. The principal component analysis method is used to extract the common factors, and the maximum variance method is selected to rotate the factors. Three common factors with eigenvalues greater than 1 are extracted, and the cumulative variance contribution rate reaches 76.20%. Taking the proportion of the variance contribution rate of each common factor in the cumulative variance contribution rate as the weight, the total score of the factors is calculated, and the participation level of farmers' collective action is obtained.

4.2.2. Dependent Variable

Sustainable livelihood level. The sustainable livelihood level of farmers is comprehensively reflected from the four dimensions of livelihood risk prevention ability, livelihood capital accumulation level, livelihood mode selection and livelihood income improvement, and the values of each dimension are from the average value of the questionnaire.

4.2.3. Control Variables

Considering the influence of other factors, gender, age, education background and region are selected as control variables, and the specific variable definitions are shown in Table 9.

Table 9. Descriptive statistics of variables.

Variable category	variable name	variable description
Independent variable	Level of participation in collective action	Using factor analysis method to measure from three dimensions
Dependent variable	Livelihood risk prevention	Questionnaire mean value of livelihood risk coping ability
	Livelihood capital accumulation	The mean value of financial capital accumulation variable survey
	Livelihood mode selection	Survey data on Farmers' livelihood mode selection
	Improvement of livelihood income	Annual income data of rural households
Control variables	Gender	Gender was distinguished by 0-1 variable, male sample=1, female sample=0
	Age	Age is divided into 1-7grades
	educational background	Education level is divided into 1-7 grades
	Region	Taking Taiyuan as the control group, Taiyuan sample=0, and samples from other regions=1

4.3. Model Construction

Based on the fact that both dependent variables and core independent variables are continuous variables, we can use multiple linear regression model to investigate the impact of collective action on Farmers' sustainable livelihood level.

$$Y_i = a + bX + \sum Control + \varepsilon \quad (1)$$

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Among them, the explained variable Y represents the sustainable livelihood level of farmers in Shanxi Province,i from 1 to 4 represents the four livelihood level measurement indicators of livelihood risk prevention, livelihood capital accumulation, livelihood mode selection and livelihood income improvement, and X represents the level of collective action participation. The rest are control variables, ε is residual.

5. Results and Analysis

5.1. Analysis of Benchmark Regression Results

From the regression results in Table 10, we can see that the P values of the four regression models are significant, indicating that the model fitting effect is good. The participation level coefficient of the first column of collective action is 0.223, which is significant at the 1% level, indicating that farmers' active participation in collective action can effectively improve their risk prevention ability, share benefits in the collective and share risks at the same time. The stronger the awareness of farmers and their families to participate in insurance, the more they participate in insurance, which effectively reduces and reduces the energy and cost that individuals need to pay when facing risks, which verifies H1. The coefficient of collective action in the second column is significantly positive at the level of 1%, and reaches 1.012, indicating that farmers' participation in collective action can accumulate their livelihood capital. In collective cooperation activities, farmers can concentrate funds and resources, improve agricultural production efficiency and economic scale, and then increase farmers' capital accumulation, which verifies H2. The third column is the choice of livelihood mode, and the independent variable coefficient is significantly positive at the level of 10%, indicating that the higher the development level of rural collective action in underdeveloped areas, the more enthusiastic farmers' participation in collective action, and the more opportunities for livelihood mode selection, they can broaden their horizons in collective action, obtain resources, and help them seek a higher income livelihood mode. H3 has been verified. The independent variable coefficient of the fourth column of livelihood income reached 1.320, which was significant at the level of 1%, indicating that in underdeveloped rural areas, the most direct impact of farmers' participation in collective action is the increase in income. The higher the development level of rural collective operation, the more actively farmers participate in collective action. Compared with isolated production and farming, it is more cost-effective and easier to share technology and resources with each other, plus government support and subsidies, It will significantly increase the livelihood income of farmers, which verifies H4.

Table 10. multiple linear model regression results of collective action affecting farmers' sustainable livelihood level.

