Evaluation of the Compactness of Benefit Coupling of Farmers’ Cooperatives in Poor Areas: Based on the Date in Qinba and Wumeng Areas in Sichuan, China

Xinhong Fu*, Zhijing Du*, Xiyu Zhang, Xue Chen and Jianqiang Li*
College of Management, Sichuan Agricultural University, Chengdu, China

*Corresponding author e-mail: 153015239@qq.com, 475994803@qq.com, 156301522@qq.com, 421709417@qq.com, 870631865@qq.com

Abstract. As a new type of agricultural management, farmers' cooperatives play a critical role in the development of rural industries and the promotion of farmers' poverty alleviation. However, in recent years, the problem of non-standardization and “empty shelling” of farmers’ cooperatives has seriously restricted the common development of their interests with members. Based on the field research of farmers' cooperatives in the poverty-stricken areas of Qinba and Wumeng in Sichuan, this paper estimates the close relationship of the interests of farmers' cooperatives in poor areas in Sichuan and summarizes the problems of farmers' cooperatives in poor areas. The empirical results show that the poverty alleviation funds invested in the cooperatives have a positive effect on the compactness of benefit coupling, that the cooperatives are more closely related to the degree of closeness, and the sales linkage and rebate linkage are mainly semi-closed. The degree of frequency of the looseness of the equity linkage is high, and the tightness of service is mainly loose. Therefore, it is suggested that cooperatives should integrate resources, quantify equity, and clarify property rights to strengthen the close connection with the interests of members, and drive farmers to lift poverty and increase income.

1. Introduction

Eliminating poverty and building a well-off society in an all-round way are the focus of the work of “agriculture, rural areas and farmers” in the new era, and an important basis for the implementation of the rural revitalization strategy. At present, China is making every effort to promote poverty alleviation. However, the special resource endowment, social structure and geographical location of poverty-stricken areas have restricted the use of poverty alleviation funds by individual small-scale farmers to develop poverty-stricken industries, and it is difficult to complete the transformation from “transfusion” to “hematopoietic”. Therefore, considering how to organize a large number of small and scattered small farmers, and the better use of poverty alleviation funds to develop the industry is a breakthrough to solve the problem. Farmers’ cooperatives (hereinafter referred to as “cooperatives”) play an increasingly important role in improving the organization and intensification of farmers' production, promoting the commercialization of agricultural products, driving farmers to increase their income, and achieving effective docking between small farmers and the market [1, 2]. By the end of April 2019, there were 2.207 million farmers' cooperatives registered in the country, and 100 million
households had entered the society, accounting for 48.5% of the total number of farmers in the country. Cooperatives have become an important organizational carrier for promoting China's agricultural modernization.

The goal of a cooperative is to serve or create value for stakeholders [3]. Among the stakeholders, as an important component, the government, cooperatives, and poor members can achieve mutual goals and maximize the benefits of poverty alleviation. Many scholars have conducted research on the interests of cooperatives. For example, Ji & Chen (2002) proposed that “the connection of stakeholder relations” determines the interest linkage mechanism between cooperatives and internal and external entities [4]. Therefore, the development of cooperatives cannot be separated from “investment or participation of various stakeholders”; Li (2015) pointed out that the members are very important stakeholders by reconstructing the theoretical framework of cooperative development; the issue of interest linkage mechanism is an important basis for the interests of cooperatives' stakeholders [5]. Zhou & Kong (2017) used multiple cases to conduct comparative analysis, revealing the impact of asset specificity on cooperative income distribution and its mechanism of action[6]; Shen & Jia (2016) used “agricultural co-operation system in Chongzhou city” as an example to construct a “grain household-peasant professional manager-cooperative” system as a benefit linkage mechanism[7]; Yan & Feng (2015) constructed the four-in-one interest linkage mechanism called "contract + service + Return + Dividend”[8]. How to construct an effective interest linkage mechanism to ensure the effectiveness of various stakeholders, some scholars put forward suggestions for cooperatives to strengthen the protection of their members' interests [9]; some scholars have proposed to transfer benefits from profit distribution mechanisms, to build a regulatory system. The establishment of an audit system and a credit supervision system to strengthen the close relationship between the interests of cooperatives and members [10]. Although many scholars have conducted extensive discussions on the cooperative mechanism of cooperative interest, there is still a lack of relevant empirical analysis and research on the measurement and evaluation of the closeness of interest linkages, especially in poor areas. Therefore, this study will focus on the poverty-stricken areas of Qinba and Wumeng based on stakeholder theory.

