International Scholars Journals

International Journal of Agricultural Sciences ISSN 2167-0447 Vol. 10 (2), pp. 001-005, February, 2020. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Effective factors on the demand of insurance of agricultural crops in Sistan area, Iran

Kamran B. Khomeini[1]*, Parviz H. Omidyar[2] and Hossein Daneshjoo[3]

[1]Department of Agricultural Economics, Zabol University, Zabol, Iran.
[2]Department of Agricultural Economics, Zabol University, Zabol, Iran.
[3]Department of Scienc e of Extension and Agriculture, Zabol University, Zabol, Iran.

Accepted 28 October, 2019

As farming is faced with uncertain conditions such as climate (rain reduction and drought), pests, diseases, production, price and market fluctuations, it is an economic activity under risk. In order to reduce risk and stimulate investment, agricultural insurance has been planned in agriculture. This study attempts to investigate the performance insurance of agricultural crops by collecting sectional information in the region of Sistan. A Tobit model was used to analyze effective factors on the demand of agricultural insurance. The results indicate that agricultural services insurance of crops has fluctuated because of several socio-economic effects on farmers' acceptance and demand of insurance in recent years. Annual return and experience are two main effective factors which affect farmers' demands of insurance. The structural improvement and appropriate government policies can potentially increase the insurance of agricultural crops.

Key words: Insurance of agricultural crops, censored regression model, demand, Iran.

INTRODUCTION

Agriculture is a high risk economic activity. Farmers are engaged with natural unpredictable disasters such as floods, hay, heavy rain, drought, economic hazards, fragility and vulnerability. Therefore they experience high return volatility. Also agricultural producers do not have confidence in the price and products function; farmers are forced to decide on the unpredictable use of resources and production levels. So, this activity is potentially a deterrent system that reduces agricultural investment and products, farmers' income and welfare.

The population is steadily growing and so they obviously need more food security. In order to maintain the national capital and sufficient food production, there is need to expend coverage insurance with the participation of wide range of farmers. Essentially, farmers' acceptance of insurance depends on understanding of the vital role of agricultural insurance in securing investment in agriculture. The success level of crop insurance policies considerably relies on farmers' demand tendency. There is need for analytical surveys to be applied on the relative effect of various factors, such as economic, social, and technical risk on farmers' decision. It supports insurance system and policy makers especially in agricultural activities.

Fund performance of crop insurance was clearly improved in Sistan and Baluchestan province in 1999. The numbers of covered farmers are increased because agricultural and animal products are mostly covered by fund insurance. Farmers risk aversion is reduced because of creating more insurance for farmers by fund insurance of crops in this province. The number of covered farmers reduc ed because farmers are unfamiliar with comprehensive insurance services from 1995 to 1998. Expansion of agricultural activities led to more farmers' coverage from then on (Fund Insurance of Agricultural Products, Sistan and Baluchestan province, Iran, 2010).

PREVIOUS RESEARCHES

Enjolras et al. (2012) asserted that the effective factors of crop insurance decision have been known by them in France and Italy. The system of insurance is highly

*Corresponding author. E-mail: kamran22@yahoo.com

subsidized and trans forming from a public fund to private policies in these countries. The system of production insurance and capability of these two countries are alike, as is recognized in this study. The elasticity of demand for crop insurance is determined by a two-stage empirical model. The degree of risk aversion is measured in the first model, while the second model measures the optimal of farmer's expected utility subject to their risk attitude. Results show that insurance coverage developed into more cost and less profit. Although insurance is more expensive, farmers' attitude will be more secured by overcoming the costs.

Garrido and Zilberman (2008) observed in their study that several Probit models are applied with insuring and non-insuring approaches by calculating dispersion independent variables. The data used included 52300 observations of farmers made for 11 years. The results explain that farmers' insurance strategies rely strongly on their actual insurance experience which was obtained from variables introduced in their paper. They mentioned that individuals with loss rations greater than 1 do not show more responsiveness than those facing more balanced premium charges. Also, according to the results, adverse selection was not the key source of inefficiency in the Spanish insurance system.

