The Risk Perception of Natural Disasters and the Willingness to Pay Insurance in the Grapes Farms. Region Vlora

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Abstract:

Natural disasters are a phenomenon facing the economy of each country. The sector that faces often is agriculture. Risks from natural disasters are different in different areas. The risk of natural disasters is perceived in various ways based on the sources of risk and socio-economic factors.

Based on the literature review, we will analyze, by means of econometric methods, the factors that influence the perception of the danger of natural disasters in agriculture. The study will first bring a review of literature and similar studies. Questionnaires were made to 136 grape farmers in the Vlora area, during 2017. Farmers who were interviewed were selected randomly.

The purpose of the study is to analyze the sources of natural disasters risk on Albanian farms according to perceptions. Also, it is to identify the factors that influence the perception of risk and the links between the variables through econometric methods. We will also analyze the factors that affect the willingness to pay for insurance.

In the end, the document will end with conclusions and suggestions to be taken into account in further studies.

Key words: Perception, farm, natural disaster, agriculture, perception of risk

INTRODUCTION

Natural hazards often lead to total reduction or loss of food produced for consumption and earnings from harvest. In Albania, natural disasters have always been present due to the position and geographical reach of our country in the Western Balkans.

If we refer to the facts, most of the population works in the agricultural sector, about 48%, and agricultural production accounts for about 19% of GDP. Albanian agriculture is dominated by small farms. The list of current problems in the agricultural sector includes poor trade in agricultural goods, lack of processing facilities, underdeveloped irrigation and drainage systems and low culture of cultivation, lack of developed technology and high exposure to natural disaster risk.

Although the risk of natural disasters is an important problem for the development of the agricultural sector, there is almost no academic study of risk perception and factors affecting its perception.

For this reason our study will give an overview of the current situation of the perception of the risk of natural disasters in Albania. The work will be answered by the following questions:

> - What are the sources of risk from natural disasters and how are they perceived by Albanian farmers?
> - What are the factors influencing the perception of risk?
> - Is there a link between farmer's willingness to pay for insurance and risk perception?

Based on the revision of the literature and the analysis of the data collected from questionnaires completed in 136 grape production farms in the Vlora area, will be answered the above questions.

PURPOSE OF THE STUDY

The study aims to make a analysis of the risk resources from the natural disasters in the grapes farms in Vlora and an analysis of the factors that influence risk perception and willingness to pay insurance.

LITERATURE REVIEW

From the literature review it turns out that there are different sources of risk from natural disasters in different countries. Risk perception is influenced by social factors as well as by economic and personal factors. These factors have different significance in different studies, based on geographical locations, cultural changes, and product specifics that are produced.

The methods widely used in studies are econometric methods, and most of all logistic regressions as the dependent variables are dummy variables.

Suresh Kumar and others (2011)[1] conducted a study in Tamil Nadu, India, interviewing 600 farmers spread across 27 of the 32 county districts. Agricultural crop farmers were mainly sugar cane growers, rice and peanut plants. Farmers proved to be in different agro-ecological situations, and used different technologies for protection against natural disasters, such as tank irrigation, underground irrigation, canal irrigation and rainfall. Data were analyzed with Probit and Tobit models. The study found that social participation and education levels had an effect on raising awareness about new products in agro-insurance. The study showed that they had a significant and positive impact on the approval of insurance including factors

[1] Suresh Kumar, D., et.al (2011) "An Analysis of Farmers' Perception and Awareness towards Crop Insurance as a Tool for Risk Management in Tamil Nadu", Agricultural Economics Research Review, Vol. 24 January-June 2011, pp. 37-46.

such as: other non-agricultural incomes, the presence of risk to agriculture, the number of workers in the agricultural households, the repayment of the insurance schemes and the affordability of the premium amount insurance.

Boyd and others (2011) [2]collected data from a survey questionnaire given to farmers in Inner Mongolia, China, in 2007. The survey includes 220 farmers. The results show that a number of variables explain crop insurance purchases from farmers in Inner Mongolia. Of the eight variables in the model, seven are statistically significant. The eight variables used to explain crop insurance purchases are: recognition of crop insurance, previous crop insurance purchases, trust of the crop insurance company, amount of risk received by the farmer, low importance of crop insurance premium, government as the main source of information for culture insurance, the role of village chairman, as well as the number of family members working in the city. They reach this conclusion by explanatory model using the Probit regression model.

