

Research Article

An Empirical Analysis on Foresters' Livelihood Changes after the Collective Forest Right Reform-taking Yong'an County of Sanming as an Example

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Abstract: In this study, Sanming in Fujian was taken as an example and it mainly analyzed the change of farmers' livelihoods after the collective forest right system reform. The results were found that farmers' livelihood strategy was changed from relying mainly on agricultural production to gradually focus on the accumulation and transformation, of financial capital. Moreover, principal component analysis was used to analyze which factors impacted on farmers' livelihood. The results showed that whether having forestry right certification, forestry land quality, forestry land quantity have become the main performance of farmers livelihood changes.

Keywords: Changes, collective forest right system reform, farmers' livelihoods

INTRODUCTION

The ultimate purpose of rural development is to improve the foresters' livelihood hood. The foresters' livelihood includes many capitals which are connected to the livelihood strategies and results of foresters during production and living practice. As an important reform of production factors, the collective forest right system reform (hereinafter referred to as the "reform") directly influences the foresters' forestry income and their livelihood. In recent years, the reform has become a hot topic in the forestry field in China. Many experts and scholars, such as Lei and Caiyun (2008), Chuanlei (2007), Xiangzhi and Zhen (2008) and Shuifa and Tali (2005) have conducted many qualitative and quantitative researches focuses on the background, motivation, status quo, effects, problems of the reform as well as suggestions for the further implementation of the policy of returning the grain plots to forestry. Some scholars have made an empirical discussion on the influence of reform on the foresters' production activities and income using the econometric methodology. However, they paid little attention to the changes to foresters' livelihood. This article, based on the field survey data, summarized the changes to the foresters' livelihood after the reform and made an empirical analysis with the principal component analysis method and thus presented a certain theoretical and actual value. At present, the term "livelihood" is often used in domestic and foreign thesis and articles on poverty and rural development for different purposes. However, the term is understood and defined differently among different scholars. It is pointed out in New Century Modern Chinese Dictionary that the word

"livelihood" means a method for making a living, basic materials for maintaining the life, life Stefan (2001) points out: livelihood consists of capabilities, assets (including material resources and social resources) and activities required in life. Chambers and Conway (1992) thinks that livelihood is a method for making a living. The foresters' livelihood contains the capabilities required by survival and development, assets (including reserves, resources, claims and enjoyment rights) and activities. Ellis (2000) thinks livelihood includes assets (natural, material, human, financial and social capitals), activities and rights to obtain these assets (subject to the systems and social relations). They determine the acquisition of individual and foresters' life. After analysis, we found that the core of the above definitions is the same, that is, the livelihood consists of assets, rights and activities. Livelihood has richer connotation than work, income and profession.

We think the definition of livelihood made by Chambers and Conway (1992) is more applicable for our research and thus this definition is used in this study. According to their definition, the assets are divided into two parts: tangible assets and intangible assets. Scoones divides assets into four parts, namely the natural capital, the financial capital, the human capital and the social capital. The financial capital defined by Scoones is segmented into financial capital and material capital in current livelihood analysis frameworks. Martha (2003) divide livelihood into five parts: natural capital, financial capital, material capital, human capital and social capital. Many Chinese scholars, including Yunyan and Feng (2005) have made researches on the foresters' livelihood capitals in some

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Table 1: Basic description of household

Survey contents	Details	Proportion (%)	Survey contents	Details	Proportion (%)
Sex	Male	95.0	Main source of income	Planting	19.8
	Female	5.0		Working for others	48.3
Age of householder	≤30	4.3	Family number	Forestry	12.1
	30-40	9.5		Others	19.8
	40-50	39.7		≤3	9.5
	≥50	46.6		4	29.3
Age of correspondents	≤30	5.2	5	28.4	
	30-40	12.9	≥6	32.8	
	40-50	44.0	Average income per year	≤5000	51.0
	≥50	37.9	5000-10000	16.4	
Education background	Illiteracy	11.2	10000-15000	13.8	
	Primary	21.6	≥15000	19.0	
	Junior high	39.7			
	Senior high school	20.7			
	Above senior high school	6.9			

regions of China based on this analysis framework and have made great achievements. In this study, Sanming in Fujian was taken as an example and it mainly analyzed the change of farmers' livelihoods after the collective forest right system reform.

