Crop Insurance as Resiliency Measure to Climate Change: Evidence from Corn Farmers in the Philippines

Jose M. Yorobe, Jr. – UPLB

Pilipinas Luis - SEARCA

I. Introduction

- Agricultural production is a risky business
- Natural hazards, weather related events – more difficult to control but some mitigating measures are available
- Extreme climatic events are becoming more prominent and frequent – can lead to crop failures
- Most affected by extreme climatic shifts is the corn sector where accumulated losses (1995-2004) have reached 7.2 billion pesos (Reyes, 2009), 3% of annual production (ADB, 1999), 33 % reduction in yield (Lansigan and Salvacion, 2007)
- Farmers are generally risk-averse (avoid risks)
- Some risks are addressed through government policy and adoption of new technology but many lie beyond these controls

I. Introduction

- **How can we make corn farmers more resilient?**

  1. Offset risk by compensating farmers during bad years – crop insurance (the PCIC was created in 1978 mainly to provide the protection for farmers against losses)

  2. Adoption of good agricultural practices (GAP) – evolved at FAO in 2002 – now adopted principle by many countries as an approach to develop sustainable agricultural production systems even with changing environment

- **At present, little is known on why farmers insure and/or adopt GAP and what factors can possibly influence adoption**

II. Objectives

- **Identify existing GAP technologies related to pest and disease/climate change resilience in corn production**
- **Evaluate psychological, socio-economic and demographic determinants of insurance and GAP adoption**
- **Assess the perception and level of awareness on corn insurance and GAP among corn farmers**
- **Identify appropriate intervention measures to improve adoption of GAP and the formulation and effectiveness of the corn insurance program**

III. The Philippine Corn Insurance Program

- Administered by PCIC since 1979
- Two types of cover: multi risk and natural disaster
- More than half of the premium (16% for low risk up to 22% of high risk) is subsidized by the gov't
- Total corn farmers served (1982- 2012) – 504,056. At its peak in 1990, it served more than 40,000 corn farmers
- In 2012, more than 12,271 farmers were insured and 3,565 were able to claim indemnities. About 6,856 were borrowing farmers.
- Indemnities paid in 2012 – 27.39 M; 16.8 M for natural disaster.

IV. Estimation methods and empirical approach

A. Survey Design and Data Description

- **The data used in the analysis came from the 2012-2013 face-to-face survey of corn farm households in Isabela, Pangasinan, and Bukidnon provinces (Figure 1).**
- **A total of 426 corn farm households were selected from 12 villages (*barangays)* using *a* multi-stage stratified random sampling in 2 strata: insured and not insured**
- **Variables used include 6 farmer characteristics, 6 institutional factors, 3 extension variables, 2 location dummy variables, and more importantly, 3 psychometric (behavior/attitude) variables (cognitive ability, attitude towards GAP, and risk preference)**

Figure 1. Location of study sites in the Philippines

IV. Estimation methods and empirical approach

B. Estimation methods

Determinants of Corn Insurance Adoption

- A Probit regression model was used given as:

$$P(zj = 1 \mid xj) = xj'\lambda + \mu j \qquad (1)$$

Determinants of GAP Adoption

- Since we have count data, a Poisson regression was used:

$$\text{Log GAP} = xj'\beta + uj \qquad (2)$$

where: **GAP** is a count data from 0 to 11

IV. Results

- **Pests/diseases and drought were the major hazards in corn production and farmers adopt measures to mitigate risks**

Table 1. Hazards causing yield reduction in corn production 2008-2012.

Hazards	Provinces			All
	Isabela	Pangasinan	Bukidnon	
	in percent			
Pest and diseases	46.75	76.87	22.06	48.12
Drought	21.43	15.67	53.68	29.81
Typhoon/strong winds	5.84	14.93	43.38	20.66
Floods	1.95	2.24	12.5	5.4
Others	1.95	0	0.74	0.94
No. Reporting	77	67	69	213

Table 2. Farmers' strategies to manage risk fo crop failure, 213 corn farmers, 2012.

