Research article

Determining Crop Insurance Participation in Laguna, Philippines Using Subsidy and Asymmetric Information Incentives

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Abstract The Philippines is susceptible to tropical cyclones which threaten the production of agricultural crops. To help farmers cover their losses, financial protection through crop insurance can be employed. This paper studied the effects of the Philippine multi-peril crop insurance on mean returns per acre. Data on *palay* (unhusked rice) yields in the province of Laguna were gathered from 1978 to 2015. Using classical decomposition, the time series data was decomposed into trend-cycle, seasonality and irregularity components to compute for the Actual Production History (APH) yield and to forecast the APH yield for 2016. Using the crop insurance incentives model of Just et. al., the data were used to explore the subsidy and asymmetric information incentives for insurance participation for both wet and dry seasons. Three risk classes were considered: low, medium and high, while four insurance guarantee levels were considered: 100%, 90%, 10% and 0%. It was found that as yield guarantee increases, the effect of insurance on mean returns also increases. Additionally, as insurance premium increases, the effect of insurance on mean returns per acre decreases. Results also indicate that effects of crop insurance on mean returns per acre are highest when risk class is low and yield guarantee is high.

Keywords crop insurance, subsidy incentive, asymmetric information incentive

INTRODUCTION

The Philippine government has been helping farmers, who are amongst the poorest citizen in the country, cover their production losses by offering financial protection through crop insurance. These insurance products pay the farmer the cost of production input when a partial or total loss is experienced. A loss is considered partial if the loss is between 10% and 90%; otherwise, if the loss is above 90%, it is considered a total loss. While some insurance products from the government are free, farmers are required to pay a premium for these insurance products. The insurance premium varies according to the season and risk classification. There are two main planting seasons in the country, the wet and the dry season. While there are three risk classes: low-risk, medium-risk or high-risk, which is classified according to the riskiness of planting rice in that area. The farmer can choose the amount of cover or guarantee level.

The government heavily subsidizes the premium to help the farmers. This is a great aid to many low-income farmers, who still finds it difficult to purchase the insurance despite the subsidy. However,

this may also attract opportunistic agricultural producers who use information advantages to obtain more profits. Though extensive studies are conducted by the insurance providers, farmers are often more knowledgeable about the risk in planting. Some studies conducted by Just, Calvin and Quiggin (1999), Walters, Shumway, Chouinard and Wandschneider (2014), and Wang, Hanson and Black (2003) suggest the presence of adverse selection and moral hazard in insurance. Profit-maximizing in adverse selection occurs when there is information asymmetry between two parties before the agreement, whereas profit-maximizing in moral hazard occurs when there is a change in behavior after the agreement (Nickolas, 2016). If premiums paid are not able to cover the indemnities, this may render the insurance product unsustainable.

Many studies identifying factors affecting farmer participation in crop insurance have been conducted. According to some literatures, a set of factors that impact farmer participation decisions include farmer-specific attributes, region-specific attributes and economic factors. Farmer-specific attributes include age, experience, education and income. Region-specific attributes involve farm size, location and soil quality. Economic factors consist of the insurance premiums and indemnity payments.

Sai, Yulian and Xiaofeng (2010) found that in Chinese household, agricultural land, farmer's education, production capacity and transaction costs are the significant factors for families in rural areas to enroll in crop insurance programs. A study performed in the United States verified the idea that decreasing transaction cost improves crop insurance participation. According to Ker and Ergun (2003), when transaction cost is reduced through efficient delivery channels, greater insurance participation can be elicited. A research by Cabas, Leiva and Weersink (2008) found that that farmer participation in insurance is largely determined by price variables.

In this study, it will be determined if adverse selection is present in the crop insurance program in the Philippines to aid the insurers in safeguarding the sustainability of their insurance products. This study can also be useful for farmers who are on a tight budget and are picking only the likely situation where insurance can help them in safeguarding their income.

OBJECTIVE

The primary aim of this study is to estimate the effects of insurance, particularly the multi-peril rice insurance, on mean returns (bushels per acre) to the farmer and to look into the influence of subsidy and asymmetric information in the decision of farmers to participate in crop insurance programs.

METHODOLOGY

In this study, an analysis is made by applying the crop insurance incentives model built by Just, Calvin and Quiggin (1999). Data are collected from two sources: Regional Office of the Department of Agriculture (DA), and the Philippine Statistics Authority. The data on rice production are collected from the Regional Office of the Department of Agriculture (DA) in Calauan, Laguna. These included harvest area, average yield (in metric tons per hectare) and yield production (in metric tons) in 2014 and 2015 during wet and dry seasons. There data collected from the Philippine Statistics Authority - Bureau of Agricultural Statistics are downloaded from the website. These data are statistics on the quarterly area and volume of *palay*, and monthly farm-gate prices of *palay* in Laguna from the years 2006 to 2015.