Variable	Livelihood risk prevention	Livelihood capital accumulation	Livelihood mode selection	Improvement of livelihood income
Level of participation in collective action	0.223*** （3.287）	1.012*** （7.975）	0.236* （1.946）	1.320*** （12.898）
Age	0.030 （0.672）	-0.105 （-1.259）	-0.117 （-1.233）	-0.291*** （-4.331）
Gender	0.014 （0.163）	0.145 （0.891）	-0.163 （-0.882）	0.079 （0.601）
Education level	0.020 （0.447）	0.002 （0.019）	0.027 （0.287）	0.107*** （3.039）
Region	0.153 （1.762）	1.691*** （4.915）	1.221*** （3.136）	0.744*** （2.679）
Intercept term	3.053*** （11.454）	3.591*** （7.190）	3.020*** （5.347）	5.127*** （12.728）
R^2	0.024	0.223	0.037	0.377

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F	2.526	18.894	3.396	38.570
P值	0.029**	0.000***	0.005***	0.000***

Note: * * *, * * and * are significant at 1%, 5% and 10% statistical levels respectively, the same below.

5.2. Robustness Test

The robustness test was performed by grouping difference t test. Taking the mean value of factor score (i.e. zero) as the boundary, the degree of farmers' participation in collective action is divided into high-level group and low-level group. Table 11 reports the t-test results of farmers' sustainable livelihood gap with different degrees of participation in collective action. It can be seen that there is a significant gap between the two groups of farmers in the four dimensions of the sustainable livelihood level, indicating that farmers' participation in collective action can improve their sustainable livelihood level, and its mechanism is that collective action has internal functions such as information sharing, technology diffusion, risk sharing, capital accumulation and Entrepreneurship promotion.

Table 11. t-test for differences in farmers' sustainable livelihood levels under different levels of collective action participation.

Sustainable livelihoods of farmers	Participation level in collective action		Two groups difference	T value	P value
	Low group（N=166）	High group（N=146）			
Livelihood risk prevention	**3.10**	**3.38**	0.28	3.41	0.001***
Livelihood capital accumulation	2.94	3.99	1.05	6.49	0.000***
Livelihood mode selection	2.59	2.81	0.13	1.91	0.074*
Improvement of livelihood income	2.99	4.38	1.39	10.07	0.000***

5.3. Further Analysis

Table 12 reports the results of multiple linear regression models of the impact of various dimensions of collective action on Farmers' sustainable livelihood level. The P values of the four regression models are significant at the level of 1%, indicating that the model fitting effect is good. The results in the first column show that the participation time and value perception of collective action are significant at the level of 5%. For each unit of participation time, the livelihood risk prevention ability of farmers will increase by 0.137 units, and for each unit of participation value perception, the livelihood risk prevention ability will increase by 0.147, while the effect of participation frequency on livelihood risk prevention ability is not significant, But the overall results show that farmers' participation in collective action will improve their awareness of livelihood risk prevention. The estimation results in the second column show that both the frequency of farmers' participation in collective action and value perception will promote the accumulation of livelihood capital, especially financial capital, with coefficients of 0.358 and 0.548, respectively. The higher the education level and the more developed the region, the more farmers' livelihood capital will accumulate. The third column shows that the frequency of collective action participation at the level of 1% significantly promotes farmers' choice of livelihood mode, and the coefficient is 0.4, which has a significant promotion effect. By actively participating in collective action, farmers can understand and learn emerging production technologies, management modes and market trends, so as to adjust their production mode and product structure, and change the traditional livelihood mode. In addition, The region of farmers will also have an impact on their choice of livelihood mode. The results in column 4 show that the participation frequency and value perception of collective action can improve farmers' livelihood income at the 1% confidence level, and the promotion effect of value perception is more significant, because farmers have the opportunity to share resources, technology and market channels through participation in collective action, so as to improve production efficiency

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and the quality of agricultural products, so as to obtain better livelihood income, Collective action can also help farmers carry out cooperative operation and large-scale production, so as to obtain more economic benefits and significantly increase their income.

Table 12. regression results of the impact of three dimensions of collective action participation on Farmers' sustainable livelihood level.

