

Dynamic Change and Evaluation of Poor Households in Qinba Mountain Area During the Process of Poverty Alleviation from the Perspective of Sustainable Livelihood—Based on the Empirical Study of 21 Villages in 6 Districts of Qinba Mountain Area

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Abstract: With the deepening of the work to take targeted measures in poverty alleviation, the Qinba Mountain Contiguous Poor Areas is one of the main battlefields for poverty alleviation. The research on the effect of poverty alleviation has reference and guidance significance for the work of other poverty-stricken areas. In recent years, poverty alleviation has been carried out in an orderly manner, but there are still many contradictions and the application in special difficult areas is not deep enough. Analyzing the dynamic changes of sustainable livelihood capital data and the current situation of poverty alleviation will help to provide data basis and theoretical basis for optimizing the overall allocation and improving poverty alleviation programs, and at the same time narrow the gap of regional economic development. Based on the field survey, data analysis shows that the scores of livelihood capital of the Qinba Mountain Contiguous Poor Areas before and after poverty alleviation are respectively a, b, and the difference is b-a. Negative growth accounts for 5 in the index layer, while the remaining 15 indicators are experiencing positive growth. Based on the results of this study, the benefits created by natural capital, material capital, financial capital, social capital and human capital in poverty alleviation work for farmers are determined, and their effects on poverty alleviation are evaluated. A series of suggestions on the development and process of poverty alleviation work are put forward to help the poverty alleviation work more accurately and steadily.

1. Introduction

The Qinba Mountain Contiguous Poor Areas is located in the Qinling Mountain and Daba Mountain, in the upper reaches of Hanshui River and its adjacent areas, spanning six provinces of Henan, Hubei, Chongqing, Sichuan, Shaanxi and Gansu. The internal economic development of the region is not balanced, and the industrial development is lagging behind (2012, Ma Zhengjie); the poverty area is large and the factors are complicated (2016, Luo Qing, Fan Xincheng, Gauguin and Yang Huimin); natural disasters are prone to multiple occurrences and weak infrastructure (2018, Ye Zheng, Zhu Yuchun); the ecological environment is fragile, the old revolutionary base areas is concentrated (2005, He Jiali) and other elements in one. In the programmatic document of China's poverty alleviation and development work published in 2011, "China's Rural Poverty Alleviation and Development Program (2011-2020)", it is clearly pointed out that Qinba Mountain Contiguous Poor Areas belong to 11 contiguous poor areas with special difficulties, which is aimed at poverty alleviation. One of the main battlefields for total poverty alleviation. As the country's in-depth promotion of the new stage of poverty alleviation, the main battlefield has the widest coverage, involving the most provincial areas. It has received great assistance and resource in industrial development, ecological compensation, immigration support, and counterpart support. Therefore, the dynamic change and evaluation of the capital of poor households from the perspective of sustainable livelihood is worthy of studying, which has reference and demonstration role in the other 10 main poverty-stricken areas in China.

On the issue of poverty alleviation and other related issues abroad, the sustainable livelihood framework is considered to be relatively effective and authoritative, and has been widely used. It is a kind of method combing and analyzing the complex factors of farmers' livelihoods, especially around poverty. The UK Overseas Development Agency has established a typical sustainable livelihood framework model, which has been widely applied in relevant research fields. Since its introduction, China has paid more and more attention to its application in poverty-reduction factors, ecological and environmental management. At present, relevant research has been done, but we have short history of the theory and model application of sustainable livelihood frameworks in China, and we only simply copy this framework. The related research and interactions do not pay attention to the linkages between elements of sustainable livelihood frameworks. So its theoretical results are still urgently needed to be supplemented and expanded, and the application field still needs to be improved.