Timothy and Richards (2000) published a paper titled "A Two-Stage Model of the Demand for Specialty Crop Insurance". He focused on modification of the Federal Multiple-Peril Crop Insurance Program for crops which have high cost for catastrophic-level coverage and which would significantly reduce program participation. Three scenarios of insurance coverage (50, 65 and 75%) were examined by using aggregate data from grape production in 11 California counties from 1986-1996. The results show that the price-elasticity of demand for 50% coverage is elastic. An increase in premium reduces much more participation. Such growth may also lead to a major reallocation of growers among coverage levels.

In 2012, a review of the core economic rationale and the economic literature for subsidies of crop insurance programs is presented by Sumner and Zulauf. As crop insurance was developed during the earlier period of 2012, crop subsidy program was grown in the budget account (about 63% of all crop subsidies) and so it was more important for the fiscal year 2013 in the U.S. This study aims to create certain design elements from the insurance programs which may affect less diversification of crops and planting in marginal land, and increase the potential of inputs' use while reducing certain risk mitigation practices. It is concluded that crop insurance subsidies encourage production changes adding to the aggregate negative environmental effects of farming. Although production changes may be relatively small for some crops, insurance encourages planting on insignificant lands; so, the negative environmental effects of insurance are excessively high.

Karbasi (2000), in his paper, studied farmers' attitude factors that affect the acceptance and use of agriculture insurance products by using a Logit model for whole crops in Iran. Results showed that education levels increase wheat, barley and sugar beet insurance demand but side jobs by farmers and high saving reduce insurance demand. Agricultural credit increases probability acceptance of insurance for barley.

Smith and Boquet (1996) provided a survey about crops insurance of Montana farmers in America. This paper addresses that risk factors such as history, debt to credit institutions and banks, fluctuations of the product, the education level of farmers and insurance claims are sources of effective crop insurance scheme.

Liu et al. (2008) estimated that the ways by which economy and agriculture water reserve can be attained is by applying Tobit model in 10 states of China based on 3 traditional technologies founded on family (medium and advanced). Important variables such as governmental support, training and promotion are effective factors in the application of economic ways by farmers.

DATA AND METHODOLOGY

Data required for this study were collected from 105 samples of farmers by questionnaires. A Tobit model was used in this study for data analysis. If the regression model shows that the dependent variable is incompletely visible in some of its set, then the Tobit model is used. Tobit model as a linear regression model is introduced when the value of the dependent variable is censored (limited). In the model, when the value of independent variable is unobserved it occurs at zero; while it is observed, it is taken as a value of 1. Tobin was the first person to use Tobit model in economics in 1958. In his model, household expenditure regressed on durable goods, and he considered that household expenditure (dependent variable of Tobin regression model) cannot be negative. The model is named by Tobin as restricted dependent variables model. Since this model was similar to Probit model, its name was changed by Goldberger to Tobit in 1964. These kinds of models and their investigated forms are introduced as Tobit models or restricted dependent models (Greene, 2002). To estimate regression coefficients and analyze data, Eviews6 software was applied.

Now an explanation, based on the theory of the Tobit model, was given by the latent variable as follows: "The Tobit model is a statistical model proposed by James Tobin in 1958 to describe the relationship between a non-negative dependent variable y_i and an independent variable (or vector) x_i."

The model supposes that there is a latent (that is, unobservable) variable y_i^*. This variable linearly depends on x_i via a parameter (vector) β which determines the relationship between the independent variable (or vector) x_i and the latent variable y_i^* (just as in a linear model).

In addition, there is a normally distributed error term u_i to capture random influences on this relationship. The observable variable y_i is defined to be equal to the latent variable whenever the latent variable is above zero and zero otherwise.

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases}$$

(1)

Where y_i^* is a latent variable:

$$y_i^* = \beta x_i + u_i, u_i \sim N(0, \sigma^2)$$

(2)

The β coefficient should not be interpreted as the effect of x_i on y_i, as one would with a linear regression model; this is a common error. Instead, it should be interpreted as the combination of (1), the change in y_i of those above the limit, weighted by the probability of being above the limit; and (2) the change in the probability of being above the limit, weighted by the expected value of y_i if above.