Variable	Livelihood risk prevention	Livelihood capital accumulation	Livelihood mode selection	Improvement of livelihood income
Participation frequency	0.048 （0.799）	0.358*** （5.182）	0.400*** （3.140）	0.350*** （4.309）
Participation time	0.137** （2.300）	-0.028 （-0.311）	0.042 （0.335）	-0.043 （0.591）
Participation in value perception	0.147** （2.588）	0.548*** （6.168）	0.136 （1.120）	0.988*** （12.775）
Age	0.033 （0.761）	-0.059 （-0.879）	-0.101 （-1.094）	-0.245*** （-4.178）
Gender	0.029 （0.344）	0.117 （0.891）	-0.209 （-1.173）	0.173 （1.517）
Education level	0.031 （0.121）	0.060* （1.899）	0.025 （0.450）	0.189*** （3.107）
Region	0.047 （0.262）	1.051*** （3.769）	0.984** （2.587）	0.097 （0.400）
Intercept term	2.173*** （7.156）	0.658*** （3.062）	1.552** （2.427）	1.023** （2.506）
R^2	0.075	0.500	0.098	0.533
F	4.603	45.459	5.849	51.651
P	0.000***	0.000***	0.000***	0.000***

6. Conclusions and Suggestions

Promoting the level of farmers' participation in collective action and improving the degree of farmers' organization are important policy measures of Rural Revitalization Strategy, and improving farmers' sustainable livelihood level is an important policy goal of Rural Revitalization Strategy. Taking Shanxi Province as an example, this paper investigates and analyzes the status of farmers' collective action participation, sustainable livelihood level and the livelihood effect of collective action participation in underdeveloped areas. The results show that there is a "high willingness and low behavior" paradox between farmers' willingness to participate in collective action and their participation behavior in underdeveloped areas, but participating farmers have a high degree of evaluation on the role of participation, indicating that there is a broad space for promoting farmers' collective action in underdeveloped areas; Although it has a high ability to cope with livelihood risks, farmers' livelihood capital and income are relatively low, which highlights the arduous task of Rural Revitalization in underdeveloped areas; The degree of participation in collective action has significantly improved farmers' livelihood risk prevention, livelihood capital accumulation, livelihood mode selection and livelihood income, and the frequency, time and value perception of collective action have different degrees of impact on Farmers' sustainable livelihoods, indicating that collective action is an effective path to improve farmers' sustainable livelihood level.

Based on the above conclusions, the following policy suggestions are put forward to enhance the participation of farmers in collective action:

First, strengthen the organization construction of rural farmers to provide organizational support for collective action [16]. Establish and improve farmers' organizations and rural cooperatives, improve internal rules and regulations, and formulate relevant laws and regulations to ensure the scientificity and fairness of organizational decisions. At the same time, it is also necessary

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to ensure the standardization of the operation of farmers' cooperatives, and formulate relevant rules and regulations suitable for the local situation according to national policies. For example, it is necessary to strengthen supervision on the issuance and investment of funds for rural cooperative organizations and farmers' entrepreneurship, Ensure that the limited subsidy funds given to cooperatives can be distributed in place within the specified time and quantity, and ensure the standardization and rationality of the operation of collective organizations.

Second, provide incentives and incentives to enhance farmers' enthusiasm to participate in collective action. Provide incentives to individuals and organizations that perform well in collective action, including material and spiritual aspects, especially professionals and excellent collective operation promoters who play an important role in the organization, and formulate a series of preferential policies to help the organization retain talents; Relevant departments can establish contacts with local agricultural colleges and universities to provide professional talents in scientific research and experiment for rural cooperative organizations; Employment subsidies and work bonuses should be given to the personnel of the main business body, technicians and relevant employees in the organization. For collective organizations with excellent performance, corresponding reward systems should also be formulated. In addition to bonuses and subsidies, honorary titles and technical support should be given to stimulate their enthusiasm and enthusiasm for work, which will also indirectly encourage other collective organizations.

The third is to improve the quality and skills of farmers and build a rural development community. Strengthen the training of farmers, provide training on agricultural technology and management knowledge, help farmers improve their professional skills and business ability, and increase their confidence and ability to participate in collective action; In addition, we should strengthen publicity and education, guide farmers to change the traditional concept of small farmers, strengthen individual value recognition of common consciousness, and participate in various cultural activities and collective activities. It is convenient for farmers to establish a collective concept, enhance the cohesion of villagers, lay value and emotional recognition for collective action, and let farmers realize the importance of participating in collective action for improving personal and family interests, Cultivate farmers' awareness and willingness to participate in rural collective action.

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