

Farmers' Willingness and Influencing Factors to Purchase Forest insurance

—A Case Study on Six Counties (Flag) of Western China

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Abstract—In order to explore farmers' responses to the government's guidance to develop policy forest insurance, 544 samples from six counties in western China are used to analyze the farmers' participation willingness of forest insurance of non-commercial forest based on the method of logistic regression. The results show that respondents' age, forest quality, willingness to invest in forestland, whether farmers have the intention of long-term operation for forestland and whether farmers learn about forest insurance policy have significant impacts on farmers' participation willingness of forest insurance. Furthermore, the following three recommendations are proposed to increase the income of forestry and stimulate farmers to participate in forest insurance.

Keywords—Forest Farmer; Forest Insurance; Willingness of Participation; Influencing Factor; Logistic Regression

I. INTRODUCTION

Forest insurance, a policy tool for the government to support forestry development, is a kind of guarantee for providing economic compensation for its economic losses when forestry is suffering from disasters. Forestry is the foundation and key to the construction of ecological civilization, but at the same time it is an industry with long production cycle and high risk. Therefore, how to effectively avoid forest risks and establish a scientific forest insurance system is imperative. In China, forest insurance belongs to the category of agricultural insurance. The policy content of the central government "No. 1 Document" from 2004 to 2019 is involved[1]. In particular, with the continuous advancement and deepening of the reform of the collective forest rights system, the importance of policy forest insurance has become more prominent. In addition to the "No. 1 Document", the central government and various departments have issued a

number of policy documents since 2008. To ensure the orderly development of policy forest insurance work, the government plays a pivotal role in guiding farmers to participate in policy forest insurance. However, the key to the development of policy forest insurance is the farmer's own attitude, that is, the response of farmers to the 'Forest insurance' after policy promotion.

Taking the six counties of western China as examples, this paper obtains 544 valid samples through the questionnaire survey to farmers, and uses binary logistic regression method to analyze the willingness and influencing factors of farmers' forest insurance participation. From one aspect, we explore the farmers' response to the government's guidance to develop policy forest insurance and make relevant suggestions.

II. DATA SOURCES AND INDICATORS SELECTION

A. Data Sources

The data used in this paper come from investigation of six sample counties (flag) of western China by research team. All of the data were obtained in July, August and December of 2013 and in July, August and September of 2014. Specifically, six counties (flag) are Yulong County of Yunnan Province, Xiuwen County of Guizhou Province, Huili County of Sichuan Province, Jingbian County of Shaanxi Province, Qingcheng County of Gansu Province and Wulateqian County of Inner Mongolia Autonomous Region^[2], respectively. The research team selected the villages (towns) and case towns surveyed in the case counties according to the typical sampling principle, and randomly selected the surveyed households. On average, 4 counties (towns) were surveyed in each county, 2-3 villages were surveyed in each township, and 90-100 forest farmers were surveyed in each case county, and

a total of 583 households were investigated. Finally, excluding the samples with missing information or conflict answers that 544 samples are selected.

B. Evaluating Indicators Selection

This paper identifies 'whether farmers are willing to participate in forest insurance' (Y) as a dependent variable. 'intention to participate in forest insurance willingness analysis' is used to study the extent to which variables are determined in the process of farmers' participation in forest insurance willingness decision-making. In terms of the existing research results^[2-6], the choice of independent variables is obtained according to the research questions. It is preliminarily determined that the individual characteristics of the respondents, the characteristics of the households, production characteristics of forestland, farmers' awareness of the forest insurance policy, and the geographical factors have certain influence on the farmers' willingness to participate in the forest insurance. Therefore, this paper takes sixteen variables as independent variables, which could be divided into individual characteristics of respondents, household characteristics, production characteristics of forestland, policy influencing factors and geographical characteristics.

C. Research Assumptions

1) Individual characteristics of respondents

X_1 represents *respondents' age*. On the one hand, the elder the farmers are, the more conservative their thoughts are; on the other hand, they may think that their experience of operating forest land is relatively rich, the willingness to purchase forest insurance is weak. Therefore, it is supposed that this factor will be negatively related to dependent variable.

X_2 represents *level of respondents education*. The higher the educational level of farmers is, the more open-minded, the clearer understanding of risks and disasters and forest insurance are. Therefore, it is supposed that this factor will be positively related to dependent variable.

X_3 represents *whether respondent is a village officer*. In general, village officers usually have better understanding about the relevant policies and regulations of forest insurance than other families. Therefore, it is supposed that this factor will be positively related to the dependent variable.

2) Household characteristics

X_4 represents *number of household labor*. The greater the number of household laborers in the household, the greater the economic pressure they can bear, the more they have the ability to withstand risks, and the less demand for forest insurance. Therefore, it is supposed that this factor will be negatively related to dependent variable.