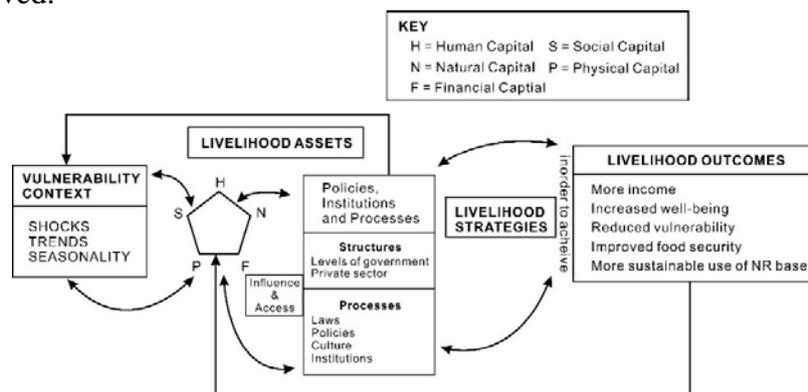


Fig. 1. Framework for sustainable livelihoods

2. Construction and calculation analysis of evaluation index system based on sustainable livelihood capital model

2.1 Overview of Qinba Mountain Area

The Qinba Mountain Contiguous Poor Areas is located in the Qinling Mountain and Daba Mountain and its adjacent area in the upper reaches of Hanshui River. The total area of the soil is 225,000 square kilometers, including 80 counties in Henan, Hubei, Chongqing, Sichuan, Shaanxi and Gansu provinces and cities. The key counties of national and provincial poverty alleviation and development work account for 90% of the total number of counties, and there are 47 old districts and counties, accounting for 58.8% of the total counties. According to the data released by the State Council's Leading Group Office of Poverty Alleviation and Development in 2012, there are 3.025 million rural poor people under the per capita poverty alleviation standard in the Qinba Mountain area. The incidence of poverty is 9.9%, which is 7.1 percentage points higher than the national average, 3.8 percentage points higher than the western region average, and the per capita net income of farmers is only 67.2% of the national average. In terms of economic development, in 2010, the counties with the lowest per capita gross income in local government budgets and the lowest per capita net income of farmers were only 23.2% and 45.7% of the average level of the districts. The economic development of each region was seriously unbalanced.

In terms of natural conditions, the area is rich in resources and diverse in climate types. The average annual precipitation is 450-1300mm, and the forest coverage rate is 53%. The terrain in the area is complex, and natural disasters such as floods, droughts and landslides are prone to occur frequently. It is one of the the six major debris flows areas in China. Due to the disaster, the phenomenon of returning to poverty is obvious.

2.2 Confirmation of evaluation indicators and data sources

2.2.1 The connotation of livelihood capital

Based on the framework of sustainable livelihood capital, this paper divides the resources that farmers use to maintain their lives into five parts: natural capital, material capital, financial capital, social capital and human capital. Through the evaluation of each capital element, the current living situation of farmers is obtained objectively, and the weak links are found.

2.2.2 Construction of evaluation indicators

The evaluation system for poverty alleviation in the Qinba Mountain Contiguous Poor Areas covers a wide range of contents, and it has extremely high dynamic and complexity due to the work process of poverty alleviation and the change of poverty factors. Therefore, in order to accurately describe the dynamic changes of the farmers' poverty alleviation status, according to the principles of typical, scientific, easy to obtain and easy to operate analysis of indicators choosing, on the basis of collecting and reading literature and periodicals and comparing the previous research results, among the multiple analysis and evaluation methods, this paper selects the dynamic change of livelihood capital in the sustainable living framework theory as the core, and builds a thorough evaluation system for the poverty alleviation in this area. At the same time, combined with the actual situation of poor households in the district and the opinions of experts, a total of 20 evaluation indicators under the five major livelihood capital types were obtained through screening.

2.2.3 Data source for evaluation

The research data comes from the first-hand field research on 226 poverty-stricken poor households in the 21 villages of the 6 districts of Qinba Mountain Contiguous Poor Areas, and the communication to the heads of the 21 villages, and the corresponding township government.

2.3 Weight calculation

Here, an analytic hierarchy process based on subjective decision scores for qualitative and quantitative analysis is used, and the capital weights are calculated using the basic data obtained from the survey. Determining the weight of each category's livelihood capital is beneficial to the later analysis, and to understand the different role that each element plays.

AHP decision makers score as:

$$Am(n)_{ij}, \quad m \text{ is the capital type, } n \text{ is the AHP decision maker serial number.} \quad (1)$$

AHP decision makers compare the indicators between the two, Complete the rating of $Am(n)_{ij}$, among which:

$$Am(n)_{ij} = 1, \quad i = j. \quad (2)$$

According to different decision makers, different living capital types constitute different indicator matrixes, and different indicators are compared according to the following scale:

$a_{ij} = 1$, element i and element j are of the same degree of importance to the previous level factor;

$a_{ij} = 3$, element i is slightly more important than element j ;

$a_{ij} = 5$, element i is more important than element j ;

$a_{ij} = 7$, element i is much more important than element j ;

$a_{ij} = 9$, element i is extremely important to the previous level factor compared to element j ;

