

Research on Insurance Difficulties and Countermeasures after the Reform of Collective Forest Rights

—Empirical Research Based on the Investigation Data in Yongan City of Fujian Province

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Abstract—Forestry insurance was the main reason that constraints the reform process of collective forest. This paper chose the method of Logistic analysis and game theory to enrich the study of collective forest insurance by using survey data in Yongan city of Fujian province. Besides, it demonstrated the emergent dilemma of collective forest insurance and analyzed the need and important role of the country, the government and cooperatives based on the use of econometric models and game theory. Furthermore, it pointed out the importance of publicity and education from the standpoint of forest farmers. Then, it put forward solutions. This paper tried to improve relevant methods and theory based on empirical study in order to benefit the development of national forestry insurance and tenure reform.

Keywords—Collective Forest; Forestry Insurance; Forest Farmers; Cooperative

I. INTRODUCTION

Forestry insurance is a kind of high risk, low return insurance. It has the problem in shortage of demand and supply, especially after the reform of forest rights. The phenomenon becomes worse and restricts the development of forestry in our country. From 1983 to the present, forest rights reform in Yongan City of Fujian Province has undergone a process that combines mandatory changes to induce institutional changes with mandatory institutional changes (Li Yuhui et al., 2006). As the "Xiaogang village" of forest rights reform, collective forest reform has been carried out since 2003. And an attempt has been made to build a clear system of property rights to ensure the number of collective forests and their social and ecological benefits. However, after the forest reform, due to the gradual withdrawal of the state and the collective, the collective forest insurance has encountered difficulties.

Forestry insurance had the characteristics of difficult risk prediction, loss assessment, compensation handling, high compensation rate, and poor profitability. Thus, general

commercial insurance companies were reluctant to operate (Pan Jiaping, 1997). The cooperation between local governments and China Insurance could not be long-term. This can be explained by the cooperation between Yongan city in 2003 and the Chinese insurance to terminate forestry insurance in 2005. Forestry insurance is of great significance for spreading risks, promoting the rational use of funds, preventing and reducing forest disasters, and ensuring forestry reproduction. Therefore, most countries distinguished between forestry insurance and commercial insurance and give economic, legal and administrative support (Pan Jiaping, 1997). Therefore, based on the survey data of forest rights reform in Yongan city of Fujian province in 2005 by the Institute of agriculture and rural development of Renmin University of China, this paper discusses the important role of state or collective subsidy insurance. There are few scholars who analyzed the problems of collective forest insurance through statistics and game theory. This paper improves the research on the field of collective forest insurance on the basis of these theories, and provides solutions to the difficulties and problems in forestry insurance, which has important practical significance and guiding significance..

II. LITERATURE REVIEW

Zhang Yuehua et al. (2005) found a threshold through measurement studies, after which farmers' risk aversion of increasing wealth decreased, and was previously positively related. They took Shanxi province and Jiangxi province as the subjects of investigation, and combined subsidies to study farmers' insurance preferences. Ningmanxiu et al.(2005) used Probit model to study the influencing factors of cotton insurance purchase behavior of cotton farmers in the Manas River basin, and found that the demand for agricultural insurance was mainly affected by the risk of agricultural production, the degree of cotton specialization, and the total area of arable land. Ma Jingyun et al. (2007) analyzed the