X_5 represents *household incomes per capita*. The higher the per capita income of the households, the more economically they can purchase forest insurance. Therefore, it is supposed that this factor will be positively related to the dependent variable.

X_6 represents *proportion of forestry income to household income*. Higher proportion of forestry income to household income indicates that there is a greater contribution of forestry

income to household income. Meanwhile, if most of the household income comes from forestry, farmers will have more willingness to purchase forest insurance in the event of a forest disaster that causes greater damage to farmers' families. Similarly, it is supposed that it will be positively related to the dependent variable.

X_7 represents *proportion of non-agricultural income to household income*. Higher proportion of non-agricultural income indicates that the family can obtain more income in various ways. Therefore, forest farmers are reluctant to invest in forestry. Accordingly, we suppose that it will be negatively related to the dependent variable.

3) Production characteristics of forestland

X_8 represents *proportion of tenure issued forestland area to total forestland area*. There are two types of collective forest tenure issue in sample counties. One type is that collective forest tenure is issued to family and the other one is to team or group. In general, forestry tenure form reflects the clarity of forest tenure. If forest tenure is clearer, forest farmers usually pay more attention on the income. Therefore, they will be thinking about forest insurance much more than other farmers. On the contrary, they will not. It is supposed that it will be negatively correlated with the dependent variable.

X_9 represents *household forestland area per capita*. More household forestland area per capita indicates that the larger the per capita forest area of the family, the greater the investment in operating the forest land. In this paper, it is supposed that it will be positively related to the dependent variable.

X_{10} represents *forest quality*. The higher the quality of the forest, the greater the loss after the disaster. Therefore, it is usually positive correlated with the dependent variable.

X_{11} represents *proportion of forestry labors to total household labors*. Forestry investment accounts for the proportion of total household investment, the higher the forestry income expectation, the stronger the risk awareness. Therefore, it is usually positive correlating with the dependent variable.

X_{12} represents *whether received forestry technical training*. Received forestry-related technical training will have a better understanding of forestry rules and regulations, laws and policies. Therefore, it is usually positive correlating with the dependent variable.

X_{13} represents *willingness to invest in forestland*. If farmers are willing to invest a lot in the forestland, they usually expect to obtain more revenue and the risk awareness is relatively strong, and they attach more importance to the forest insurance issue. Therefore, it is usually positive correlated with the dependent variable.

4) Policy influencing factors

X_{14} represents *whether farmers have intention of long-term operation for forestland*. If farmers have long-term plans to operate forestland, they will actively understand the policies and regulations on forestry, so they have a deep understanding of forest insurance and are more likely to purchase forest

insurance. Therefore, it is positively relating to the dependent variable.

X_{15} represents whether farmers know the purpose of the forest tenure certificate. Farmers who know the purpose of the forest tenure certificate are more likely to purchase forest insurance. Therefore, it is positively related to the dependent variable.

X_{16} represents whether farmers know the forest insurance premium subsidy policy. If farmers know the forest insurance premium subsidy policy, the willingness to participate in forest insurance will be stronger. Therefore, it is positively related to the dependent variable.

5) *Geographical characteristics.*
Set dummy variables by county.

III. ECONOMETRIC ANALYSIS AND DISCUSSION

A. Method

In this paper, whether farmers are willing to participate in forest insurance or not (Y) is taken as the dependent variable.

The binary logistic regression will be used and the dependent variable is limited to range of [0,1]. 'No' is defined as $Y=0$ (unwilling to participate) and 'yes' is defined as $Y=1$ (willing to participate). The binary logistic regression model is:

$$\ln[p/(1-p)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{21} X_{21} + \mu \quad (1)$$

where P is the probability if $Y=1$; $1-P$ is the probability if $Y=0$; X_1, X_2, \dots, X_{16} are independent variables respectively and $X_{17}, X_{18}, \dots, X_{21}$ is the geographical factor according to the county's location; $\beta_0, \beta_1, \beta_2, \dots, \beta_{21}$ are parameters to be estimated and μ is a disturbance term.

B. Results

According to the empirical analysis of the 544 valid questionnaires, only 30.9% of the famers indicated that they were willing to participate in forest insurance, and 69.1% of the farmers indicated that they were not willing to participate in forest insurance.

Binary Logistic regression analysis was used to analyze the variables of 544 forest households using software SPSS22.0. The results were shown in Table 1.