Strategy	Strongly Agree	Agree	No Comment	Disagree	Stronly Disagree
	% of farmers				
Use of own funds	29.11	55.87	3.28	0.07	4.69
Borrow money/loan	15.74	65.02	0.47	17.14	2.11
Sell farm properties	1.17	15.69	14.55	50.47	17.14
Engage in ag. livelihood	18.07	53.76	18.08	6.57	2.58
Buy crop insurance	17.37	61.50	6.39	12.21	2.11
Practice crop rotation	11.97	60.33	8.45	11.97	6.33
Reduce input use	11.74	34.74	8.68	39.44	14.79
Use recommended tech.	12.91	77.23	4.23	4.46	0.71
Change planting dates	8.45	55.40	11.97	20.65	2.82
Control pests and diseases	37.79	60.09	0.23	0.70	0.47

- **Farmers in Bukidnon preferred the multi-risk cover while natural disaster cover was the choice in Isabela**

Table 3. Types of insurance subscribed by farmers by location.

Type	Provinces			All Locations
	Isabela	Pangasinan	Bukidnon	
Multi-risk				
No. of farmers	14	31	52	97
Ave. premium paid (P)	5,475.71	1,830.32	3,585.94	3,297.62
% with indemnity	42.86	32.25	55.77	46.39
Ave. indemnity (p)	1,791.67	5,948.50	14,338.62	10,801.22
Natural Disaster				
No. of farmers	50	24	16	90
Ave. premium paid (P)	2,671.22	1,412.50	2,543.37	2,312.83
% with indemnity	18.00	12.5	43.75	21.11
Ave. indemnity (P)	5,744.44	5000.00	14,314.91	8,783.16

- **Main reasons for buying insurance was to access credit and to have peace of mind indicative of moral hazard. For not buying, the major reason is that it is just an added cost**

Table 4. Reasons for buying insurance, 213 corn farmers.

Reason	Provinces			All Locations
	Isabela	Pangasinan	Bukidnon	
	% of farmers			
Peace of mind	34.47	41.79	52.17	41.78
Influenced by others	12.99	4.47	1.45	6.57
Access credit	37.66	52.24	43.48	44.13
Acess ne technology	1.3	-	1.45	0.94
Low interest rate	3.9	-	-	1.41
Others	5.19	-	-	1.88
No. of Farmers	77	67	69	213

Table 5. Reasons for not buying corn insurance..

Reason[a]	Provinces			All Locations
	Isabela	Pangasinan	Bukidnon	
	% of farmers			
Lack of understanding	14.29	29.85	-	14.09
Lack of knowledge to avail	12.97	19.4	15.94	15.96
Lack of funds to buy insurance	1.29	13.43	17.39	10.33
Insurance is just added cost	5.19	38.8	10.14	17.37
Costs may outweigh benefits	-	11.94	1.44	4.22
Bad experience with crop insurance	-	4.47	-	1.41
others	-	5.97	5.8	3.76
No answer	72.73	29.85	47.82	51.17
No of farmers	77	67	69	213

[a] Multiple answers

- **In the last 4 years, many of the farmers have experienced adopting a GAP but few have used IPM methods. The number of GAP adopted in a given season is still low.**

Table 6. Adoption rates of GAP by corn farmers.

Good Agricultural Practice[a]	Provinces			All Locations
	Isabela	Pangasinan	Bukidnon	
	% of farmers			
Variety resistant to pest &diseases	85.06	95.52	100	93.19
Seed treament	62.34	44.78	99.28	68.78
Shallow cultivation	59.75	56.72	97.1	70.89
Chemical weed control	98.7	98.51	99.28	98.82
Chemical pest & disease control	91.56	83.58	99.28	91.55
Recommended fertilizer use	90.91	77.61	100	89.67
Recommended planting distance	81.17	64.92	100	82.16
Crop rotation	26.62	96.27	86.23	67.84
Use of IPM methods	15.58	5.22	18.12	13.15
Conduct field monitoring	96.75	97.01	99.12	97.65
Dry corn after harvest	96.75	98.51	99.12	97.65
No of farmers	154	134	138	426

[a] Multiple answers

- **5 factors significantly influence corn insurance adoption with GAP score, membership in a farmers organization showing the greatest influence**

Table 7. Estimated coefficients and marginal effects of the probit model on corn insurance adoption.