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forest insurance systems of Japan, Northern Europe, and the United States, and believed that China should draw on its measures in legislation, flexibility, and mortgage loans to build a forest insurance system. Chen Yan et al. (2007) conducted an empirical study on Wuhan City and Xingshan County through the Logit model and found that the household agricultural income, the area of arable land, the number of years of education and the length of agricultural life of the respondents had significant impacts on the willingness to purchase agricultural insurance. Li Yuhui et al. (2007) based on the field survey data of Linnong in Yong an City, Fujian Province, used the cumulative Logitic model for the first time to analyze the factors affecting Forest Farmers' demand for forestry insurance, and conducted the McNemar test on the impact of state subsidized premiums on the willingness to participate. Wu Xixi et al. (2008) analyzed the reasons for the imbalance of supply and demand in forest insurance market from four aspects: the price factors of forest insurance market failure, the double externalities of forest insurance, the public nature of forest insurance, and the effect of financial subsidies on forest insurance. Pan Jiaping et al. (2008) analyzed the types of risks that may arise in commodity forest investment from the perspective of risk management, which are natural risks, economic risks, technical risks and policy risks. Cui Wenqian et al. (2008) believed that due to the existence of market failures, it was necessary for the state to provide policy support to commercial insurance companies operating forest insurance businesses. Shi Yan et al. (2008) analyzed the main behavior of forest insurance and pointed out that the establishment of government-led policy-oriented forest insurance is more suitable for the needs of current forestry development, and put forward corresponding countermeasures. Fang Fengwen (2011) found that the reform of collective forest rights system had a positive impact on farmers' income based on the first-order differential model, which also had a positive impact on the bamboo forest area, fertilizers and other cost inputs. Zhao Jing et al. (2014) used AHP method to carry out a comprehensive evaluation of forest reform performance, which found that the performance of Yongan Forest Reform was more significant and had a significant impact on the farmers' forest management willingness.

III. EMPIRICAL ANALYSIS

This paper based on the survey data of the Institute of agriculture and rural development of Renmin University of China in Yongan city of Fujian province on December, 2005. It divided the influence factors such as subsidies and farmers' participation in cooperative organizations into two parts, and discussed the relationship between them and the interpreted variable "willingness to participate in forest insurance". As follows:

TABLE I. INDEMNITY AND BENEFITS

		N	Marginal Percentage
5. Would you like to join forest insurance? p11e:	1	27	17.6%
	2	54	35.3%
	3	25	16.3%
	4	45	29.4%
	5	2	1.3%
7. If the state or group subsidizes a portion of the forest insurance costs and requires you to participate in forest insurance, are you willing to take insurance?	1	41	26.8%
	2	69	45.1%
	3	18	11.8%
	4	24	15.7%
	5	1	.7%
Valid		153	100.0%
Missing		23	
Total		176	
Subpopulation		5 ^a	

a. Source: Yongan City of Fujian Province, December 2005, School of Agriculture and Rural Development, Renmin University of China (The same below).

b. Among them, 1-5 of the interpreted variables represent: 1 is very willing; 2 is willing; 3 is it does not matter; 4 is unwilling; 5 is objection.

TABLE II. INSURANCE WILLINGNESS AND COOPERATIVES

		N	Marginal Percentage
5. Would you like to join forest insurance? p11e:	1	21	15.2%
	2	52	37.7%
	3	21	15.2%
	4	42	30.4%
	5	2	1.4%
1. Are you currently participating in the relevant cooperative economic organizations(cooperative forest farms or professional associations)? p10a:	1	2	1.4%
	2	136	98.6%
(2) Do you think agricultural cooperative organizations are needed in rural areas? p10b2:	1	91	65.9%
	2	38	27.5%
	3	9	6.5%
(3) Would your family like to join a cooperative organization in the future? p10b3:	0	1	.7%
	1	94	68.1%
	2	32	23.2%
	3	11	8.0%
Valid		138	100.0%
Missing		38	
Total		176	
Subpopulation		12 ^a	

c. Among them, 1-5 of the interpreted variables represent: 1 is very willing; 2 is willing; 3 is it does not matter; 4 is unwilling; 5 is objection. Explain that 1-2 of the three variable cooperative organizations represent: 1 participation; 2 Not participating and 0-3 represent: 0 not filling in; 1 willing; 2 Not willing; 3 doesn't matter.

It can be seen that the willingness of forest farmers to participate in insurance is about 52.9 %, and it is closely related to state and collective subsidies, which also reflects the

incentive effect of subsidies. Although the majority of forest farmers do not currently participate in the cooperative organization, the majority of those who express the need and wish to participate in the organization in the future have a great influence on their willingness to insure (except for the negative correlation with the current participation in the cooperative organization). In addition, the percentage of forest farmers' willingness to insure is not high (52.9 %), which also shows that the promotion of forest insurance is not enough. Among them, those with high education and special experiences (such as working in large cities) account for the majority, which also shows the importance of human capital.