$a_{ij} = 2n$, $n = 1, 2, 3, 4$, the importance of element i and element j to the previous level is between $a_{ij} = 2n - 1$ with $a_{ij} = 2n + 1$ between;

on the contrary:

$$a_{ij} = \frac{1}{a_{ji}}. \quad (3)$$

Weight the $Am(n)_{ij}$, the comparison between the two indicators of i and j under the capital type of livelihood, made by n decision maker, to obtain the weighted geometric mean of the comparison values between the two indicators of the i and j under the subjective perspective of all decision

makers, and the weighted new matrix Am_{ij} is obtained, and normalize the feature to obtain the weight:

$$Am_{ij} = \sqrt[x]{\prod_{n=1}^x Am(n)_{ij}}, \quad x \text{ is the number of experts.} \quad (4)$$

$$Bm_{ij} = \frac{Am_{ij}}{\sum_{i=1}^x Am_{ij}}. \quad (5)$$

$$Wm_i = \frac{\sum_{j=1}^x Bm_{ij}}{\sum_{i=1}^x \sum_{j=1}^x Bm_{ij}}, \quad x \text{ is the matrix order.} \quad (6)$$

2.4 The list of weights

Table 1. Weights of indicators under each livelihood capital.

Livelihood capital	Index	Weight	Livelihood capital	Index	Weight
Natural capital (N)	Per capita cultivated land area (N1)	0.17	Physical capital (M)	Per capita housing area of household members(M1)	0.14
	The quality of cultivated land (N2)	0.59		The housing structure of family (M2)	0.31
	Per capita cultivated land area (N3)	0.24		Total assets of household production tools (M3)	0.40
				Per capita housing area of household members(M4)	0.14
Financial capital (F)	Per capita operating income (F1)	0.22		Communication fee (S1)	0.07
	Per capita transfer income (F2)	0.08			
	Per capita wage income (F3)	0.37	Social capital (S)	Relationship with neighbors and village cadres (S2)	0.33
	Whether to get the government's poverty alleviation loan (F4)	0.13			
	Debt status (F5)	0.20		Relationship with neighbors and village cadres (S2)	0.60
Human capital (H)				The proportion of labor force to the total number of households (H1)	0.05
				The education level major labor force (H2)	0.17
				Health status of family member (H3)	0.33
				Employment situation (H4)	0.36
				Participation in farming and training (H5)	0.08

2.5 Consistency check of weights

$Am_{ij} \cdot Wm_i$ stands for matrix Am_{ij} multiplied by matrix Wm , x is the order of the matrix of Am_{ij} . And calculate the maximum characteristics root of the matrix:

$$\lambda m_{max} = \frac{\sum(Am_{ij} \cdot Wm_i)}{xWm_i}. \quad (7)$$

Calculate the consistency index of matrix:

$$C. I. _m = \frac{\lambda m_{max} - x}{x - 1}. \quad (8)$$

The consistency index of the test matrix is the random consistency ratio of it, and the random consistency ratio ($C. R. _m$) is calculated:

$$C.R._m = \frac{C.I._m}{R.I.(x)}, \quad x \text{ is the matrix order.} \quad (9)$$

$R.I.(x)$, the average random consistency index, is a constant, and the value is as follows (the unused values in this article are not listed) :

$$R.I.(3) = 0.52; \quad R.I.(4) = 0.89; \quad R.I.(5) = 1.20.$$

The random consistency ratio $C.R._m < 0.1$, that is, maintain the significance level, and the comparison matrix is consistent. If $C.R._m > 0.1$, it means that the significance level is not maintained, and the comparison matrix needs to be adjusted:

$$C.R._1 = \frac{C.I._1}{R.I.(1)} = \frac{0.0106}{0.52} = 0.02048 < 0.1; \quad C.R._2 = \frac{C.I._2}{R.I.(2)} = \frac{0.0220}{0.89} = 0.02470 < 0.1;$$

$$C.R._3 = \frac{C.I._3}{R.I.(3)} = \frac{0.0183}{1.12} = 0.01631 < 0.1; \quad C.R._4 = \frac{C.I._4}{R.I.(4)} = \frac{0.0349}{0.52} = 0.06703 < 0.1;$$

$$C.R._5 = \frac{C.I._5}{R.I.(5)} = \frac{0.0048}{0.12} = 0.00428 < 0.1.$$

3. The evaluation results and empirical analysis

3.1 Standardization and averaging

The dimensions and units of each indicator are different and cannot be directly compared, so standardization is required before each indicator is calculated:

When the indicator is a positive indicator, its standardized formula is:

$$O'_{ij} = \frac{O_{ij} - O_{*j}^{min}}{O_{*j}^{max} - O_{*j}^{min}}, \quad O_{ij} \text{ is the raw data, } O'_{ij} \text{ is the data after the dimensionless.} \quad (10)$$