Qinba mountain area and Wumeng mountain area are two typical poverty-stricken areas in Sichuan. The development of cooperatives faces many influences. Most cooperatives are not standardized. It does not play its role as a new type of business entity. However, with the investment of poverty alleviation funds based on the cooperatives' absorption of poor households, the degree of heterogeneity among cooperative members has further increased, which inevitably changes the way of cooperative interests. Poor members and non-poor members have obvious differences in interest claims due to factors such as income sources and labor structure, and the interests relationship between cooperatives and their members has changed. The interest linkage mechanism is the constraint relationship and adjustment function of each economic entity in terms of interests, and it can be divided into two aspects: interest creation and benefit distribution. The interest distribution mechanism is the core content of the interest linkage mechanism. Different ways of interest linkage will have an impact on the income level of farmers. In the long run, the way of interest linkage will also have an impact on the stability of cooperatives, and the stability of cooperatives will eventually have an impact on farmers' continued income growth. Therefore, it is of great significance to further expand the effectiveness of poverty alleviation and promote the development of poverty alleviation and cooperative development in the context of the integration of poverty alleviation funds in the context of the integration of poverty alleviation funds. In view of this, based on the survey data of 68 cooperatives in poverty-stricken areas in Sichuan, this paper intends to answer the question of how closely the interest linkages in the development of cooperatives in poverty-stricken areas in Sichuan, and how to improve the closeness of the interests of cooperatives in poverty-stricken areas in Sichuan.

2. Measurement and type of cooperatives interest linkage
According to the field research, the cooperatives and their members have the following interests. The first is that there is only a “purchase and sales” relationship, that is, the members sell the products to
the cooperatives; the second is to sign the sales contracts, and the cooperatives are pre-production and production. After the middle and post-production, the members provide services to the members. The members are produced according to the contract and sell the products to the cooperatives. Third, the members participate in the cooperatives through land, capital, and manpower. The cooperatives conduct unified production and unified management, and dividends and rebates are made at the end of the period. In practice, most cooperatives not only have a single model of interest linkage, but also a variety of models coexisting phenomena, and the closeness of the interest linkage model is closely related to the standardization of cooperatives. Therefore, the classification of cooperative interest linkage is mainly based on the following considerations: First, the cooperative interest distribution form, including dividends by share, surplus distribution, and withdrawal of provident fund; second, the form of cooperation between cooperatives and members, including the provision of services and contracts, contracts, market transactions, etc. Therefore, the degree of interest connection of cooperatives can be divided into loose type, semi-compact type and compact type (see Table 1).

Loose interest linkage is mainly for the market transaction type, production service type connection, the agricultural products produced by the cooperatives and members are the link, and the interests of the two parties mainly involve unpaid (or offset) service connection and sales behavior linkage. Some cooperatives and members signed a sale and purchase agreement to reach a sale and purchase contract; some cooperatives provided agricultural resources services and technical support to the members to help them scientifically and efficiently produce and improve the quality of agricultural products. The cooperatives purchased the agricultural products of the members according to the market sales and development needs. Therefore, this form of interest linkage is loose, which is the most primitive state of interest linkage before the cooperative is embedded in poverty alleviation funds.

Semi-closed interest linkage is mainly contractual and cooperative. Cooperatives and members, in addition to signing sales contracts, providing agricultural production services, and providing production materials at low prices, also involve cooperatives as brokers to establish employment relationships with members, and to transfer members’ land and anti-lease. Packages, etc., to clarify the distribution of interests and responsibilities and obligations of members and cooperatives. On the one hand, cooperatives can manage income through the transfer of land, and members can also earn income from cooperative workers. On the other hand, cooperatives adopt anti-rent and reverse package methods, and members regain control of land, and still have individual independence, and their production interests and the cooperative is bound, and the members are managed by the cooperative and accept the services provided by the cooperative. With the integration of poverty alleviation funds into cooperatives, this is the main form of current interest linkage development and a more stable interest relationship, but the distribution of interests will only involve some members.