METHODOLOGY

Overview on the studied area and data source:

Overview on the studies area: Yong'an County is at the west of the central Fujian Province, located at the upstream of Shanxi and the transition zone of Wuyi Mountain Range and Daiyun Mountain Range. Its geographical coordinates are E116°56' to E117°47' and N E25°33' to N26°12'. It is adjacent to Datian County in the east, Liancheng and Qingliu in the west, Zhangping and Longyan in the south and Mingxi and Sanyuan in the north. It has a width of 82 km from the east to the west, a length of 71 km from the south to the north and a total area of 2942 km². By the end of 2003, it has a population of 318400, including an nonagricultural population of 171400. There are four residential districts, seven towns and four counties in Sanming City. Yong'an County is an important reform pilot and the project was started at the beginning of 2002 in some villages. By the end of 2012, a total forestry area of 848511 μ were involved in the reform (including collective ecological public-welfare forests of 775884 μ and state-owned ecological public-welfare forests of 72672 μ). Nineteen thousand one hundred and thirty four forest eight parcel certificates were issued, with a total forest area of 2590000 μ and a certificate issuance rate of 96%, among which, 120 certificates were newly issued in 2008 and the total area of 184 parcels was 36520 μ. By the end of 2012, the area of forest land per capita in Yong'an County was 6.65 hm² and the income per capita was 3956 Yuan/person.

Basic information of farmer samples: Considering that the head of a household may be much familiar with his/her own family, the survey objects this time were mainly the heads of households and thereby the

interviewees were mainly males. Among the 232 effective survey samples (Table 1), the heads of household with an age of 50 years old or above accounted for the most part of the interviewees, reaching 46.6%; then, the interviewees with an age within the range of 40-50 years accounted for 44%; and those with an age of 30 years ago or bellow accounted for 5.2%. In terms of education level, most of the interviewees (72, 39.7%) were with an education level of junior high school; there were relevantly fewer illiterate interviewees (26, 11.2%) or interviewees (16, 6.9%) with an education level of senior high school or above. In terms of per capital net income of the family, the families with a per capital net income of RMB 5000 or bellow were the most, accounting for 50.9%. In terms the mains source for family income, most farmers obtained their income by out-migration work, accounting for 48.3% (112 families). Most of the interviewed families had 4 or more family members, accounting for 90.5%. There were 76 families with 6 or more family members, accounting for 32.8%.

ANALYSIS ON THE INFLUENCES OF COLLECTIVE FOREST RIGHT REFORM ON FORESTERS' LIVELIHOOD BASED ON AN EMPIRICAL MODEL

Selection and determination of influence factors:

Explained variables: Because the foresters' income is the most direct and important influence factor to the foresters' livelihood, we can analyze whether the reform influences the foresters' income to confirm whether the reform influences their livelihood. Therefore, the explained variable is defined as "whether the foresters think that the reform influences their income".

Explanatory variable: There are many factors influencing the foresters' income. Based on a field survey and a retrospect on research results recorded in literature, the author classifies the factors influencing the foresters' income into the following aspects: first,

Table 2: Models and basic statistic of households

Variables	Unit or value	Mean value	S.D.	Anticipated influence
Personnel characteristics of the foresters				
X1: the age of the interviewees	Year	53.34	11.44	1
X2: the education degree of the interviewees	Year	5.25	4.54	+
X3: whether having some technical training	Y = 1; N = 0	0.23	1.65	+
Family characteristics variables				
X4: the number of family members	Year	4.44	1.89	+
X5: whether the number of labors accounting for 50% or above of the total family members	Y = 1; N = 0	0.55	1.40	+
X6: whether a family member being a village cadres	Y = 1; N = 0	0.11	0.91	+
X7: whether a family member being a migrant worker	Y = 1; N = 0	0.87	1.58	+
Forestry production characteristics				
X8: the area of forestry land per capita	μ	29.45	66.40	+
X9: the parcels of forestry land	Unit	1.77	1.98	+
X10: the quality of forestry land	Y = 1, N = 0	0.65	2.50	+
Variables related to the forest right system				
X11: whether or not having a forest right certificate	Y = 1, N = 0	0.82	1.98	?
X12: whether the forestry land being allocated appropriately	Y = 1, N = 0	0.55	2.50	?
X13: whether or not joining the forestry cooperation	Y = 1, N = 0	0.69	1.96	+
X14: whether well knowing the contents of forest right system reform	Y = 1, N = 0	0.64	1.79	?
X15: whether involved in the forestry right mortgage loan activity	Y = 1, N = 0	0.25	1.45	?