The analysis uses data on rice production of Filipino farmers in Laguna to identify crop insurance effects on mean returns per acre. The insurance effects on mean returns are then decomposed into asymmetric information and subsidy incentives. Subsequently, the crop insurance effects are forecasted for the following year using forecasted values of the Actual Production History (APH) yield and using forecasted values of the *palay* price. Forecasting of APH yield and *palay* price for 2016 is employed to

predict insurance effects on mean returns per acre and to predict the changes in the subsidy and the asymmetric information effects for 2016.

RESULTS AND DISCUSSION

Decomposition of Data Collected

Upon applying classical decomposition, the data collected on production shows that *palay* production in the Philippines has an increasing trend (Fig. 1), except for the drop experienced in the first quarter of 2010, which can be attributed to the *palay* damaged due to spread of tungro, rice blasts, black bug, as well as the onset of El Niño. Another observation from the seasonality component (Fig. 2) of the data is that yields are highest during the wet season and lowest during the dry season. This observation is necessary in determining the periods when insurance participation are most effective.

Computing the effect of insurance on mean returns per acre shows that as the premium increases, the effect of insurance to the farmer's mean return decreases. However, the effect of insurance increases as the loss increases. This implies that adverse selection can happen for farms in high-risk area. These results are summarized Table 1, Figs. 3 and 4. Figure 3 shows that as insurance premium increases, the effect of insurance on mean return decreases. Figure 4 shows that the effect of insurance on mean returns increase for higher than 70% of loss.

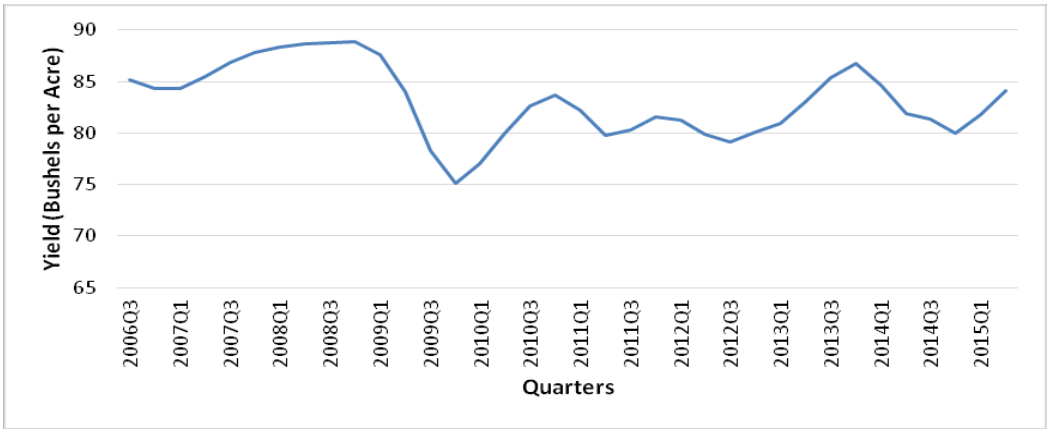

Fig. 1 Trend-cycle component of *Palay* yield on a quarterly basis from 2006 to 2015

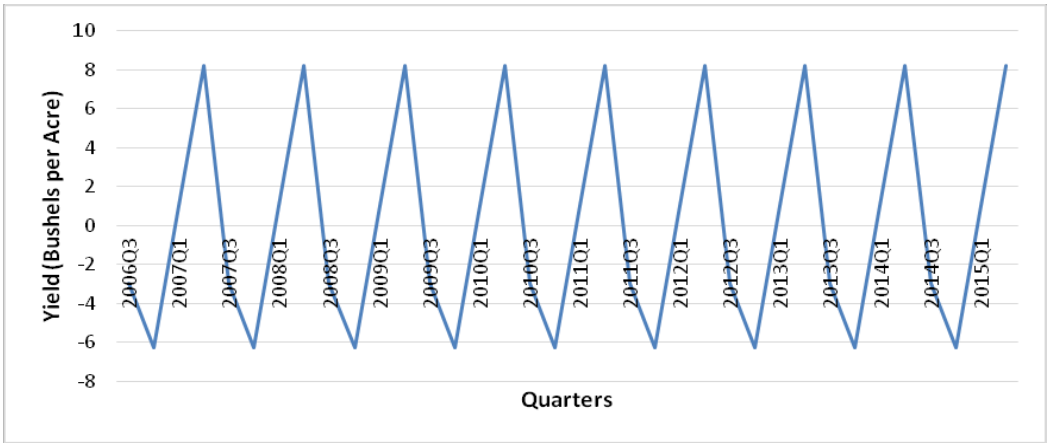

Fig. 2 Seasonality component of *Palay* yield on a quarterly basis from 2006 to 2015