When the indicator is a negative indicator, its standardized formula is:

$$O'_{ij} = \frac{O_{*j}^{max} - O_{ij}}{O_{*j}^{max} - O_{*j}^{min}}, \quad O_{ij} \text{ is the raw data, } O'_{ij} \text{ is the data after the dimensionless.} \quad (11)$$

After the dimensionless original data of each index are made, the obtained index data are averaged:

$$AVE_j = \frac{\sum_{i=1}^n O'_{ij}}{n}, \quad n \text{ is the number of samples.} \quad (12)$$

Sum the indicators under each subsistence capital yields:

$$S_m = \sum_{j=1}^n AVE_j \cdot Wm_j, \quad n \text{ is the number of indicators under this livelihood capital.} \quad (13)$$

3.2 The calculation results of livelihood capital

$$\Delta AVE_j = AVE_j^L - AVE_j^B. \quad (14)$$

$$\Delta S_m = S_m^L - S_m^B. \quad (15)$$

Table 2. Corresponding data before poverty alleviation

Livelihood capital	Index	$AVE_j^B \cdot Wm_j$	$AVE_j^L \cdot Wm_j$	$\Delta AVE_j \cdot Wm_j$	S_m^B	S_m^L	ΔS_m
Natural capital (N)	Per capita cultivated land area (N1)	0.0820	0.1036	0.0216	0.2709	0.2790	0.0081
	The quality of cultivated land (N2)	0.1391	0.1236	-0.0155			
	Crop type (N3)	0.0498	0.0518	0.0020			
Physical capital (M)	Per capita housing area of household members(M1)	0.0466	0.0555	0.0089	0.3166	0.3993	0.0827
	The housing structure of family (M2)	0.1087	0.1765	0.0678			
	Total assets of household production tools (M3)	0.1314	0.1368	0.0053			
	Public infrastructure (M4)	0.0299	0.0305	0.0007			
Financial capital (F)	Per capita operating income (F1)	0.0924	0.0908	-0.0015	0.3471	0.3808	0.0337
	Per capita transfer income (F2)	0.0066	0.0035	-0.0031			
	Per capita wage income (F3)	0.0594	0.0642	0.0048			
	Whether to get the government's poverty alleviation loan (F4)	0.0029	0.031	0.0281			
	Debt status (F5)	0.1859	0.1913	0.0054			
Social capital (S)	Communication fee (S1)	0.0226	0.0317	0.0091	0.4420	0.4683	0.0262
	Relationship with neighbors and village cadres (S2)	0.2662	0.2891	0.0229			
	Relationship with friends and relatives (S3)	0.1532	0.1474	-0.0058			
Human capital (H)	The proportion of labor force to the total number of households (H1)	0.0252	0.0242	-0.0010	0.4141	0.5713	0.1752
	The education level major labor force (H2)	0.0773	0.0789	0.0016			
	Health status of family member (H3)	0.0854	0.1016	0.0162			
	Employment situation (H4)	0.2149	0.2929	0.0780			
	Participation in farming and training (H5)	0.0113	0.0737	0.0625			
Total score before poverty alleviation	1.7907	Total score after poverty alleviation	2.0987	Δ Total score	0.3080		

3.3 Summary of results

There is no negative growth in livelihood capital, and all five livelihood capitals are growing positively. The total score increase by 0.3080. Among them, natural capital score increased by 0.0081, material capital score increased by 0.0827, financial capital score increased by 0.0337, social capital score increased by 0.0262, and human capital score increased by 0.1752. Human capital score increased the most while natural capital score increased the least.

In the indicator layer, there are 5 indicators of negative growth (1 natural capital indicator, 0 physical capital indicator, 2 financial capital indicators, 1 social capital indicator, 1 human capital indicator), including the quality of cultivated land, per capita operating income, per capita transfer income, relationship with friends and relatives and the proportion of labor force to the total number of households, and the other 15 indicators all changed positively.

3.4 Interpretation of result

3.4.1 Poverty alleviation has little impact on natural capital

Natural capital, as the basis of peasant life, is an important part of improving the status of their subsistence capital. However, among the sample of poor households, this capital has the smallest improvement. The optimization of this element is hindered by factors such as solidification of land allocation, relatively stable land quality and output, single choice of crops, and high cost and risk of

crops replacing. The government should promote industrial integration and cooperate with villagers' committees to introduce village and township industries. The government and the collective jointly contribute to share the risks of farmers, guide farmers to integrate land, improve crops, use mechanized production, and improve the use of small-scale automated agricultural tools.