The Tobit model is a special case of a censored regression model, because the latent variable y_i^* cannot always be observed while the independent variable x_i is observable. A common variation of the Tobit model is censoring at a value of y_L different from zero:

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > y_L \\ y_L & \text{if } y_i^* \leq y_L. \end{cases} \quad (3)$$

Another example is censoring of values above y_U:

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* < y_U \\ y_U & \text{if } y_i^* \geq y_U. \end{cases} \quad (4)$$

Yet another model results when y_i is censored from above and below at the same time.

$$y_i = \begin{cases} y_i^* & \text{if } y_L < y_i^* < y_U \\ y_L & \text{if } y_i^* \leq y_L \\ y_U & \text{if } y_i^* \geq y_U. \end{cases} \quad (5)$$

The rest of the models will be presented as being bounded from below at 0, though this can be generalized as we have done for above model.

The likelihood function

Below are the likelihood and log likelihood functions for the Tobit model. This is a Tobit that is censored from below at y_L when the latent variable $y_j^* \leq y_L$. In writing out the likelihood function, an indicator function $I(y_j)$ was first defined where:

$$I(y_j) = \begin{cases} 0 & \text{if } y_j = y_L \\ 1 & \text{if } y_j \neq y_L. \end{cases}$$

(6) (2)

Next, we mean Φ to be the standard normal cumulative distribution function and ϕ to be the standard normal probability density function. For a data set with *N* observations, the likelihood function for the Tobit model is:

$$\prod_{j=1}^{N} \left(\frac{1}{\sigma} \phi \left(\frac{Y_j - X_j \beta}{\sigma} \right) \right)^{I(y_j)} \left(1 - \Phi \left(\frac{X_j \beta - y_L}{\sigma} \right) \right)^{1-I(y_j)}$$

(7)

In the linear regression of this study's model, independent variables are sorted into two sets that are explained as follow:

$$Y_i = \theta + \sum_{i=1}^{n} \beta_i X_i + \sum_{i=1}^{m} \alpha_i D_i + U_i$$

(8)

where Y is a dependent variable, X is an independent variable, D is a dummy variable, β and α are coefficients, θ is a fixed variable and U is an error term in regression.

RESULTS AND DISCUSSION

Farmers' personal characteristics are indicated in Table 1. It shows that age and experience of farmers recorded high levels and ensured that cultivation plans and farmers' returns also have great fluctuations.

Educated farmers are reviewed in Table 2. More than half of the farmers are illiterate or their population proportion is 57%. Only 6 and 9% of farmers graduated from high school and are under graduates respectively; also, only 28% of them studied at primary school as is shown in Table 2 and Figure 1.

The results of Tobit regression are presented in Table 3. As estimated, regression coefficients and probabilities show that 1% increase in income causes a 0.06%

Table 1. Factors of insurance demand on far mers.

Variable	Definition	Average	Max	Min	E.d
X_1	Experience (years)	36.6	61	6	112.5
X_2	Ensured cultivation plane (hectares)	4.1	8	2	8.799
X_3	Annual income (10 thousand Rials)	764	1500	300	1683
X_4	Age	61	85	28	155.2

Table 2. Degree of farmers.

Under graduate	High school	Primary school	Illiterate
9	6	28	57

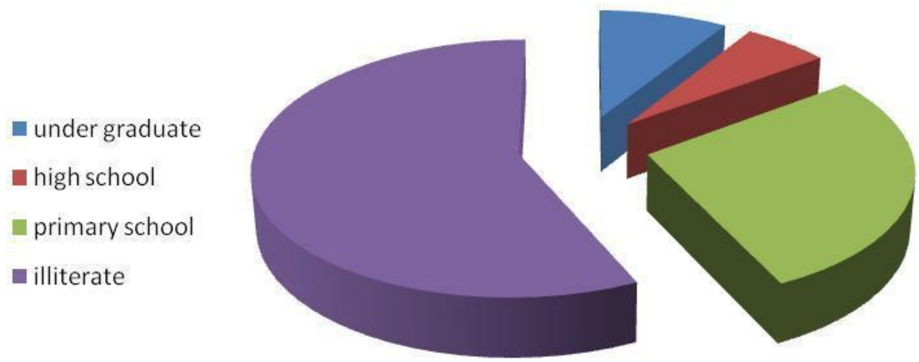

Figure 1. Degree of farmers.