TABLE I. RESULTS OF BINARY LOGISTIC REGRESSION

| Variables | B | S.E. | Wals | df | Sig. | Exp (B) |
|---|--------|-------|--------|----|----------|---------|
| Respondents' Age (X_1) | -0.033 | 0.010 | 11.261 | 1 | 0.001*** | 0.968 |
| Level of Respondents Education (X_2) | -0.122 | 0.139 | 0.767 | 1 | 0.381 | 0.886 |
| Whether respondent is a village officer (X_3) | 0.329 | 0.251 | 1.721 | 1 | 0.190 | 1.390 |
| Number of household labor (X_4) | -0.013 | 0.096 | 0.019 | 1 | 0.890 | 0.987 |
| Household Incomes Per Capita (X_5) | 0.000 | 0.000 | 1.112 | 1 | 0.292 | 1.000 |
| Proportion of Forestry Income to Household Income (X_6) | -0.284 | 0.857 | 0.110 | 1 | 0.740 | 0.753 |
| Proportion of Non-agricultural Income to Household Income (X_7) | 0.414 | 0.387 | 1.145 | 1 | 0.285 | 1.514 |
| Proportion of Tenure Issued Forestland Area to Total Forestland Area (X_8) | -0.21 | 0.252 | 0.696 | 1 | 0.404 | 0.810 |
| Household Forestland Area Per Capita (X_9) | 0.004 | 0.002 | 2.692 | 1 | 0.101 | 1.004 |
| Forest Quality (X_{10}) | 0.265 | 0.154 | 2.967 | 1 | 0.085* | 1.303 |
| Proportion of Forestry Labors to Total Household Labors (X_{11}) | 0.388 | 0.930 | 0.174 | 1 | 0.677 | 1.474 |
| Whether Received Forestry Technical Training (X_{12}) | 0.448 | 0.291 | 2.377 | 1 | 0.123 | 1.565 |
| Willingness to Invest in Forestland (X_{13}) | 0.599 | 0.232 | 6.676 | 1 | 0.010*** | 1.820 |
| Whether Farmers have Intention of Long-term Operation for Forestland (X_{14}) | 0.389 | 0.212 | 3.383 | 1 | 0.066* | 1.476 |
| Whether Farmers know the purpose of the forest tenure certificate (X_{15}) | 0.069 | 0.224 | 0.094 | 1 | 0.759 | 1.071 |
| Whether Farmers know the forest insurance premium subsidy policy (X_{16}) | 1.272 | 0.358 | 12.610 | 1 | 0.000*** | 3.567 |
| Geographical characteristics variable (X_{17}) | 0.862 | 0.498 | 2.994 | 1 | 0.084 | 2.368 |
| Geographical characteristics variable (X_{18}) | 1.308 | 0.510 | 6.568 | 1 | 0.010 | 3.698 |
| Geographical characteristics variable (X_{19}) | 1.701 | 0.518 | 10.801 | 1 | 0.001 | 5.478 |
| Geographical characteristics variable (X_{20}) | 1.017 | 0.484 | 4.415 | 1 | 0.036 | 2.764 |
| Geographical characteristics variable (X_{21}) | 0.826 | 0.553 | 2.229 | 1 | 0.135 | 2.284 |
| Constant | -1.360 | 0.825 | 2.716 | 1 | 0.099 | 0.257 |

Note: *** indicates significant at 1% level, ** indicates significant at 5% level, * indicates significant at 10% level. Geographical factors are considered during regression, and dummy variables are set by the county

The econometric results in Table 1 show that there are five variables which have a significant relationship with dependent variable. They are *respondents' age* (X_1), *forest quality* (X_{10}), *willingness to invest in forestland* (X_{13}), *whether farmers have intention of long-term operation for forestland* (X_{14}), *whether farmers know the forest insurance premium subsidy policy*

(X_{16}). In terms of significant relationships, *respondents' age* (X_1), *willingness to invest in forestland* (X_{13}), *whether farmers know the forest insurance premium subsidy policy* (X_{16}) are significant at 1% level, while *forest quality* (X_{10}), *whether farmers have intention of long-term operation for forestland* (X_{14}) are significant at 10% level.

In this study, the Omnibus test and the Hosmer and Lemeshow test are used to test the goodness of fit of the model. The test results of the Omnibus test shows that the overall model fit test of the regression model is 81.427, and the corresponding p-value = $0.000 < 0.050$, reaching a significant level. The test value of Hosmer and Lemeshow test is $0.326 > 0.05$, which also proves that the model has good fit.

C. Discussion

1) *Respondents' age (X_1)* is significantly and negatively correlated with the dependent variables. The elder the farmer is, the less willingness to participate in forest insurance, which is consistent with the null hypothesis.

2) *Forest quality (X_{10})* is significantly and positively correlated with the dependent variables. The better the quality of forest trees, the more farmers are willing to participate in forest insurance, which is consistent with the original assumptions. Since the better the quality of the forest, the higher the income earned. Once the disaster is affected, the loss will be greater, so the farmers are willing to participate in forest insurance.