Then, this paper analyzed the emergence of insurance dilemma based on the insurance company (insurance supplier). In 2005, the People's Insurance Company of China withdrew from the forestry insurance market in Yong'an City and ended its two-year cooperation. This is because of the adverse selection problems in the insurance market and the huge losses caused by natural disasters. Therefore, it is divided into two parts for analysis:

(I) Problem of Adverse Selection in Forestry Insurance

TABLE III. COMPARISON OF NATURAL DISASTER LOSSES AND WILLINGNESS TO INSURE FOR FOREST FARMERS IN YONGAN CITY OVER THE PAST FIVE YEARS

Loss amount(yuan)	Willingness to insure(1 is very willing; 2 is willing; 3 is it does not matter; 4 is unwilling; 5 is objection)
5000	2
6000	2
5000	1
5000	2
2000	2
1300	1
3000	1
4000	2
100000	1
4000	2
1000	2
2000	3
30000	2
2000	4
500	1
2000	2
1000	2
2000	1

As can be seen from the above table, the losers tend to be insured except for a few farms. For insurance companies, although it cooperates with the Yong'an Forestry Bureau, as a self-financing corporate legal person, it will still determine the premium based on the average probability of a disaster. In 2003, the People's Insurance Company of China cooperated with Yong'an City to carry out the business of eucalyptus fire, frost damage and snow disaster insurance¹. Therefore, due to asymmetric information, Adverse Selection occurred in 2003. Due to the withdrawal of some non-losers, the proportion of demand falling and the high probability of loss are relatively large. The average probability of disaster occurrence increases, which makes the premium higher. This drove the low-loss probability and no-loss people out of the forestry insurance market and increased Compensation risk of People's Insurance

¹Li Yuhui, Sun Juan, Gao Xiaoyi. Analysis of Factors Affecting Forestry Farmers' Demand for Forestry Insurance: An Empirical Study Based on the Investigation of Forestry Farmers in Yong'an City of Fujian Province [J]. Managing World, 2007(11): 71-75.

Company of China.

(II) Two Years of Frost Disaster (Unexpected Factors) have caused People's Insurance Company of China to Make Huge Losses

After the disaster in 2003, some of the previous non-losers also joined the insured population, resulting in a sharp increase in the demand for insurance. Although People's Insurance Company of China increased premiums, the continued frost disaster let the Chinese to pay more in 2004. People's Insurance Company of China suffered huge losses and terminated the business of forestry insurance, leaving the local collective forest in a blank state. The specific process is as follows:

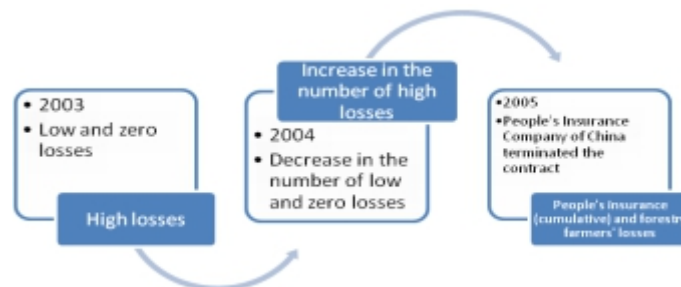


Fig. 1. Flowchart of Insurance Status from 2003 to 2005

In summary, due to Adverse Selection and uncertainty of the insurance market, People's Insurance Company of China is unable to cover the insurance risk after the collective forest reform. This is a major reason for the emergence of insurance difficulties. For forestry farmers, individual decision-making after the property rights reform still needs the support of the state and the collective. This is the reason for the demand of insurance. After the reform of collective forest, the government and the collective gradually withdrew. Although the efficiency was improved and property rights were obvious, the failure of "Invisible Hand" in forestry insurance still required "Tangible Hand" to intervene and regulate it.