Variables	Coefficients	Robust S.E.	p-Value	Marginal effects
Owner-operator	0.4233	0.4501	0.347	0.1687
Age	-0.0142	0.0076	0.062	-0.0056
Gender	0.0591	0.1698	0.728	0.0235
Schooling	0.0185	0.0252	0.461	0.0074
Household size	0.0285	0.0462	0.538	0.0113
Experience	0.0004	0.0078	0.950	0.0001
Cognition	0.0168	0.0233	0.471	0.0067
Risk preference	0.1112	0.1740	0.523	0.0443
Corn area	0.0631	0.0699	0.366	0.0251
Credit	0.0001	<0.0001	0.000	<0.0001
Distance to nearest market	-0.0180	0.0095	0.059	-0.059
Distance to nearest road	-0.0001	0.0109	0.157	0.1560
Distance to nearest Insurance ofiice	0.0155	0.0109	0.157	0.1560
Membership in farmers org.	0.7634	0.1563	0.000	0.0500
Distance to extension office	-0.0087	0.0066	0.186	0.0035
Attendance at ag. trainings	0.2428	0.1653	0.142	0.0966
GAP score	-0.0950	0.0510	0.063	-0.0378
Net returns	-0.0001	<0.0001	0.000	<-0.0001
D1	0.8060	0.2067	0.696	0.0321
D2	0.0484	0.1941	0.803	0.0193
Constant	-0.6358	1.0619	0.549	-

n = 351

Wald Chi^2 = 80.67***

Pseudo R^2 = 0.2239

Log pseudolikelihood = - 188.7413

Goodness of fit = 388.83***

*** means highly significant at 1% level.

Large owner-operated farms and risk-averse farmers are more likely to adopt GAP. But, buying insurance reduces the GAP adoption

Table 13. Coefficient estimates and marginal effects of the Poisson regression model.

Variables	Coefficients	Robust S.E.	p-Value	Marginal effects	irr
Dependent Variable: number of good agricultural practices (GAP) used					
Corn insurance	-0.0315	0.0191	0.099	-0.2774	0.9688
Owner-operator	0.1010	0.0489	0.039	0.8874	**1.1063**
Age	0.0007	0.0008	0.390	0.0062	1.0007
Gender	0.0194	0.0197	0.325	0.1702	1.0196
Schooling	-0.0051	0.0030	0.095	-0.0453	0.9948
Household size	0.0039	0.0047	0.407	0.0346	1.0039
Cognition	0.0036	0.0028	0.200	0.0320	1.0036
Risk preference	-0.0416	0.0201	0.038	-0.3632	0.9591
Corn area	0.0120	0.0054	0.027	0.1055	1.0120
Credit	<0.0001	<0.0001	0.780	<0.0001	1.0000
Distance to nearest market	-0.0021	0.0010	0.045	-0.0191	0.9978
Distance to nearest road	0.0007	0.0002	0.015	0.0063	1.0007
Distance to nearest Insurance ofiice	0.0041	0.0010	0.000	0.0367	1.0041
Distance to extension office	0.0008	0.0007	0.244	0.0074	1.0008
Attendance at ag. trainings	0.0211	0.0186	0.256	0.1860	1.0213
Attidude to GAP	0.0017	0.0040	0.670	0.0150	1.0017
Production	<0.0001	<0.0001	0.715	-0.0001	0.9999
D1	0.0317	0.0273	0.246	0.2802	1.0322
D2	0.0721	0.0215	0.001	0.6413	1.0748
Constant	1.8335	0.1239	0.000	-	6.2560

n = 351

Wald Chi^2 = 89.06***

Pseudo R^2 = 0.0095

Log pseudolikelihood = - 750.6346

Deviance goodness of fit = 90.6774^{ns}

V. Conclusions/Policy Implications

- **The positive and significant effects of credit and farmers organization on corn insurance adoption – farmers with loans and those affiliated to farmers' organizations can broaden corn insurance market**
- **Corn farmers near the road but distant from the market are the more likely insurance adopters**
- **An additional GAP is adopted by increasing the farm area, distances to extension and insurance offices, and farmers that are likely risk averse.**