Table 3. Estimate of effective factors coefficients using Tobit model.

Variable	Estimated regression coefficient			Statistic Z	Prob.
Fix	-2.55			-5.15	0.0
Farming experience (X_1)	-0.0006 n.s			-0.042	0.965
				z_{α_1} = -0.4	0.661
Education (D_i)	α_1 : -0.23 n.s	α_2 : -0.24 n.s	α_3 : -0.20 n.s	z_{α_2} = -1.48	0.138
				z_{α_3} = -0.4	0.686
) X_2 (Cultivated area of crop	-0.01 n.s			1.4	0.160
) X_3 (Annual income	0.0006*			2.12	0.033
) X_4 (Age	0.041**			2.89	0.003
R^2	0.693				
Log likelihood	-27.464				

n.s: The value is non-significant; ***: Significant at less than 1%; *: Significant at less than 10%; **: Significant at less than 5%.

increase in admissions of insurance. Also, it indicates that farmers with higher income levels have a greater tendency for insurance of their products . Farming experience does not affect the demand of insurance, because their methods of cultivation are mostly the same. Moreover, a one percent increase in age of the insured crops causes 4% increases in the percentage of insurance demand; as a result, the older farmers are exceptionally more willing to be insured. Although t he value of probability for the level of cultivated area showed an insignificant effect on the crops insured, the growth of cultivated farms ' size lead likely to reduction of the insurance of products. In addition, R^2 of the model fit compared to about 0.7 is a good criterion for the validity of the independent variables in regression models. The Log-likelihood statistical test shows significant estimates in the overall regression.

SUGGESTIONS

- To develop insurance policy, farmers need to acquire further knowledge in order to improve their communication with insurers.
- The growth of farmers' return could extend demand of insurance; therefore, any policy on increasing farmers' income might largely create more insurance contracts.
- Insurance compensation could not only pay for the main products but also for all damages.
- As a result of this study, the size of farms has no effect on demand of insurance but the efficiency and productivity of farming may produce more farmers return and insurance.

REFERENCES

Bosch DJ, Johns on CJ (1992). An evaluation of risk management strategies for dairy farms. South. J. Agric. Econ., 24(2): 173-180.

Enjolras G, Capitanio F, Adinolfi F (2012). The demand for crop insurance. Combined approaches for France and Italy. Agri. Eco. Rev., 13(1): 5-22.

Garrido A, Zilberman D (2008). Revisiting the demand of agricultural insurance: The case of Spain. Euro. Asso. Of. Agric, J., pp. 1-22.

Greene A (2002). Fixed effects and bias due to the incidental parameters problem in the Tobit model. Econometric Reviews. Taylor. Fran. J., 23(2): 125-147.

Karbasi AR, Kambozia N (2003). Survey effective factors on Agricultural crops insurance demand. Agric. Econ. Dev., 11: 167-185.

Liu Ch, Zhang L, Fan Sh (2008). A Study on the Factors Affecting Farmer's Agricultural Production Investment. J. Agric. Sci., p. 33.

Sargazi AR, Karbasi AR, Fahimifard SM (2012). Analysis of agricultural water application technology (a case study of Sistan region of Iran). Indi an J. Agric. Res., 46(1): 54-59.

Smith V, Boqluet AE (1996). The demand for multiple peril crop insurance from Montana wheat farms. Am. J. Agric. Econ., 78: 189-201.

Sumner DA, Zulauf C (2012). Economic and Environmental Effects of Agricultural Insurance Programs. Amer-Eura. J. Sustain. Agric., 6(2): 97-101.

Timothy J, Richards S (2000). A Two -Stage Model of the Demand for Specialty Crop Insurance. J. Agric. Res. Econ., 25(1): 177-194.

Tobin J (1958). Estimation of relationships for limited dependent variables. The Econ. Soc. J., 26(1): 24–36.