Study on the Influence of Government Subsidy on Farmers' Willingness to Purchase Typhoon Index Insurance

Fang Song[1,2], Xinyuan Wang[2] and Xuerong Xu[1, *]

[1]Fujian Agriculture and Forestry University, College of Economics and Management, Fuzhou 350001, China
[2]Concord University College, Fujian Normal University, Fuzhou 350001, China

Keywords: Government Subsidy, Typhoon Index Insurance, Purchase Intention, Influence Factor.

Abstract: The purpose of this paper is to analyze the influencing factors of farmers' willingness to buy typhoon index insurance from the perspective of government subsidy policy. In particular, the authors develop the binary logistic regression model based on the survey data of 124 aquaculture farmers in Fujian Province. The results showed that the age, input cost and the number of disasters affecting production except typhoon had a negative effect on the willingness of aquaculture farmers to buy typhoon index insurance. In turn, the number of losses due to typhoons in the past five years, attitude towards typhoon index insurance and satisfaction with subsidy policy have a positive impact on the willingness of aquaculture farmers to buy typhoon index insurance. This study helps to improve the risk guarantee system of aquaculture farmers and the government's subsidy policy.

1   INTRODUCTION

The aquaculture industry is an important part of China's agriculture. Its output value accounts for 3.5 % of the total agricultural output value, and the total production can reach 60% of the total world aquaculture. However, in the contrast to the prosperity of aquaculture, the development of aquaculture insurance market in China is lagging behind. As an industry with strong natural attributes, aquaculture is affected by typhoon, drought, high temperature, floods and other natural disasters, and the situation of "poverty caused by disasters" is endless. Moreover, in the aquaculture insurance system is not complete, the huge losses caused by disasters are almost borne by farmers themselves, the industry's ability to resist risks is very weak. Therefore, farmers and even the entire aquaculture market demand for aquaculture insurance is increasingly urgent.

In recent years, many scholars have studied the influencing factors of farmers' willingness to purchase agricultural insurance. Zheng et al.(2018) investigated 1280 fishermen in three coastal cities of China, and found that the degree of loss, fishermen's awareness of insurance and personal education have a positive effect on purchase intention, but income and breeding years have a negative impact on purchase intention (Zheng, Zhao, 2018). Liu et al. (2019) took a group of farmers who had suffered excessive floods as the observation objects, and on this basis, they searched for the second group of observation objects who had not suffered floods but had basically the same other conditions. Through the investigation and study of the two groups of objects, they concluded that farmers with corresponding disaster experience had higher insurance purchase intention (Liu, Tang, Ge, et al., 2019).

In addition, Oduniyi et al.(2020) used the conditional value assessment method to locate the influencing factors of farmers' willingness to buy livestock index insurance, and found that farmers' breeding experience, age, education, marital status, awareness of insurance and family status have a significant impact on purchase intention (Oduniyi, Antwi, Tekana, 2020). Ali et al. (2020) randomly sampled the northern region of Togo, West African countries, and selected 704 farmer households as the

---

respondents to observe the specific factors that affect the purchase intention of weather index insurance of the respondents. The analysis shows that the length of the drought period is the most important factor (Ali, Egbendewe, Abdoulaye, et al., 2020). Budhathoki et al. (2019) took the low-lying areas of Nepal as the research area. Through investigating 350 farmers in the region, they concluded that the main reason for the low coverage of local agricultural product index insurance was related to the pricing of insurance and government subsidies (Budhathoki, Lassa, Pun, et al., 2019).

Scholars have analyzed the influencing factors based on different perspectives and theoretical systems. However, due to the differences in geological conditions, climate environment and the degree of development of agricultural insurance in different countries and regions, the factors affecting purchase intention are also different. Most of the existing literature focuses on the empirical research of agricultural products in cotton, vegetables, grain and other planting industries, and the research on aquaculture insurance is insufficient (Tang, Yang, Ge, et al., 2019; Roder, Hudson, Tarolli, 2019; Mutaqin, Usami, 2019; Sarwary, Senthilnathan, Vidhyavathi, et al., 2020; Shee, Azzarri, Haile, 2020).