Tight interest linkage is a contractual, cooperative, and equity-type linkage, and belongs to the advanced form of interest linkage. Cooperatives and members finally established a community of interests of “resource sharing, benefit sharing, and risk sharing”. After the poverty alleviation funds are embedded in the cooperatives, they will absorb the participation of the poor members and, with the support of the policies, develop agricultural industrialization, and the poor members will benefit from them and ensure the stable and stable economic income of the poor members.

Table 1. The Farmers’ cooperative interests close degree.

| Tightness type       | Loose interest linkage | Semi-closed interest linkage | Tight interest linkage |
|----------------------|-----------------------|------------------------------|-----------------------|
| Quantity             | 8                     | 45                           | 3                     |
| Percentage           | 14.29                 | 80.36                        | 5.36                  |

3. Data and variable selection

3.1. Data

The data used in this study were derived from the field research conducted by the research team in July 2016 and May 2017 in 16 districts and counties (national and provincial poverty counties) in 6
cities in Qinba and Wumeng poverty-stricken areas of Sichuan. Consult the relevant staff of the municipal and county agricultural bureaus, poverty alleviation and immigration work bureaus, and agricultural economic management stations, and go to the cooperatives to meet with the directors and members to collect data. In order to ensure the scientificity and rationality of the sample, this paper adopts the method of stratified sampling, and selects the districts and counties with relatively wide coverage of poverty alleviation funds in the poverty-stricken areas of Qinba and Wumeng poverty-stricken areas in Sichuan, and the cooperative development is relatively good. 4 to 5 cooperatives were selected, mainly involving planting and breeding cooperatives. A total of 71 cooperative questionnaires were distributed, 71 questionnaires were returned, and invalid questionnaires such as inconsistencies and incorrect errors were excluded. Among them, 68 were valid questionnaires, and the effective rate of the questionnaire was 95.77%. Among the sample cooperatives, 56 were embedded in special financial poverty alleviation funds, and 12 were not embedded in poverty alleviation funds. The effective sample distribution is shown in Table 2.

### Table 2. The Survey and effective sample distribution.

| City      | County (District) | Cooperatives sample | Quantity | Percentage |
|-----------|-------------------|---------------------|----------|------------|
| Guangyuan | Cangxi            |                     | 5        | 7.35       |
|           | Wangcang          |                     | 6        | 8.82       |
|           | Jiange            |                     | 4        | 5.88       |
|           | Zhaohua           |                     | 3        | 4.42       |
| Guang’an  | Yuechi            |                     | 3        | 4.42       |
|           | Guang’an          |                     | 4        | 5.88       |
| Nanchong  | Langzhong         |                     | 3        | 4.42       |
|           | Nanbu             |                     | 2        | 2.94       |
| Bazhong   | Bazhou            |                     | 4        | 5.88       |
|           | Enyang            |                     | 2        | 2.94       |
|           | Pingchang         |                     | 4        | 5.88       |
|           | Tongjiang         |                     | 3        | 4.42       |
|           | Nanjiang          |                     | 4        | 5.88       |
| Yibin     | Xingwen           |                     | 8        | 11.76      |
|           | Pingshen          |                     | 5        | 7.35       |
| Leshan    | Muchuan           |                     | 8        | 11.76      |
| Total     |                   |                     | 68       | 100        |