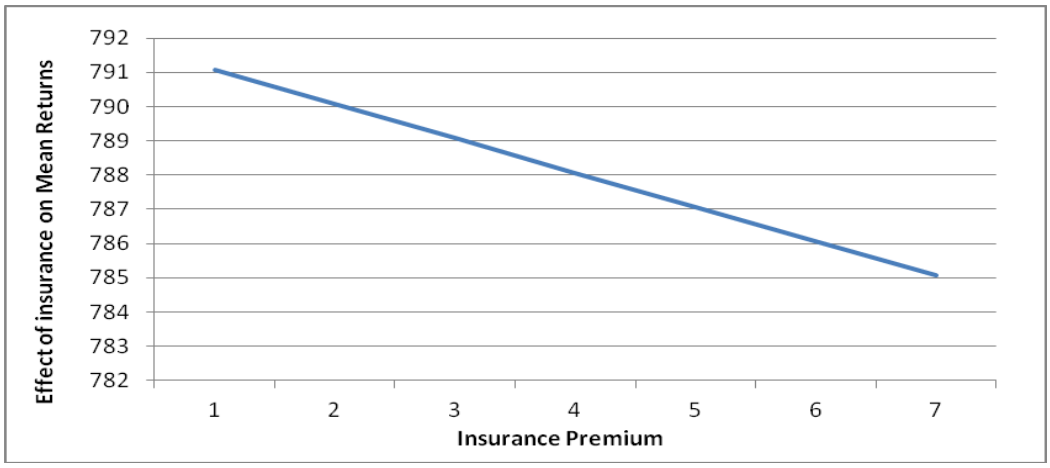

Fig. 3 Relationship between insurance premium and effect of insurance on mean returns per acre during the wet season when there is total loss

Table 1 Effect of insurance on mean returns per acre

Multi-Risk Cover	Effect of Insurance on Mean Returns per Acre					
	Wet Season			Dry Season		
	Low	Medium	High	Low	Medium	High
Total Loss	390.02 to 790.74	387.43 to 788.15	384.83 to 785.55	-10.40 to -2.55	-12.73 to -4.88	-15.06 to -7.21
Partial Loss	-14.25 to 390.02	-16.84 to 387.43	-19.44 to 384.83	-12.87 to -10.40	-15.20 to -12.73	-17.53 to -15.06
No Loss	-14.31 to -14.25	-16.90 to -16.84	-19.50 to -19.44	12.87	-15.20	-17.53

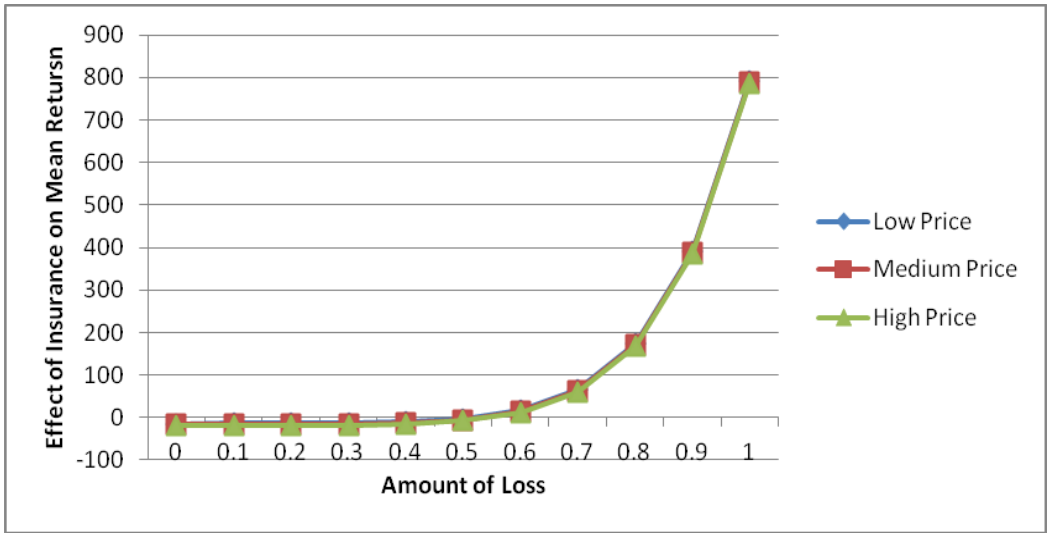

Fig. 4 Relationship between amount of loss and effect of insurance on mean returns per acre during wet season (original and forecasted price)

Analysis of the Subsidy and Asymmetric Information Incentives

This effect is decomposed into subsidy and asymmetric information incentives. Subsidy incentive refers to the financial aid given by the government to increase farmer participation in crop insurance programs, whereas the asymmetric information incentive is defined to be the incentive associated with the inaccuracies in insurance underwriting because of incomplete information for the side of the insurer.