Fujian Province is China's second longest land coastline provinces, land coastline up to 3752 kilometers, accounting for about one sixth of the country. There are many kinds of aquatic products in the sea area, and a large number of aquatic organisms with economic value. However, Fujian Province is also a severely affected area by typhoon disasters, which often brings a huge blow to farmers who have invested high cost in the early stage. In response to this situation, Fujian Fisheries Mutual Insurance Association, jointly with Fujian Branch of China Life and Property Insurance, tailored and launched the aquaculture typhoon index insurance for the aquaculture industry in Fujian Province, which was officially issued and promoted throughout the province in 2017. With the support of the Government, the project incorporates a policy dividend project to support agriculture and benefit farmers, enjoying 30-40 percent of all levels of financial subsidies, which greatly reduces the cost of farmers' purchase. According to the latest "Pilot Scheme of Typhoon Index Insurance for Aquaculture in Fujian Province in 2020", the provincial financial subsidy of typhoon index insurance is 20% of the total premium, and the minimum financial subsidy at the city and county levels is 10%. Conditional cities can increase the proportion of subsidies according to their own conditions.

Presently, in order to attract aquaculture farmers to buy the typhoon index insurance, the government invested a lot of financial resources. So can these subsidies increase the purchase intention of aquaculture farmers as expected? What factors affect farmers' purchase intention besides financial subsidies? The exploration of these problems is helpful to improve the relevant policies of policy-oriented agricultural insurance, and provide reference for whether the government provides subsidies and benefits and what path to subsidize. This paper takes aquaculture typhoon index insurance as the research object, analyzes the influencing factors of farmers' insurance purchase intention by the binary logistic model based on the micro survey data of aquaculture farmers in Fujian Province.

2 MECHANISM ANALYSIS AND MODEL CONSTRUCTION

2.1 Mechanism Analysis

2.1.1 Mechanism 1: From the Perspective of Welfare Economics Theory

Traditional welfare economics believes that increasing the total national income on the production side and reducing the inequality of income distribution on the distribution side could improve the social economic welfare. Through the support and promotion of typhoon index insurance, the government establishes a reasonable financial subsidy system to purchase farmers' fees, which can improve the participation of aquaculture farmers in typhoon index insurance, enhance the ability of farmers to resist risks, and ensure the smooth progress of the breeding process and the final production income. This is conducive to the development of agricultural economy, realize the redistribution of agricultural part of national income, thereby increasing the overall welfare of whole society.

2.1.2 Mechanism 2: Market Failure Theory Perspective

Aquaculture typhoon index insurance as an example of a class of agricultural insurance market, due to the existence of moral hazard caused by information asymmetry, the insurance company's business costs increase, resulting in the insurance company related business exit or increase premiums. However, at the

same time, increasing premiums also means that the cost of farmers' purchase increases, which cannot meet the insurance needs of farmers, and ultimately leads to the failure of the relevant agricultural insurance market. Therefore, the government reduces the input costs of insurance companies and aquaculture farmers through financial subsidies and policy support, so as to solve market failure to a certain extent.
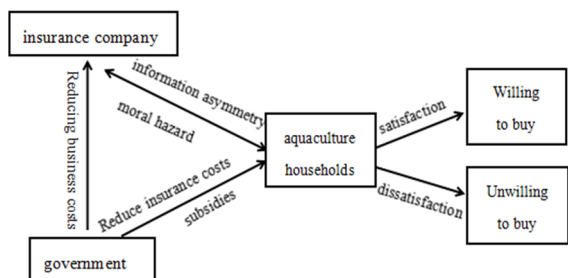

Figure 1: Influence Mechanism of Financial Subsidies on Purchase Intention of aquaculture households.