3) *Willingness to invest in forestland (X_{13})* is significantly and positively correlated with the dependent variables. Farmers who are willing to invest a lot in their own forest land have more willingness to participate in forest insurance that is consistent with the original assumption. Since farmers who are willing to invest a lot in their own forest land management have high expectations for forestry income and relatively strong risk awareness, and are willing to participate in forest insurance.

4) *Whether farmers know the forest insurance premium subsidy policy (X_{16})* is significantly and positively correlated with the dependent variables. If farmers understand the policy about forest insurance subsidy, they have more willingness to participate in forest insurance, which is consistent with the original hypothesis.

IV. RECOMMENDATIONS

The above empirical analysis shows that although forest insurance has always been paid attention by the government, farmers who are unwilling to participate in forest insurance account for 69.1% of the total number of farmers surveyed, indicating that farmers' response is lagging. Therefore, the following suggestions are proposed in order to stimulate the enthusiasm of farmers to participate in forest insurance and promote the healthy development of collective forests.

A. Strengthening policy propaganda and raise awareness of farmers' forest insurance policies

The results of the significant variable analysis shows that *respondents' age (X_1)* is significantly and negatively correlated with the willingness to participate in forest insurance that means the elder farmers have more conservative ideas and lack a sense of identity with forest insurance. Moreover, *whether farmers know the forest insurance premium subsidy policy (X_{16})* is significantly and positively correlated to the willingness to participate in forest insurance, that indicates

that raising the awareness of farmers' forest insurance premium subsidy policies can increase their willingness to participate in forest insurance. According to the empirical study of farmers' households, the average age of the surveyed farmers in the six sampling counties (flag) is 49.42-year old, the proportion of the farmers who learn the forest insurance premium subsidy policy is only 9%, and the proportion of the farmers who are elder and do not learn the forest insurance premium subsidy policy is over 90%, that the forest household insurance policy awareness is very low. Therefore, it is necessary to strengthen policy propaganda, raise the awareness of farmers' risks, and mobilize the enthusiasm of farmers to participate in insurance. The first important thing is to publish forest insurance policies and their significance through television, radio, internet, posters, publicity brochures, service manuals and other media. Let more forest farmers understand, recognize and participate in policy forest insurance. Second, by visiting the farmers, serving the farmers, and let more farmer to benefit from policy forest insurance, then they can participate in policy forest insurance.

B. Strengthening the scientific management concept and increase the value of participating in forest insurance

The results of the significant variable analysis shows *forest quality (X_{10})* is significantly and positively correlated with the willingness to participate in forest insurance that means improving the quality of trees can stimulate the enthusiasm of farmers to participate in insurance. Therefore, the government must improve the scientific and technological content of forestry, vigorously promote new technologies and new varieties, strengthen forestry technical training, timely carry out forest tending, strengthen the forest science management concept, improve the quality and value of forest stands and stimulate farmers' awareness of participating in forest insurance.

C. Increasing forestry income and stimulate farmers' enthusiasm for participating in forest insurance

The results of the significant variable analysis shows *willingness to invest in forestland (X_{13})* and *whether farmers have intention of long-term operation for forestland (X_{14})* are significantly and positively correlated with the willingness to participate in forest insurance that means farmers who are unwilling to invest a lot in forest management and have no plans to manage forest land for a long time have a weak willingness to participate in forest insurance. Whether farmers are willing to invest a lot in forest land management or whether they have long-term management of forest land depends largely on the level of forestry income. According to the empirical study of farmers' households, the proportion of forestry income to total household income in the six case counties (flag) is only 7.1% on average, and the contribution of forestry income to the household income of farmers is too small. Therefore, raising the forestry income of farmers can stimulate farmers' having more willingness to invest in forest land management and the long-term plan to manage forest land, thereby increasing farmers' participation in forest insurance. The key to raise the forestry income of farmers is to establish and practice the concept of 'lucid waters and lush mountains are invaluable assets', improve the current forest

resource protection policy, accelerate the development of forestry industry, give full play to the economic benefits of forestry forest products, and the ecological benefits of forests, and increase the income of farmers.

V. CONCLUSION

The government plays an important role in guiding farmers to participate in political forest insurance. However, the 544 sampling cases show that only 30.9% of all the farmers expressed their willingness to participate in forest insurance according. The results also show that five factors had the significant influence on the willingness, which are *respondents' age, forest quality, willingness to invest in forestland, whether farmers have intention of long-term operation for forestland and whether farmers know the forest insurance premium subsidy policy*. According to the econometric analysis, three policy recommendations put forward to stimulate the enthusiasm of farmers to participate in forest insurance. This research is of great significance to establish and improve the forest insurance system of collective forests and promote the healthy development of the collective forest.

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