Wenli Feng and others (2012)[3] collected data from a survey questionnaire given to farmers in Hebei Province, China in 2012. The survey includes 210 farmers and for data analysis they used the logistic regression method to extract the factors leading factors affecting farmers for readiness to purchase agricultural insurance. They come to the conclusion that variables like; age, income sources, level of education and compensation received have a significant effect on farmer's willingness to pay for agricultural insurance.

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[2] Boyd and Milton (2011), "Factors affecting crop insurance purchases in China: the Inner Mongolia region, China", Agricultural Economic Review, Vol. 3 No. 4, pp. 441-450

[3] Wenli F. et al, (2012), "Empirical Analysis on Farmers' Agriculture Insurance Purchasing Intention of Hebei Province" International Agricultural Risk, Finance, and Insurance Conference (IARFIC), Canada.

Euphrasie B.H. Kouame, and others (2012)[4] in a study analyze the readiness to pay for agricultural insurance to cocoa farmers in Cote d'Ivoire, Africa. Findings indicate that farmer's willingness to pay for insurance is influenced by a number of independent variables such as family size, agricultural experience, investment value, cocoa income in total income, age, farm size, and social networking coping mechanism. For data analysis they used the log method.

Behrooz Hassanpour, and others (2013)[5] have studied in Iran factors affecting readiness to buy agro insurance by completing questionnaires surveyed by a 120-choice farmer. The collected data were analyzed using the Logit model. The obtained results showed that variables of age, education, agricultural experience, security awareness rate, land area, other agricultural expenditure and other revenues had a significant effect on the demand for agricultural products.

Abraham Falola, and others (2013)[6] studied the readiness to receive agricultural insurance from cocoa farmers in Nigeria. Data collected from questionnaires in 120 farms were analyzed with descriptive statistics and Probit model. The results showed that only 50% were willing to pay for agricultural insurance. Significant variables affecting the readiness to receive agricultural insurance from farmers were the age of the head of the household, the level of education, access to counseling service and farm income.

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[4] Euphrasie B.H. Kouameet al. (2012) "Risk preferences and demand for insurance under price uncertainty: an experimental approach for cocoa farmers in Cote D'Ivoire "Research Conference on Micro insurance, Netherlands.

[5] Behrooz H. et al, (2013) "Factors Influencing Crop Insurance Demand in KB Province, Iran: Logit Model Approach", Research Gate/publication.

[6] Abraham Falola, et al, (2013) "Willingness to take agricultural insurance by cocoa farmers in Nigeria" , International Journal of Food and Agricultural Economics, Vol. 1 No.1 pp. 97-107

Phillip Daniel Daninga (2014)[7] made a study to understand the factors influencing drought-securing farmer's contracts, using 410 questionnaires for cotton growers, randomly selected in the Bunda in Tanzania. Results from logistic regression analysis showed that respondents' perception of drought risk phenomena was influenced by experience, previous loss due to drought and age.

Hiwot Teshome and Ayalneh Bogale (2014)[8] point out that insurance is an important instrument to transfer part of the risk and in their study assesses the farmers 'willingness to pay for risk pricing risk and consider factors that affect farmers' readiness to pay. The study was conducted through questionnaires developed in 161 family farms. The log model is used to evaluate the willingness to pay, and the Tobi model to examine the factors that affect the readiness to pay and the intensity of the payment. Six variables; income, ownership, income outside farm, age, number of members and the availability of public and private donations have an effect on willingness to pay.

DATA

Sources of important information from where we collected the primary data are 136 farmers in Vlora district. The study was conducted through questionnaires conducted in this area during 2017. The farmers were randomly selected.

The questionnaire was designed in three sections. A. Demographic and social data, B. Risk perception factors, and C. Economic farm situation.

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[7] Phillip Daniel Daninga and Zhang Qiao (2014)" Factors influencing holding of drought insurance contracts by smallholders in Bunda", International Journal of Development and Economic Sustainability, Vol.2, No.5, pp.16-30.

[8] Hiwot Teshome and Ayalneh Bogale (2014) "Willingness to pay for Rainfall based Insurance by Smallholder Farmers in Central Rift Valley of Ethiopia: The Case of Dugda and Mieso Woredas", Asia Pacific Journal of Energy and Environment, Volume 1, No 2

Research hypotheses

Based on the research questions we constructed the following hypotheses:

1. H_0: Farms that perceive the risk of natural disasters are more willing to pay for insurance.
2. H_0: The willingness to pay insurance is affected by the change of factors in farms.

The empirical analysis of the problem was carried out using the econometric models of Logistic Regression analysis, based on the literature review. The SPSS program was used for the analysis.