2.2 Model Construction

In order to study the impact of government subsidies on the purchase intention of aquaculture farmers for typhoon index insurance, the following binary Logistic regression model was constructed:

$$Y = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \sum_1^n \beta_i x_i + \mu \quad (1)$$

In this model, Y is the dependent variable, when Y=1, the farmers are willing to purchase the insurance, in turn, when Y=0, they are unwilling to buy. P is the probability of aquatic farmers purchasing typhoon index insurance, and (1-P) is the probability of non-purchase. The independent variables Xi (i=1, 2,..., n) represents the factors that may affect purchase intention. This model select government subsidies as the key variables, select the age of aquaculture farmers, farming area, annual investment cost, the number of losses due to typhoon in the past five years, in addition to typhoon, there are several disasters affecting production, the understanding of typhoon index insurance as the control variable. β_0 is the intercept items, β_i (i = 1, 2,..., n) is the coefficient of each factor, reflecting the influence of each factor on purchase intention, and μ is the random disturbance term.

3 DATA SOURCE AND DESCRIPTIVE STATISTICS

3.1 Data Source

The data used in this study were collected through a questionnaire of aquaculture farmers in Fujian Province conducted in 2021.The authors visited Ningde, Xiapu, Changle, Luoyuan, Lianjiang, Zhangpu and other major aquaculture producing areas in Fujian Province, and investigated the varieties including abalone, clam, yellow croaker, spotted fish et,al. The survey mainly includes four parts:(1) the basic characteristics of aquaculture farmers, namely age and education level:(2) the aquaculture related information of farmers, including aquaculture area, annual cost of aquaculture and annual income;(3) the typhoon disaster situation of farmers, including the number of losses due to typhoon in the past five years, the maximum loss caused by typhoon and several disasters affecting production in addition to typhoon;(4) the farmers' awareness of the typhoon index insurance and whether they are satisfied with the proportion of government subsidies. After excluding disqualified questionnaires, 124 valid responses were obtained.

3.2 Descriptive Statistics

Table 1 shows the descriptive statistics of seven variables. The age span of aquaculture farmers involved in the survey is large, and the youngest is 22 years old and the oldest is 75 years old. Aquaculture information is represented by aquaculture area and cost logarithm. Raising area due to varieties, funds and other factors affect the individual gap is large, the maximum reaches 185 acre and the minimum is only 1 acre. When farmers have invested a large amount of money as a cost, paying premiums means that the cost of expenditure will be further expanded, and the cost of many farmers includes part of the borrowing. The additional cost means that more money will be borrowed, which virtually increases the degree of another risk. Typhoon disaster situation is divided into two control variables : the number of losses due to typhoon in the past five years and several disasters affecting production except typhoon. It can be seen from Table 1 that each aquaculture farmer participating in the survey has suffered four typhoon attacks in the past five years on average. Due to the different geographical locations and geographical conditions, the number of wind disasters has reached the maximum of nine.

Table 1: Descriptive statistics of variables.

Variable	Operational Definition	Mean	Std. Deviation
Age	Years old	43.43	11.92
aquaculture area	Acre	33.57	27.78
Log(cost)	The logarithm of actual cost	3.02	.68
Number of typhoon losses over the past five years	Number	4.02	2.32
Number of disasters affecting production other than typhoons	Number	1.45	0.87
Attitude towards typhoon index insurance	1=Completely unimportant, 2=unimportant, 3=not essential 4=more important, 5=very important.	3.27	1.01
Satisfaction with government subsidy policy	0=No,1=Yes	0.73	0.45

Table 2: Comparison of characteristics of aquaculture farmers willing and unwilling to buy typhoon index insurance.

Variable	Mean		Std. Deviation	
	willing	unwilling	willing	unwilling
age	41.24	49.21	11.27	11.83
aquaculture area	37.97	21.94	30.60	12.63
Log(cost)	3.20	2.56	0.59	0.68
Number of typhoon losses over the past five years	4.72	2.18	2.10	1.82
Number of disasters affecting production other than typhoons	1.09	2.41	0.53	0.86
Attitude towards typhoon index insurance	3.71	1.97	0.74	0.72
Satisfaction with government subsidy policy	0.94	0.18	0.23	0.39

By comparing the data in the Table2, it can be found that individual characteristics of two groups of farmers willing and unwilling to buy typhoon index insurance are significantly different : the age of aquaculture farmers who are unwilling to buy insurance is 8 years old on average higher than that of those who are willing to buy insurance. The aquaculture area and cost of the unwilling group were 16 acre and 1.7 less than the willing group, respectively. In addition, the willing group has experienced an average of two more wind disasters that have caused losses over the past five years, while the unwilling group has experienced an average of two disasters affecting production other than typhoons. In terms of attitude towards typhoon index insurance, the willing group believes that the insurance is more important than the unwilling group. The gap between the two groups was the largest in whether they were satisfied with the subsidy policy.