3.2. Variable selection

The interest relationship between the cooperative and its members is an internal connection, which is mainly manifested in the interest-related relationship between the cooperative and the members. Some scholars have studied the form of interest linkage. For example, Sun (2008) believed that the ways of connecting interests between cooperatives and members are mainly: the members pay the shares to the cooperatives, the cooperatives provide various services and preferential trading conditions to the members, and the contract and Carry out income distribution, etc. [10]; Song (2012) believed that the cooperative relationship between cooperatives and members is based on service-related and contractual associations. Type, property rights related [11]. Based on the field research of cooperatives in poverty-stricken areas in Sichuan, this paper summarizes the types of interest linkages and indicators selection in poverty-stricken areas based on previous researches on the interests of cooperatives in cooperatives [12]. (Indicators and variables are shown in Table 3)

3.2.1. Service connection. The agricultural production technology in poverty-stricken areas is relatively low, mainly in traditional agricultural cultivation; since the individual farmers’ land is more
dispersed and it is difficult to mechanize production, the degree of agricultural mechanization is relatively low. In order to ensure product quality and meet market demand, cooperatives require members to produce according to uniform standards, unified seedlings and unified agricultural materials. Farmers join the cooperatives to obtain agricultural production technical guidance and various services provided by cooperatives to improve the quality of agricultural products. Therefore, the main selection of technical guidance services, low-cost provision of agricultural materials and guaranteed quality and provide agricultural materials are selected as measurable variables.

3.2.2. Sales linkage. Farmers join cooperatives to ensure that the agricultural products they produce can be sold. Through the contractual relationship with the cooperative, the members form a cooperative and order-based production model to ensure the sales channels of agricultural products. Inaccessible traffic in poor areas leads to poor access to external market information and blocked information resources of farmers. In addition, the prices of agricultural products are susceptible to external factors such as weather and environment, resulting in unstable agricultural prices and sometimes fluctuating. Based on this, the cooperative establishes a sales linkage mechanism, which can effectively solve the problem of the sales of the agricultural products of the members. Therefore, it mainly selects four indicators, namely, the signing a selling contract, the protection price acquisition, the market price acquisition and the higher than market price acquisition as the measurable variables.

3.2.3. Equity linkage. With the expansion of the cooperative business and the expansion of its scale, in order to raise capital, most cooperatives have absorbed some members to participate in the stock. In this way, while the cooperatives obtain the resources of the members, including capital, labor, and land, the members can share the benefits and dividends of the cooperatives and obtain the income from the cooperatives. Therefore, equity linkage is a mutually beneficial bond. In the context of the embedding of poverty alleviation funds, in addition to the general ability of members to participate in shares, the government also encourages cooperatives to absorb poor members and promote the development of poor members. Therefore, two indicators of share dividend and interest on shares are mainly selected as measurable variables.

3.2.4. Rebate connection. In the context of the embedding of poverty alleviation funds, in addition to establishing agricultural product order sales models, the most important thing is that the poor members can participate in the shareholding, participate in the cooperative's interest distribution, and be able to obtain the surplus distribution according to the proportion of their shares in the cooperative. At the same time, the poverty alleviation funds enable the cooperatives to have sufficient capital to gradually develop and grow; while the poor members belong to the true members of the cooperatives, and the cooperatives give the members a second rebate according to the operating benefits. Therefore, the cooperative and the members establish a rebate relationship, increase the economic income of the members, and effectively play the sustained role of poverty alleviation funds. Therefore, the two indicators of earnings distribution and rebate by transaction volume are mainly selected as measurable variables.

3.2.5. Cooperative connection. The land of farmers in poverty-stricken areas is fragmented and the resources of individual farmers are very limited, making it difficult to form large-scale production. Cooperatives play an important role in the economic development of poverty-stricken areas: on the one hand, cooperatives can integrate labor in poverty-stricken areas and solve their employment problems. On the other hand, cooperatives can integrate scattered resources and integrate intensive and large-scale land by integrating the resources of individual farmers. Production and operation. Cooperatives mainly provide standards-consistent technologies and production methods to ensure that agricultural products can be unified in standard production and effectively interface with the market environment. Therefore, the four indicators of broker role, hiring labor, land rent and anti-lease and contracting are selected as measurable variables.
Table 3. The farmers’ cooperative interests close degree evaluation system framework.