Methodology

Logistic regression is the appropriate regression analysis to conduct when the dependent variable is dichotomous (binary). Like all regression analyses, the logistic regression is a predictive analysis. Logistic regression is used to describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables.

Logistic Regression Formula:

$$Logit_i = \ln\left(\frac{prob_{ngjarjes}}{1 - prob_{ngjarjes}}\right) = b_0 + b_1X_1 + \cdots + b_nX_n$$

Characteristics of Logistic Regression

Cases are independent. Does not assume a linear relationship between the dependent variable and the independent variables, but it does assume linear relationship between the logit of the explanatory variables and the response.

Independent variables can be even the power terms or some other nonlinear transformations of the original independent variables.

The dependent variable does not need to be normally distributed, but it typically assumes a distribution from an exponential family (e.g. binomial, Poisson, multinomial, normal...); binary logistic regressions assume binomial distribution of the response.

The homogeneity of variance does not need to be satisfied.

Errors need to be independent but not normally distributed.

It uses maximum likelihood estimation (MLE) rather than ordinary least squares (OLS) to estimate the parameters, and thus relies on large-sample approximations.

Goodness-of-fit measures rely on sufficiently large samples, where a heuristic rule is that not more than 20% of the cells counts are less than 5.

Usually some grouping of the data is needed. The most commonly, use the Hosmer-Lemeshow statistic, and influence values and plots.

Analysis and Results

From data analysis, farmers perceive the sources of risk from hail, droughts and frosts as the most important. The risk of storms, storms, floods and fires is less important. This perception is also closely related to the experiences that the farms have been affected by these disasters in the last 10 years. According to farmers' responses on the most significant risk according to the sources of risk we have summarized in Table 1. Question: What are the most important natural disasters that your farm may be exposed in the coming years?

Table of importance of risk resources (in %)

Risk sources	1. Very important	2.Sufficient enough	3. Somewhat important	4.Less important	5. Not important

Hail	65.00	35.00	.00	.00	.00
Frost	2.00	8.00	58.00	32.00	.00
Drought	33.00	56.00	10.00	1.00	.00
Storms	.00	.00	27.00	57.00	16.00
Thunderstorm	.00	.00	.00	.00	100.00
Flooding	.00	.00	.00	.00	100.00
Fires	.00	.00	6.00	10.00	84.00
Other	.00	.00	.00	.00	100.00

According to table data, 65% of farmers consider the risk of turtles to be the most important, 56% consider the risk of drought as important and 58% consider the risk of frosts to be somewhat significant.

1. **H$_0$: Farms that perceive the risk of natural disasters are more willing to pay for insurance.**

Data processing in the SPSS[9] program for the regression of the first hypothesis gives us the results according to the following tables:

		B	S.E.	Wald	df	Sig.	Exp(B)
			Variables in the Equation				
Step 1	Constant	-8.137	2.139	14.477	1	.000	.000
	Risk perception	.431	.184	5.480	1	.019	1.539

According to the table, the coefficient of the independent variable is important Sig. <0.05, WALD > 0 and S.E. < 2. If the independent variable grows with a unit, WTP will increase its chances with 0.43 units. The link between the variables is positive. So the first hypothesis is proved, therefore, with increasing perception, WTP increases.

But how important is this connection? Let's see the following test indicators.

Omnibus Tests of Model Coefficients

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[9] LOGISTIC REGRESSION; METHOD=ENTER /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).

		Chi-square	df	Sig.
Step 1	Step	9.460	1	.009
	Block	9.460	1	.009
	Model	9.460	1	.009

Omnibus Tests of Model Coefficients have Chi – Square significant (p< 0.05). But Nagelkerke R Square is not high, is only 8, 5%, that means that this model explain only 8.5% of variance.

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	134.756	.037	.085

How well the data fits the model?

The Hosmer and Lemeshow test is basically a way of ascertaining how well the data fits the model. It is calculated using the deviance (-2LL) and produces a p-value based on a chi-square distribution.

The Hosmer–Lemeshow test is a statistical test for goodness of fit for logistic regression models. It is used frequently in risk prediction models. The test assesses whether or not the observed event rates match expected event rates in subgroups of the model population. The Hosmer–Lemeshow test specifically identifies subgroups as the deciles of fitted risk values. Models for which expected and observed event rates in subgroups are similar are called well calibrated.

It tests the null hypothesis that the model is a good enough fit for the data. As usual, we only reject the null hypothesis if p<.05, so in this case the model is a good fit if the p value is greater than .05 (p>.05). So in our case Sig. = 0.589 > 0.05.