94% of the farmers in the willing group were satisfied with the subsidy policy provided by the government, while only 18% of the farmers in the unwilling group were satisfied. Preliminary reflects the aquaculture farmers' subsidy policy satisfaction has a strong positive impact on purchase intention.

4 RESULTS ANALYSIS

SPSS23.0 and STATA15.1 soft wares were used for binary logistic regression analysis of each variable. The heteroscedasticity, multicollinearity and robustness of the model estimation results are tested and necessary corrections are made. Table 3 shows the final results:

Table 3: Regression results of the binary logistic model.

Variable	Coefficients	t-value	p
age	-0.1218***	-2.93	0.003
aquaculture area	-0.0059	-0.17	0.865
Log(cost)	-3.6110***	-3.43	0.001
Number of typhoon losses over the past five years	1.2999**	2.17	0.03
Number of disasters affecting production other than typhoons	-2.8333**	-2.36	0.018
Attitude towards typhoon index insurance	7.0043***	3.36	0.001
Satisfaction with government subsidy policy	9.6218***	4.49	0.000
Constant	-5.6351	-1.23	0.217

Note:***,** reflect the 1%, 5%significance levels, respectively

Individual characteristics of aquaculture farmers have a negative effect on the willingness to buy typhoon index insurance, and the statistical results are very significant, which means that when the age of aquaculture farmers is older, the willingness to buy insurance will also decrease accordingly. This may be because older farmers have lower acceptance of new things than younger farmers. Older farmers seldom use computers, smart phones and other equipment in daily life, so they have fewer opportunities to contact emerging insurance. Moreover, older farmers often have richer farming experience, which helps them avoid risks and resist disasters, so they have lower demand for insurance.

The statistical results of aquaculture area are very insignificant, contrary to the original expectations. The reason may be due to the different varieties and product value of farmers. The results of cost logarithm factor are significant under 1 % confidence interval, and the results have a negative impact on purchase intention. Further analysis can be found that aquaculture farmers with higher cost often have longer farming experience, accumulated a lot of farming experience, and have more solid disaster resistance. Moreover, the scale of aquaculture farmers' early investment costs is huge. If they buy property insurance, it will be a additional investment which will cause great economic pressure to them. Therefore, this factor has a negative impact on farmers' willingness to buy insurance.

The two variables of typhoon disaster are significant within 5 % confidence interval. The number of losses due to typhoons in the past five years has a positive impact on purchase intention, and

more affected aquaculture farmers have a higher purchase intention than3.669 times less affected farmers. When aquaculture farmers lost more times due to typhoon in recent years, it means buying typhoon index insurance will be a wise choice. The other variable has a negative effect on purchase intention in the direction of several disasters affecting production except typhoon. The types and times of disasters that aquaculture farmers may encounter in the breeding process are different due to different breeding varieties and breeding regions. When the types of disasters that aquaculture farmers face are more, and the damage ability of each disaster is equivalent, the cost-performance ratio of for a single disaster will be weakened.

The attitude towards typhoon index insurance pass the significance test at the level of 1%, and have a positive effect. The corresponding coefficient is large, and the occurrence ratio is 1101.327. Therefore, when the coefficient is positive, it shows that aquaculture farmers believe that the higher the value and importance of typhoon index insurance, the stronger the purchase intention. In fact, farmers' awareness of the importance of typhoon index insurance depends largely on whether they understand the insurance itself and the size of their risk awareness. When farmers understand the insurance content more clearly and deeply, the positioning of its importance will also change accordingly.