| Interest linkage type          | Indicators                                      | Variables description |
|-------------------------------|-------------------------------------------------|-----------------------|
| Service connection            | $A_1$: Technical guidance service               | 0=No;1=Yes           |
|                               | $A_2$: low-cost provision of agricultural materials | 0=No;1=Yes           |
|                               | $A_3$: Guaranteed quality and provide agricultural materials | 0=No;1=Yes           |
| Sales linkage                 | $B_1$: Signing a selling contract                | 0=No;1=Yes           |
|                               | $B_2$: Protection price acquisition              | 0=No;1=Yes           |
|                               | $B_3$: Market price acquisition                  | 0=No;1=Yes           |
|                               | $B_4$: Higher than market price acquisition      | 0=No;1=Yes           |
| Equity linkage                | $C_1$: Share dividend                            | 0=No;1=Yes           |
|                               | $C_2$: Interest on shares                        | 0=No;1=Yes           |
| Rebate connection             | $D_1$: Earnings distribution                     | 0=No;1=Yes           |
|                               | $D_2$: Rebate by transaction volume              | 0=No;1=Yes           |
| Cooperative connection        | $E_1$: Broker role                               | 0=No;1=Yes           |
|                               | $E_2$: Hiring labor                              | 0=No;1=Yes           |
|                               | $E_3$: Land rent                                 | 0=No;1=Yes           |
|                               | $E_4$: Anti-lease and contracting                | 0=No;1=Yes           |

4. Research results and discussion

This paper mainly uses Principal Component Analysis (PCA) to measure the closeness of cooperative interest linkage, and consolidates the first-level indicator factor that mainly reflects the closeness of interest linkage in the selected secondary indicators. Using these main factors to measure, this can be more scientific and accurate. The actual level of development reflecting the closeness of the interests of cooperatives in poverty-stricken areas in Sichuan.

4.1. Descriptive statistics

Among the cooperative ways of cooperative interest in poverty-stricken areas, there are cooperatives with poverty alleviation funds and cooperatives without poverty alleviation funds, and the frequency of each connection method is different. In the service connection, the most frequently used technical guidance services accounted for 85.71% and 83.33% respectively. Because farmers in poverty-stricken areas lack agricultural production technology, regardless of whether the cooperative has poverty alleviation funds, in terms of technical training. More emphasis is placed; followed by the provision of agricultural materials with quality guarantees, and 47 cooperative cooperatives with poverty alleviation funds provide agricultural materials for the quality of their members. In terms of sales behavior linkage, the proportion of cooperatives with poverty alleviation funds and cooperatives and members without poverty alleviation funds was 67.86% and 58.33%, respectively, and the proportion of cooperatives purchased at market prices was 75% and 66.67% respectively. Sixteen cooperatives with poverty alleviation funds and four cooperatives without poverty alleviation funds purchased agricultural products at higher than market prices. In terms of cooperation, most cooperatives and members with poverty alleviation funds have established employment relations, accounting for 92.86% of the total sample, indicating that most cooperatives are helping to solve the employment problem of rural laborers in poverty-stricken areas, and only eight cooperatives adopt the role of broker. The way to cooperate with the members, 80.36% of the cooperatives pay the land rent of the members; in contrast, cooperatives without poverty alleviation funds are relatively poor in terms of cooperation, and the most frequent employment relationship is only 33.33%. In the equity linkage and rebate linkage, cooperatives with poverty alleviation funds are relatively poor in terms of cooperation, and the most frequent employment relationship is only 33.33%. In the context of the interest linkage mode, the second rebate is only 14.29% according to the transaction volume (the amount of the benefit). The cooperatives without poverty alleviation funds without this method of interest linkage, cooperatives with poverty alleviation funds accounted for 26.79%, 21.43%, and 41.07% of the total sample size in terms of dividends, dividends, and earnings distribution, respectively. The data show that cooperatives with poverty alleviation funds have a relatively higher level of interest linkage than cooperatives without poverty alleviation funds. In the context of the
embedding of poverty alleviation funds, most cooperatives have established “semi-closed” interest linkages, and “closely” interest linkages are relatively few, while cooperatives without poverty alleviation funds mainly present “loose” interest linkages (see Table 4).