Table 2 Subsidy effect of insurance

Yield Guarantee	Subsidy Effect of Insurance					
	Wet Season			Dry Season		
	Low	Medium	High	Low	Medium	High
> 90%	-13.55 to 585.63	-16.14 to 583.04	-18.74 to 580.44	-12.09 to 587.09	-14.42 to 584.76	-16.75 to 582.43
10% to 90%	-14.33 to -13.55	-16.92 to -16.14	-19.52 to -18.74	-12.87 to -12.09	-15.20 to -14.42	-17.53 to -16.75
< 10%	-14.33	-16.92	-19.52	-12.87	-15.20	-17.53

The subsidy effect of insurance on mean net income of farmers is presented in Table 2. Results show that for both cropping seasons, the subsidy effect on mean net income is very high in low-risk area and at > 90% loss, while the least effect appears in high-risk area and at < 10% loss. This suggests that the largest increase of mean net income due to subsidy occurs when a farmer from a low-risk area experiences a total loss. This implies that a farmer will benefit from the insurance if he is from a low-risk area and he sees that for that cropping season losses are likely to occur. However, it is also seen that adverse selection is greater during the dry season than during the wet season. As for the insurer, this means that he should be more careful in underwriting the insurance product during the dry season.

By comparing subsidy effects across yield guarantees for both wet and dry seasons, high positive mean subsidy effects of crop insurance are perceived for some yield guarantees between 90% to 100%. This means that for these yield guarantees, the subsidy greatly increases mean net income when agricultural loss is at least 90%. It can also be perceived that low negative mean subsidy effects are at yield guarantees from 0% to 90%. This means that insurance subsidy causes a slight decrease on mean net income for yield guarantees 0% to 90%.

By comparing the values obtained by cropping season, it can be identified that the values for the dry season are greater than that of the wet season. Higher mean net income effects are expected during the dry season because there are less storms and typhoons that hinder the growth of *palay*. It is seen that adverse selection is greater during the dry season than during the wet season.

Another significant observation is that when the yield guarantee is low, the subsidy effect of insurance on mean returns per acre is also low. This implies that there is a positive association between these two. It is determined that as the premium increases, the effect of insurance on mean returns per acre decreases linearly.

As for asymmetric information effects (Table 3), calculations show that for dry season the mean effect on income is negative when farmer, in any area, chooses the highest guarantee level. This means that farmers cannot exploit the insurer for insufficient information, or that adverse selection is greater during the wet season than during the dry season. This implies that farmers are less likely to get insurance during dry season, and are less likely to choose maximum coverage during this season.

By comparing asymmetric information effects across yield guarantees for both cropping seasons, it can be observed that the mean net income effect is very high when yield guarantee is 90%, while it is very low when guarantee is 10%. When yield guarantee is 100%, negative asymmetric information effects are also very high. However, for other yield guarantees 10% and 90%, positive asymmetric

information effects are very low. It can be deduced here that for dry season, farmer cannot fully exploit the insurers for insufficient information.

Table 3 Asymmetric information effect of insurance

Yield Guarantee	Asymmetric Information Effect of Insurance					
	Wet Season			Dry Season		
	Low	Medium	High	Low	Medium	High
100%	205. 11	205.11	205.11	-589.64	-589.64	-589.64
90%	403.57	403.57	403.57	1.70	1.70	1.70
10%	0.07	0.07	0.07	0.00	0.00	0.00

By comparing the asymmetric information across cropping seasons, it can be identified that the values for the dry season are less than that of the wet season. This means that higher mean net income effects due to asymmetric information are expected during the wet season. It is seen that adverse selection due to asymmetry of information is greater during the wet season than during the dry season.

CONCLUSION

In conclusion, this study finds that adverse selection due to subsidy and asymmetric information incentives is existent in the multi-risk crop insurance product. The results support that the adverse selection is highest when yield guarantee is high. In most cases, adverse selection is highest when risk is low and the yield guarantee is high. For the farmer, he will benefit if he is from a low-risk area and insures when he expects that there will be losses for a certain cropping season.

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