As a key variable, the satisfactory of the subsidy policy is significant under 1% confidence interval, and the coefficient is the largest and positive of all variables involved in the model, which means that when aquaculture farmers are satisfied with the subsidy policy provided by the government, their willingness to buy typhoon index insurance will also increase accordingly. At the same time, combined with Table 2, it can be found that 94.44 % of the farmers who are willing to buy the typhoon index insurance are satisfied with the subsidy policy, while only 17.65 % of the farmers who are unwilling to buy the insurance group are satisfied with the government's subsidy policy. The gap between the two groups is as high as 5.35 times, which largely reflects the important influence of the subsidy policy in the decision whether the aquaculture farmers will eventually buy the typhoon index insurance.

5 CONCLUSIONS AND IMPLICATION

The results show that :age, cost logarithm, the number of losses due to typhoon in the past five years, several disasters affecting production except typhoon, attitude to typhoon index insurance and satisfaction with subsidy policy are the six control variables affecting purchase intention. Age, cost logarithm and the directions of several disasters affecting yield except typhoon are negative, and the other three are positive. According to the research results, the following suggestions are put forward :(1) The typhoon index insurance should set different rates according to the differences in breeding varieties to meet the insurance needs of different types of farmers; (2) Insurance companies should promote a correlation system of aquaculture disaster insurance such as typhoons and floods, red tide, and give diverse concessions according to the correlation of different disasters, so that the farmers reduce their insured cost; (3) The fishery mutual insurance associations should promote the relative natural disaster insurance according to the breeding varieties, and improve the farmers' awareness and risk awareness of disaster insurance; (4) Governments should enrich the ways of subsidies, such as the more innovative "agricultural insurance + credit" policy and so on. Diversified subsidy channels could promote the purchase intention of farmers, and attract more insurance buyers and provide a solid guarantee for aquaculture.

REFERENCES

Ali, E.; Egbendewe, A.; Abdoulaye, T.; et al. Willingness to pay for weather index-based insurance in semi-subsistence agriculture: evidence from northern Togo[J]. Climate Policy, 2020: 1-14.

Budhathoki, N.; Lassa, J.; Pun, S.; et al. Farmers' interest and willingness-to-pay for index-based crop insurance in the lowlands of Nepal[J]. Land Use Policy, 2019, 85: 1-10.

Liu, X; Tang, Y; Ge, J; et al. Does experience with natural disasters affect willingness-to-pay for weather index insurance? Evidence from China [J]. International Journal of Disaster risk reduction, 2019, 33: 33-43.

Mutaqin,D.; Usami,K. Smallholder farmers' willingness to pay for agricultural production cost insurance in rural West Java, Indonesia: A contingent valuation method (CVM) approach[J]. Risks, 2019, 7(2): 69.

Oduniyi, O.; Antwi, M.; Tekana, S. Farmers' Willingness to Pay for Index-Based Livestock Insurance in the North West of South Africa[J]. Climate, 2020, 8(3): 47.

Roder,G.; Hudson,P.; Tarolli,P. Flood risk perceptions and the willingness to pay for flood insurance in the Veneto region of Italy[J]. International Journal of Disaster Risk Reduction, 2019, 37: 161-172.

Sarwary,M.; Senthilnathan,S.; Vidhyavathi,A.; et al. Socio-economic Impact of Climate Change, Adaptation and Determinants of Willingness to Pay for Crop Insurance in Central Agro-climatic Zone of Afghanistan[J]. Current Journal of Applied Science and Technology, 2020: 83-92.

Shee,A.; Azzarri,C.; Haile,B. Farmers' willingness to pay for improved agricultural technologies: Evidence from a field experiment in Tanzania[J]. Sustainability, 2020, 12(1): 216.

Tang,Y; Yang,Y; Ge,J; et al. The impact of weather index insurance on agricultural technology adoption evidence from field economic experiment in China[J]. China Agricultural Economic Review, 2019, 11(4):622-641.

Zheng, H.; Mu, H.; Zhao, X. Evaluating the demand for aquaculture insurance: An investigation of fish farmers' willingness to pay in central coastal areas in China [J]. Marine Policy, 2018, 96: 152-162.