Table 4. Comparison of distribution of benefit coupling methods of farmers’ cooperatives.

| Indicators | Poverty alleviation funds | No poverty alleviation funds |
|------------|---------------------------|----------------------------|
|            | Quantity | Percentage | Quantity | Percentage |
| A1         | 48 | 85.71 | 10 | 83.33 |
| A2         | 43 | 76.79 | 6 | 50.00 |
| A3         | 47 | 83.93 | 9 | 75.00 |
| B1         | 38 | 67.86 | 7 | 58.33 |
| B2         | 26 | 46.43 | 6 | 50.00 |
| B3         | 42 | 75.00 | 8 | 66.67 |
| B4         | 16 | 28.57 | 4 | 33.33 |
| C1         | 15 | 26.79 | 3 | 25.00 |
| C2         | 12 | 21.43 | 2 | 16.67 |
| D1         | 23 | 41.07 | 2 | 16.67 |
| D2         | 8 | 14.29 | 0 | 0 |
| E1         | 10 | 17.86 | 1 | 8.33 |
| E2         | 52 | 92.86 | 4 | 33.33 |
| E3         | 45 | 80.36 | 5 | 41.67 |
| E4         | 22 | 39.29 | 2 | 16.67 |

Note: From A1 to E4 in this table have the same meaning in Table 3, and the same below.

4.2. Empirical results

4.2.1. Feasibility test. Bartlett and KMO sphere inspection. In order to ensure the scientificity, accuracy and stability of the empirical model, the influence of the data dimension difference on the results is minimized. This paper selects the power factor method to optimize the data. The Bartlett and KMO spheres were tested with SPSS22.0, and the Bartlett sphere test was significant (see Table 5), scilicet: P<0.001. The KMO values of all the measurement dimension indicators were all greater than 0.5, and the general KMO value was greater than 0.5. The results show that the independence between the indicators data satisfies the preconditions of factor analysis. Therefore, the indicator variables satisfy the structural validity test and are applicable to principal component analysis.

Table 5. Structural of inspection results.

| Indicators | KMO | Bartlett’s Test |
|------------|-----|-----------------|
| A1         | 0.518 | 6.215 |
| A2         |     |                |
| A3         |     |                |
| B1         | 0.653 | 7.178 |
| B2         |     |                |
| B3         |     |                |
| B4         |     |                |
| C1         | 0.6 | 6.559 |
| C2         |     |                |
| D1         | 0.771 | 10.327 |
| D2         |     |                |
| E1         | 0.767 | 10.016 |
| E2         |     |                |
| E3         |     |                |
| E4         |     |                |
4.2.2. **Measure process.** Extract the principal component factor. In this paper, the orthogonal rotation method with Kaiser Standardization is selected, and five principal component factors are determined according to the principal component load matrix model after rotation (see Table 6).

Table 6. Principal component extraction results.

| Variables | Component |
|-----------|-----------|
|           | F1 | F2 | F3 | F4 | F5 |
| A1        | 0.663 |
| A2        | 0.638 |
| A3        | 0.595 |
| B1        | 0.594 |
| B2        | 0.55  |
| B3        | 0.639 |
| B4        | 0.729 |
| C1        | 0.681 |
| C2        | 0.737 |
| D1        | 0.559 |
| D2        | 0.565 |
| E1        | 0.523 |
| E2        | 0.68  |
| E3        | 0.772 |
| E4        | 0.544 |

Determine the principal component factor weights. As can be seen from Table 7, the weight of each principal component is calculated using the cumulative variance contribution rate, and the calculation equation is: the weight of each principal component equal the cumulative contribution rate of each principal component divided by the sum of the cumulative contributions of the five principal components cumulative variance.