S.D.: Standard deviation

Table 3: Interpretation of the total variance

Component	Initial value			R ²		
	Total	Variance (%)	Accumulation (%)	Total	Variance (%)	Accumulation (%)
1	4.024	24.904	24.904	4.024	24.904	24.904
2	2.934	20.865	45.770	2.934	20.865	45.770
3	2.387	18.839	64.608	2.387	18.839	64.608
4	2.133	10.901	75.510	2.133	10.901	75.510
5	1.935	7.214	82.724	1.935	7.214	82.724
6	1.088	5.046	87.724	1.088	5.046	87.724
7	0.974	1.907	92.331			
8	0.848	1.640	93.971			
9	0.840	1.500	95.471			
10	0.756	0.950	96.421			
11	0.595	0.880	97.301			
12	0.575	0.717	98.018			
13	0.505	0.711	98.729			
14	0.488	0.709	99.438			
15	0.450	0.562	100.000			

the personnel characteristics of the foresters, including the age and education degree of the interviewees and whether having some technical training; second, family characteristics variables, including the number of family members, whether the number of labors accounting for 50% or above of the total family members, whether a family member being a village cadres, whether a family member being a migrant worker; third, the forestry production characteristics, including the area of forestry land per capita, the parcels of forestry land and the quality of forestry land; fourth, the variables related to the forest right system, including whether or not having a forest right certificate, whether the forestry land being allocated appropriately; whether or not joining the forestry cooperation, whether involved in the forestry right mortgage loan activity and whether well knowing the contents of forest right system reform.

The specific variables and statistics of various influence factors in this model are listed in Table 2.

Based on the analysis above, we confirmed 15 factors influencing the foresters' income. For details, please refer to Table 2. The raw values were processed

with standardized processing method and the proper value and proper vector solution method. SPSS 16.0 was used for the analysis of factor scores and the total score.

Indicator assessment and computation:

- KOMO and Bartlett tests. In the relation matrix of factors before factor analysis, there are values above 1 in the upper half of the above table and many values below 0 in the lower half of the above table, which means that the current 15 factors are greatly related and there is a probability of dimensionality reduction. According to the results of KOMO and Bartlett tests, the KOMO test statistics is 0.871, which is above 0.5. The p value of Bartlett sphericity degree test is 0.043, which is below 0.5. It means that the data in the model is applicable for factor analysis.
- The principal component analysis method is used for extraction. The maximum orthogonal rotation of the standardized Kaiser variance is used for rotation. For details, please refer to Table 3 and 4.

Table 4: Rotated the component scores

Component	1	2	3	4	5	6
X1	0.155	0.215	-0.326	0.230	0.179	0.022
X2	0.178	-0.073	0.359	-0.072	0.040	-0.323
X3	0.016	0.513	-0.122	-0.157	0.106	-0.010
X4	-0.119	0.132	0.031	-0.049	0.226	0.487
X5	-0.180	-0.059	0.087	0.595	-0.081	-0.007
X6	0.132	-0.097	0.014	0.018	0.583	0.151
X7	-0.287	0.044	0.050	0.336	-0.107	0.093
X8	0.162	-0.186	-0.049	0.111	-0.459	-0.031
X9	0.294	0.155	-0.160	0.090	0.159	-0.143
X10	-0.086	0.407	-0.015	0.092	-0.106	0.028
X11	0.451	-0.058	0.037	-0.108	0.016	-0.040
X12	-0.011	-0.118	0.643	0.144	0.059	0.100
X13	-0.020	0.310	0.079	0.312	0.035	-0.081
X14	0.189	-0.214	0.183	-0.023	-0.075	0.411
X15	0.125	-0.006	-0.081	0.202	0.074	0.242

Six general factors with relevant large difference are used to generalize the original 15 factors. The variance contribution rates of the first factor to the six the factor after rotation are 24.904, 20.865, 18.839, 10.901, 7.214 and 5.046%, respectively. The accumulative contribution rate of the six factors is 87.724%, which means the six factors contain much information. The 6 principal components extracted can substitute the original 15 factors and thus dimensionality reduction can be conducted for the original 15 factors.