Analysis of Government Subsidies and Insurance Activities Based on Game Theory

	Forestry Farmer (One) ¹	
	Insured	Not insured
Government	Subsidies for collective forest insurance ²	$(B-S, \underline{S}+tP-F)$ $(E-S, \underline{tL})$
	No subsidies for collective forest insurance ²	$(B, \underline{tP}\cdot F)$ (E, \underline{tL})

Fig. 2. Government does not subsidize, Forestry insurance

(Where S is the state's subsidy, $S>0$; T is the probability of loss, that is the compensation rate; P is the compensation of insurance companies for paying, $P>0$; F is the insurance fee that forestry farmers need to pay, $F>0$; L is the loss of forestry farmers at the time of the disaster Loss, $L>0$; $P>F>S$.)

As can be seen from the above figure (Government does not subsidize, Forestry insurance) is an equilibrium solution. This also shows that in the static game, the government will choose not to subsidize from its own interests and hand over insurance to commercial banks. In forestry insurance, T is usually very high, and commercial insurance companies are often reluctant to operate. People's Insurance Company of China was forced to engage in forest insurance under pressure from the government (Pan Jiaping, 1997). This is also the reason why People's Insurance Company of China cooperated with forestry insurance in 2003, but withdrew due to huge losses in 2005. However, the government does not consider that B will decrease with the occurrence of disasters, and the final result of not subsidizing will be the reduction of collective forest area until it disappears.

For insurance companies, we consider the static game of government and company, and its income matrix is as follows:

		Insurance company (One)	
		Provision of insurance	No insurance
Government	Subsidies for insurance companies	$(-S', S+F-tP)$	$(-S', 0)$
	No subsidies for insurance companies	$(0, F-tP)$	$(0, 0)$

Fig. 3. The static game of government and company, and its income matrix

(Same as above)

Therefore, due to the high compensation rate T of forestry insurance, $F-tP$ is always negative (the situation of People's Insurance Company of China in Yong'an City in 2003 and 2004). Its equilibrium is (No subsidies, No insurance is provided). It can be seen that only considering the market mechanism and its own earnings, collective forest insurance is impossible. The termination of the business by People's Insurance Company of China in 2005 illustrates this dilemma.

IV. CONCLUSION AND POLICY RECOMMENDATIONS

To sum up, the main influencing factors of demand include subsidies, forestry cooperatives and so on. Because of the universality, adverse selection and particularity of collective forest insurance, high compensation rate, unpredictability of risk, and the public welfare characteristics of collective forest, it must require the support of state, government, collective, and even society. Otherwise, the supply and demand dilemma of collective forest insurance will appear. It also shows that Forestry Farmers' willingness to insure is increasing constantly, and it is affected by subsidies and the cooperative economy. What is more difficult to solve is the loss of insurance provider

by People's Insurance Company of China, which illustrates the indispensability of the "Tangible Hand".

First of all, increase the state and government intervention and subsidies. Because forest resources have ecological and social benefits, their positive externalities require the intervention and support of state and government. However, forcing insurance companies to insure will not produce expected results. It will also result in the bankruptcy of company and the loss of forest farmers' rights and interests. Therefore, subsidies are necessary and worthwhile. This will also increase the willingness of forest farmers to insure and insurance companies' confidence in the supply of insurance, and eventually achieve "Three Wins."

Secondly, support forestry cooperatives. The survey data of Yong'an City shows that forestry farmers' willingness to join cooperative is relatively large, and the establishment of cooperative can not only share the burden of state finance, but also increase farmers' confidence in insurance. It is also conducive to maximizing the benefits of cooperatives and entering a virtuous cycle. At the same time, cooperatives can provide information transfer mechanism for Moral Hazard and Reverse Selection in insurance, and curb the occurrence of this behavior effectively. Therefore, the existence of forestry cooperatives is also indispensable. It can provide strong support for forestry insurance and is the "Assistant" of state and government.

Thirdly, strengthen publicity and education. We should increase publicity and carry out short and medium-term education and training. We can also carry out related activities in forestry cooperatives to change some forest farmers' understanding of insurance through knowledge and information dissemination.

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