Table 7. Cumulative results.

| Component                | Extraction sums of squared loadings | % of Variance | Cumulative % |
|--------------------------|------------------------------------|---------------|--------------|
| F1: Service connection   | 20.752                             | 20.752        |              |
| F2: Sales connection     | 14.608                             | 35.36         |              |
| F3: Equity connection    | 17.117                             | 52.477        |              |
| F4: Rebate connection    | 25.38                              | 77.857        |              |
| F5: Cooperative connection | 17.093                           | 94.95         |              |

Construct a calculation equation for the total score. According to Table 6, each principal component factor can be derived, and the equation of each principal component factor is written as follows:

\[ F_1 = 0.663 \times A_1 + 0.638 \times A_2 + 0.595 \times A_3 \]  
\[ F_2 = 0.594 \times B_1 + 0.55 \times B_2 + 0.639 \times B_3 + 0.729 \times B_4 \]  
\[ F_3 = 0.681 \times C_1 + 0.737 \times C_2 \]  
\[ F_4 = 0.559 \times D_1 + 0.565 \times D_2 \]  
\[ F_5 = 0.523 \times E_1 + 0.68 \times E_2 + 0.772 \times E_3 + 0.544 \times E_4 \]
In the equation, $F_1, F_2, F_3, F_4, F_5$ respectively represent 5 principal components. Based on the five principal component equations, the basic equation of the total score is obtained according to the corresponding weights:

$$F = \frac{20.752*F_1 + 14.608*F_2 + 17.117*F_3 + 25.38*F_4 + 17.093*F_5}{94.95}$$

(6)

4.2.3. Empirical results and discusses. According to the calculation equation of the total score $F$, it is possible to obtain the scores of $F_1, F_2, F_3, F_4, F_5$ and the cooperative associations of 16 national and provincial poverty-stricken counties (districts) in the poverty-stricken areas of Qinba and Wumeng in Sichuan. At the same time, all scores are normalized to the maximum and minimum values to get the final actual score. In order to facilitate the consistency of the distribution criteria of each interval, the standardization process is expanded by 3 times according to the actual variables, and finally the score is assigned. This paper divides the close relationship of the interests of different cooperatives in poverty-stricken areas in Sichuan into three types. The total scores of $F_1, F_2, F_3, F_4, F_5$ and $F$ are assigned to 1 in the interval $(0, 1)$, indicating that the degree of closeness is loose; The total score was assigned to 2 in the interval $(1, 2)$, indicating that the degree of tightness was semi-closed; the total score was assigned 3 in the interval $(2, 3)$, indicating that the tightness was tight (see Table 8).

| Component | Loose interest linkage | Semi-closed interest linkage | Tight interest linkage | Total |
|-----------|------------------------|----------------------------|------------------------|-------|
|           | Quantity | Percentage | Quantity | Percentage | Quantity | Percentage | Quantity | Percentage |
| $F_1$     | 22       | 39.28      | 17       | 30.36      | 17       | 30.36      | 56       | 100       |
| $F_2$     | 19       | 33.93      | 25       | 44.64      | 12       | 21.43      |          |           |
| $F_3$     | 23       | 41.07      | 25       | 44.64      | 16       | 28.57      |          |           |
| $F_4$     | 15       | 26.79      | 25       | 44.64      | 16       | 28.57      |          |           |
| $F_5$     | 1        | 1.79       | 3        | 5.36       | 52       | 92.85      |          |           |
| $F$       | 8        | 14.29      | 45       | 80.36      | 3        | 5.36       |          |           |

Note: $F_1, F_2, F_3, F_4, F_5$ and $F$ in this table have the same meaning in Table 7.

According to Table 8, we can know that under the perspective of embedding poverty alleviation funds, 80.36% of the cooperatives' interest linkages are semi-closed, and loose and compact types only account for 14.29% and 5.36%. Based on the overall situation, the current close cooperation of the cooperatives in poverty-stricken areas in Sichuan is in a semi-tight state. There may be two reasons for this phenomenon: First, because of the sample cooperatives surveyed, most cooperatives are in the early stage of establishment, and the poverty alleviation funds are not embedded for a long time. They are still in the stage of development, and the relevant management systems still need to be improved; most cooperatives only exist. One or two ways of connecting interests will inevitably affect the closeness of the cooperative's comprehensive interests. Second, the Sichuan cooperatives have relatively low overall development relative to Zhejiang and Jiangsu. In particular, this paper studies poverty-stricken areas. The development of cooperatives is relatively lagging behind, especially in terms of equity linkages and rebates, and the closeness of cooperatives in poor areas is lower.