RESULT ANALYSIS

- The accumulative contribution rate of the first principal component (F1) is 24.904% and it greatly influences the foresters' income. The major factors in this component are whether or not having a forest right certificate and the parcels of forestry land.
The single contribution rate of the second principal component (F2) is 20.865% and its influence is weaker than that of F1. The major factors in this component are whether having some technical training, the quality of forestry land and whether or not joining the forestry cooperation.
The single contribution rate of the third principal component (F3) is 18.839%. The major factors in this component are the age and education degree of the household head and whether the forestry land being allocated appropriately.
The single contribution rate of the fourth principal component is 10.901%. The major factors in this component are whether the number of labors accounting for 50% or above of the total family members and whether a family member being a migrant worker.
The single contribution rate of the third principal component is 7.214%. The major factors in this component are whether a family member being a village cadres and the area of forestry land per capita.
The single contribution rate of the third principal component is 5.046%, The major factors in this component are the number of family members, whether well knowing the contents of forest right system reform and whether involved in the forestry right mortgage loan activity.
- For the factor score function, please refer to formula (1); for the comprehensive factor score function, please refer to formula (2):

$$\begin{cases} F1 = -0.155X1 + 0.178X2 + 0.016X3 + \dots + 0.125X15 \\ F2 = 0.215X1 - 0.073X2 + 0.513X3 + \dots - 0.006X15 \\ F3 = -0.326X1 + 0.359X2 - 0.122X3 + \dots - 0.081X15 \\ F4 = -0.230X1 - 0.072X2 - 0.157X3 + \dots + 0.202X15 \\ F5 = -0.179X1 + 0.040X2 + 0.106X3 + \dots + 0.074X15 \\ F6 = -0.022X1 - 0.323X2 - 0.01X3 + \dots + 0.242X15 \end{cases} \quad (1)$$

$$F = 24.904F1 + 20.865F2 + 18.839F3 + 10.901F4 + 7.214F5 + 5.046F6 \quad (2)$$

- According to the analysis above, among factors influencing the foresters' income, factors such as whether or not having a forest right certificate, the parcels of forestry land, whether having some technical training, the quality of forestry land and whether or not joining the forestry cooperation are the major one and those such as the age and education degree of the household head, whether the forestry land being allocated appropriately,

whether the number of labors accounting for 50% or above of the total family members and whether a family member being a migrant worker are minor ones. And the influence of other factors is relevantly weaker.

It means such whether or not having a forest right certificate, the parcels of forestry land, whether having some technical training, the quality of forestry land and whether or not joining the forestry cooperation are the major evidences of influences of the reform on the foresters' livelihood.

CONCLUSION

We can see from the above analysis that, after the reform, there are some change to the living environment and capital condition of the foresters. On one hand, after the reform, the industrial structure in the rural area is changed and the surplus rural labor forces can go out to work in the city. The ecological protection and environment construction is improved and the ecological environment and living environment is further improved. On the other hand, the foresters can accumulate and increase their livelihood capitals and enhance the utilization of financial capitals and human capitals. Besides, the flow, transition and combination of different capitals is more flexible, which improves the foresters' capabilities to withstand the risks to some extent and reduce the fragility of foresters' livelihood. In this case, the agricultural livelihood strategy shall focuses on agricultural production, especially the transition of a livelihood strategy focusing on the utilization of natural capitals and human capitals to a more open and new livelihood strategy focusing on the accumulation, utilization and transition of financial capitals and the comprehensive utilization of the five kinds of capitals.

Based on the model and empirical analysis, we can see that whether or not having a forest right certificate, the parcels of forestry land, whether having some

technical training, the quality of forestry land and whether or not joining the forestry cooperation the major evidences to the influence of reform on the foresters' livelihood.

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