3.4.2 The improvement of human capital is the core element of poverty alleviation

Except for the proportion of labor force to the total number of households, the other four indicators of human capital all rose, and the two indicators of employment situation and participation in farming and work training changed greatly. In the process of field inspection, farming and work training has become one of the mandatory work of poverty-stricken villages, and it do helps. Therefore, the government and village collectives need to guide farmers to optimize the structure and resource allocation of planting and animal husbandry. At present, rural farmers are generally older, and the proportion of rural labor is declining. Unhealthy physical conditions lead to their loss of labor.

3.4.3 The retaining, modification and relocation of poverty-stricken areas have achieved remarkable results

The natural condition of the rural areas of Qinba Mountain is bad, and some rural households are in the remote part of the mountain, of which the roads are impassable and the communication is inconvenient. In the study, the housing farmhouses, with less damage and structural hazards, but the environment is still livable, were retained and modified; the pilot project to resettle residents in poor areas with a harsh substantial environment, fragile ecology, and the houses at remote location with damage that affected safety will be carried on. The study found that farmers who were too far away from the relocation were far from their original land, which caused inconvenience to farmers, and the change actually increased the burden of life.

3.4.4 The income source structure is increasingly reasonable

Per capita operating income and per capita transfer income decline, per capita wage income rises. On the fact that the age of rural households generally rise, it is unrealistic for farmers to generate large amounts of income through industries with low value-added industries such as basic planting and breeding industry. In the process of poverty alleviation, due to the transformation of village committees, the renovation of dangerous houses, the construction of industrial parks, the employment of village collective industries, the introduction of industries, and the establishment of public welfare posts, a large number of farmers have entered enterprises and institutions in villages and towns, and obtained relatively stable wage income, thus the income structure improved.

4. Optimization suggestion

4.1 Stabilizing human capital factors and retaining talent while realizing full employment

Through the introduction of industry and the construction of village collective industries, positions are set up in villages and towns to promote the employment of farmers and attract young and middle-aged people to return home for employment. Through the considerable income level, convenient employment channels, adequate jobs, and closer return distance, fully retain the relocated personnel to avoid rural hollowing. Through the convenient employment, full employment, and continuous employment, the human capital elements, which are already improved, will be stabilized.

4.2 Pay attention to income stability and strengthen basic living guarantee

Long-term stable income is an important way for farmers to steadily to shake off poverty and reduce the risk of poverty-returning. The health status of rural households mainly declines with age, so it is necessary to ensure that the children who go out to work are responsible for the pension; and those who have no children or special circumstances can be guaranteed normal life through government transfer payment methods such as five guarantees and low insurance. Helping funds should not be used suddenly, occasionally, or temporarily. It is not possible to count the one-off subsidy as part of the income of the farmers. And it is necessary to promptly absorb the farmers into

the collective economy, related enterprises and public welfare posts, etc. Replace farming with work to ensure the long-term stability of farmers out of poverty.

4.3 Pay attention to industrial development and pragmatical training

The rural collective economy should be effective in the long run, and the crops planted by the “farmers should be guided to ensure long-term benefits and gradually reduce the “short, flat and fast” performance projects. Actively guide the whole village to develop large-scale farming and breeding industries, and develop high-value crops. Rely on agricultural insurance or joint contribution of villages and towns to share the production risks of farmers. Forming the stable system of industrial poverty alleviation by introduction of industry, the development of village collective industry, and farmers participate in enterprise work as labor force. Reduce frequent changes in crop or village-wide breeding objectives, and achieve “one-time planting, long-term effective”.

4.4 Optimize natural capital elements and properly reconstruct land distribution

After the local government started poverty alleviation work, some poor households moved to the towns or entered the towns to work, resulting in some land being idle. In addition, idle land caused by poor health of farmers often occurs. The government can coordinate with the villagers' committees to properly integrate the land, solve the problem of the land being too far away due to the ex-situ policy and the lack of production materials of the households who enjoy the five guarantees and low insurance. And assist in the development of the village collective industry and make full use of the land resources.

5. Conclusion

The poverty in the Qinba Mountain area covers a wide range in large numbers, the causes are complex, and it is difficult to get rid of. In the perspective of sustainable livelihoods, this paper examines the existing livelihoods capital status of farmers, identifies weak links, and formulates corresponding livelihood strategies to help farmers implement stable poverty alleviation. It will help Qinba Mountain to gradually and steadily wipe out poverty, and provide examples for other poverty-stricken regions to promote the improvement of living standards.

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