Development of an Actuarially Fair Crop Insurance Model for Paddy Fields in Hambantota and Ampara Districts

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Introduction

Sri Lanka, like most of the countries in the Asian region has an agricultural economy and plays a huge role in the nation's economy and social development. Rice is the dominant food in Sri Lankan society for thousands of years, according to many historical sources. That was identified by all the governments came into power after 1948 and has implemented various programs to develop the rice production in the country.

At present rice has become the staple food of the 19 million people in Sri Lanka and its contribution to the Gross Domestic Product (GDP) is approximately 18%. It is the livelihood of more than 1.8 million farmers and more than 30% of the total labor force is directly or indirectly involved in the paddy field sector.

Agro-Climatically, the year is divided into two seasons coinciding with the monsoons as "*Maha*" and "*Yala*" and rice lands are cultivated in these two seasons. But annual losses in paddy field sector is huge in Sri Lanka due to unexpected bad weather, adverse prices of paddy, damages from insects and other various diseases. If the farmers come across with huge losses, they are helpless and always looking for a financial assistant from an external party.

All over the world, the use of Crop Insurance as a risk management tool has grown rapidly in recent years (Munich Re, 2009). In most countries, this kind of insurance policy was introduced almost four decades ago. But Sri Lanka, even though we have a great agriculture history, still been seeking for a proper insurance program to fulfill poor farmers by financing them if they incurred a loss in their paddy production. This research is based on development of a Group Crop Insurance Model for paddy field sector in Hambantota and Ampara districts by using farm visited data gathered in the month of June, 2011.The samples were not randomly selected according few limitations. Our budget was not satisfactory to conduct a huge survey by assigning reasonable number of human resources. The other main problem we came across was the limited available time. However, two samples with sample sizes of fifty were selected from each districts such that Damana division in Ampara and Tissamaharama division in Hambantota.

Methodology

Consider the simple yield insurance contract that pays indemnities if realized yields fall below some threshold value that defines a guarantee (Lawas, 2005). The premium rate is calculated as the total amount charged for the insurance product divided by the amount of protection (Carriquiry *et al.*, 2005).

Actuarially Fair Premium (AFP) Estimation

Let λ_j be the j^{th} coverage level (0.50, 0.65, 0.75, and 0.85) and let y_k^e be the expected yield of the k^{th} district. The expected yield of district k can be computed by taking the arithmetic average of the simulated yields drawn from the estimated yield distribution represented by district level parameters. Then the yield guarantee under λ_j in the k^{th} district is, $y_{jk}^g = \lambda_j * y_k^e$.Thus, the yield loss valued at crop insurance price election P_{jk} for

a given yield occurrence y_{ki} is $L_{jki} = P_{jk}$*max $[y_{jk}^{g}-y_{ki}, 0]$. Then the expected loss for district k with the coverage level λ_j is computed as, $L_{jk}^{e} = E\left(L_{jki}\right) = \sum_{i=1}^{m} L_{jki}/m$.

Therefore the Actuarially Fair Premium (AFP) rate for the k^{th} district under j^{th} coverage level is given by, $AFP_{jk} = \frac{L_{jk}^{e}}{y_{jk}^{g}}$

Results

Actuarially Fair Premium Rates for each district under respective coverage levels are given in Table 1.

Table 1: Actuarially Fair Premium Rates for each district under respective coverage levels

Coverage Level	Ampara			Hambantota		
	Expected Yield(Bushels/Acre) =130			Expected Yield(Bushels/Acre) =210		
	Yield Guaranteed (Bushels/Acre)	Expected Loss (LKR/Acre)	AFP Rate (LKR/Bushel)	Yield Guaranteed (Bushels/Acre)	Expected Loss (LKR/Acre)	AFP Rate (LKR/Bushel)
0.50	60	813.850	13.564	110	35.197	0.320
0.65	80	2620.116	32.751	140	436.641	3.119
0.75	100	4668.714	46.687	160	1508.529	9.428
0.85	110	7467.648	67.888	180	3945.255	21.918

Discussion

It can be seen that the AFP Rate in Ampara, under the 50% coverage level is LKR 13.564 per Bushel. That implies for each bushel of paddy the farmer should have to pay LKR 13.564 under the 50% coverage level as the premium. Since the expected yield in Ampara is 130 Bushels/Acre, it can be calculated the premium cost as 881.670 LKR/Acre. So an insured farmer in Ampara district under the 50% coverage level should have to pay 881.670 LKR for each Acre he/she cultivates. The premium cost for Hambantota district under the same 50% coverage level however, is 33.60 LKR/Acre. Therefore, the premium cost for Hambantota is considerably smaller compared to Ampara since there had been a huge flood in Ampara district hence the expected paddy yield has fallen down sharply in the period we conducted our research.

The study ended up with two different premium rates for each district such that the low risk producers will be charged less and the high risk producers will be charged more. If we combine both the districts and consider as one group then the APH rules will unduly penalize farmers in a region that experiences abnormally poor growing weather.

Conclusions

The present study was conducted only for Hambantota and Ampara districts and can recommend a more reasonable premium rate if we could carry out a research islandwide.

Another study with statistically selected random samples with larger sample sizes would be more effective and will generate accurate premium rates.

References

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