In the cooperative interest linkage mode, the distribution of the first four types of linkages is relatively uniform, indicating that cooperatives in poverty-stricken areas in Sichuan all involve one of the linkage models. The main purpose of the existence and persistence of cooperatives is to meet the needs of members for income. The reasonable connection mode determines its nature and efficiency. Different farmers and different income needs determine that cooperatives should implement various forms of interest linkage. By establishing a democratic system of economics and continuing to reform itself to expand its business scope, it lays the foundation for the creation of a reasonable interest linkage mechanism. Among the sample cooperatives, 52 have cooperative links, indicating that with the reform of the land property rights system, most farmers began to transfer land management rights,
and transferred idle land to cooperatives to obtain land rental income. At the same time, the number of cooperatives in poverty-stricken areas has increased and standardized development, and the demand for labor has also increased. Most farmers, in addition to working at home, are still working as cooperatives. However, due to the lack of interest linkages in the sample cooperatives, the overall interest linkage of the cooperatives in poverty-stricken areas in Sichuan is semi-closed.

5. Conclusion

Based on the survey data of 68 cooperatives in 16 districts and counties in the poverty-stricken areas of Qinba and Wumeng poverty-stricken areas in Sichuan, based on the descriptive analysis and comparative analysis of field research data, the Principal Component Analysis method was used to measure cooperatives in poverty-stricken areas in Sichuan. The closeness of interest linkage shows that: (1) Poverty alleviation funds have a positive impact on the closeness of cooperative interest linkages: before the poverty alleviation funds are embedded, the closeness of the interests of cooperatives in poverty-stricken areas in Sichuan is loose. After the poverty alleviation funds are embedded, the interests are closely linked. The degree is semi-closed and the tightness is improved. (2) The tightness distribution of the five types of interest linkages are uniform, such as cooperative service linkage, sales linkage, equity linkage, rebate linkage, and cooperation linkage, but there are differences in frequency, cooperation and cooperation. The degree of closeness is more frequent, and the tightness of sales linkage and rebate connection are mainly semi-closed; the degree of looseness of equity linkage is more frequent, and the tightness of service connection is mainly loose. Through the conclusion of the study, the following policy implications can be drawn:

First and foremost, consolidate resources and revitalize poverty alleviation funds. We will mobilize the enthusiasm of farmers to achieve scale, intensification, and industrialization, consolidate the industrial base, increase farmers' income, and embark on a new path of precision poverty alleviation. At the same time, for the poverty alleviation funds allocated by the government, the cooperatives should quantify the equity, incite the village collective property and market capital to participate in the cooperatives, promote the maximization of the poverty alleviation funds, and promote the social, economic and ecological benefits of the poverty alleviation funds.

Then, cooperatives should quantify equity and innovative income model. Encourage farmers to transfer land, guide farmers to land shares, effectively integrate various resource elements, and adopt the asset income model of “resources, equity and farmers”. Through land shareholding, change the land management model, realize the centralized operation and benefit improvement of land management rights, complete the selection of regional characteristic industries, concentrate on contiguous and large-scale operation, cultivate agricultural characteristic brands, enhance the cooperative's own ability, and provide guarantee for the continued increase of income of poor households. And share the benefits of cooperation.

Last but not the least, the property rights should be clear and the relevant systems should be improved. The property rights system, profit distribution system, financial management system, and supervision accountability mechanism are the key issues for cooperatives to solve in order to solve poverty. Therefore, the cooperative should establish a classified financial account and a special member account. On this basis, the property rights relationship is clarified, equity is quantified, and the stock fund management system is strictly enforced. At the same time, improve the surplus distribution system, implement distribution in strict accordance with the equity quantitative standards; improve the supervision and accountability mechanism to ensure that poverty alleviation funds are used in practice, and the benefits are distributed fairly and fairly.

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