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	5.583	7	.589

Contingency Table for Hosmer and Lemeshow Test						
		0		1		
		Observed	Expected	Observed	Expected	Total
Step 1	1	25	24.213	0	.787	25
	2	28	28.815	2	1.185	30
	3	17	17.142	1	.858	18
	4	42	41.608	2	2.392	44
	5	24	23.451	1	1.549	25
	6	11	12.799	3	1.201	14
	7	34	32.290	2	3.710	36
	8	21	21.199	3	2.801	24
	9	27	27.484	7	6.516	34

2. H_0: The willingness to pay insurance is affected by the change of factors in farms.

In the second hypothesis we will note the factors that influence the willingness to pay, (WTP). In the table we will see that the three variables have an important coefficient at $p < 0.001$. These are the size of farm, education, and trust in insurance institutions. Four variables are important for $p < 0.05$. Those are Extension, Income of farm, Proactive farmers, Damage caused. Age and investment are not more significant.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1a	Age	-.016	.041	.146	1	.702	.984
	FarmSize	-.721	.184	15.341	1	.000	.486
	Educ_con	-.931	.226	16.960	1	.000	.394
	Extension	-3.693	1.232	8.990	1	.003	.025
	Trust-Instit	2.800	.614	20.778	1	.000	16.437
	Income-Agri	.038	.015	6.569	1	.010	1.039
	Proactiveness	-1.091	.443	6.074	1	.014	.336
	Invest	-.467	.360	1.680	1	.195	.627
	Damage caused	.302	.123	6.059	1	.014	1.352
	Constant	9.413	4.002	5.534	1	.019	12247.599

But how important is this connection? Let's see the following test indicators.

Omnibus Tests of Model Coefficients have Chi – Square more significant ($p < 0.001$). And Nagelkerke R Square is high, 76 %, that means that this model explain 76 % of variance.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	114.697	9	.000
	Block	114.697	9	.000
	Model	114.697	9	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	73.839a	.570	.760

The Hosmer and Lemeshow test is Sig.=0.983 (p>0.05), so in this case the model is a good fit.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.921	8	.983

Contingency Table for Hosmer and Lemeshow Test

	WTP = 0.00		WTP = 1.00		
	Observed	Expected	Observed	Expected	Total
1	14	13.999	0	.001	14
2	14	13.912	0	.088	14
3	13	13.146	1	.854	14
4	11	11.295	3	2.705	14
5	10	8.365	4	5.635	14
6	4	4.647	10	9.353	14
7	1	1.895	13	12.105	14
8	1	.626	13	13.374	14
9	0	.104	14	13.896	14
10	0	.010	10	9.990	10

So the second hypothesis is proved.

CONCLUSIONS AND RECOMMENDATIONS

This study, conducted at grape farmers in Vlora area, showed that the most important sources of natural disaster risk are hail, frost and drought. This area has been affected more frequently by these phenomena in the last 10 years. And those are considered to be the most important risk sources for the coming years.

The analysis through logistic regression confirmed that there is a positive relationship between risk perception and willingness to pay for insurance. Testing also showed that this connection is not very important as there are other factors that need to be included in the model.

In the analysis of the second hypothesis were evidenced the social economic factors that influenced the willingness to pay and most of them were very important. The tests of the model proved that the model has high degree of accuracy and the data represent the vast majority of variance.

Factors with significant coefficients are size of farm, education, trust in insurance institutions, extension, income of farm, proactive farmers, damage caused. Age and investment are not more significant.

Knowing the risk factors will help build effective risk management policies for farmers and policy makers and insurance companies.

REFERENCES

1. Collett, D (1991). Analysis of Binary Data.
2. Fey, M. (2002). Measuring a binary response's range of influence in logistic regression. American Statistician, 56, 5-9.
3. Hosmer, D.W. & Lemeshow, S. (1989). Applied Logistic Regression.
4. McCullagh, P. & Nelder, J.A. (1989). Generalized Linear Models. 2nd Ed.
5. Pregibon, D. (1981) Logistic Regression Diagnostics. Annals of Statistics, 9, 705-724.
6. Rice, J. C. (1994). "Logistic regression: An introduction". In B. Thompson, ed., Advances in social science methodology, Vol. 3: 191-245. Greenwich, CT: JAI Press. Popular introduction.

7. Field, A. (2009). Discovering Statistics Using SPSS. London: SAGE Publications Ltd.

8. Osmani.M., Econometric Module, Agricultural University of Tirana, – Albania – 2002.

9. www.intat.com

10. www.bujqesia.gov.al