V. Conclusions/Policy Implications

- **GAP is inversely related to corn insurance manifesting moral hazard but the subsidy by government diminishes its effects to farmers – this however is not sustainable in the long-run due to high-variability of fund allocation. Also, the GAP recommended measures were for pest and diseases (need to look at GAP measures for climate change)**

- **In the meantime that more GAP are not yet in place and with increasing frequency of extreme climatic events, corn insurance is necessary to protect the farmers**

- **If gov't intends to slowly reduce subsidy and at the same time provide farmers' resilience to climate change, they can look at the promise of strengthening GAP adoption particularly to large owner-operated farms that are distant from the market and insurance office**

Acknowledgement

- SEARCA – Drs. Saguiguit, Burgos and Sombilla and for funding the study
- PCIC – Mr. Cajucom, Regional Managers 1, 2 and 10
- Municipal extension workers and Barangay Captains in the study sites
- Prof. Karen Quilloy – research assistance in the early phase of the study

Thank you

Table 2. Selected descriptive statistics of corn farmers.

Item	Isabela			Pangasinan			Bukidnon			All Locations		
	Insured	Not Insured	Diff.	Insured	Not Insured	Diff.	Insured	Not Insured	Diff.	Insured	Not Insured	Diff
Farmer												
Age (yrs)	44.59	48.76	4.67**	47.87	49.85	1.96	44.82	48.5	3.68**	45.69	49.02	3.32***
Education (yrs)	7.71	7.75	0.04**	10.47	9.58	-0.89*	8.4	7.46	-0.94*	8.8	8.23	-0.57*
Household size (no)	4.27	4.27	0	4.4	4.47	0.73	4.75	4.92	0.17	4.46	4.54	0.08
Years in corn farming	16.31	16.45	0.14	13.28	18.07	4.79**	10.47	11.59	1.11	13.46	15.38	1.92*
GAP attitude	3.51	3.83	0.31	4.28	3.82	-0.92	2.91	3	0.09	3.7	3.55	0.13
Male (%)	63.63	81.81	18.18	64.17	82.08	17.91	82.6	56.52	-26.08	67.07	75.58	8.51
Owner-operator (%)	89.61	90.9	1.29	100	95.52	-4.48	98.55	95.65	-2.9	95.71	93.89	-1.82
Ag. training attendance (%)	51.97	57.14	5.17	65.67	65.67	0	14.49	14.49	0	44.13	46	1.87
No. of GAP	7.97	8.12	0.15	8.04	8.32	0.28	10	9.95	0.05	8.65	8.78	0.13
Farm												
Corn area (ha)	2	1.5	-0.50***	1.69	1.2	-1.48***	1.54	1.86	-0.32	1.85	1.42	-0.43***
Production (tons/ha)	3.3	4.73	1.43***	4.89	6.16	1.25***	2.84	3.93	1.09***	3.65	4.92	1.25***
Perceived Pest Damage (%)	10.52	14.82	4.3*	8.23	7.09	-1.14	1.76	2.57	0.81	6.82	9.01	2.18*
Credit (P/ha)	29,971.43	31,545.45	1574.02	45,940.91	21,097.43	24,843.48***	47318.84	1014.49	-46,304.35***	40,614.28	18,368.67	22,215.60***
Cash input cost (P/ha)	14,736.30	20,210.72	5,474.92***	19,163.32	25,207.50	6,044.17***	21,047.62	23,126.17	2,078.54**	18,173.55	22,726.92	4,553.56***
Net Returns (P/ha)	18,048.38	27,871.14	9,822.76***	30,480.46	38,649.05	8168.58**	1,054.63	15,574.88	14,520.25***	14,520.25	16,453.93	10,824.16***
Distance from market (km)	16.33	15.49	-0.84	2.40	4.85	2.45	16.76	17.89	1.13	12.09	12.91	0.82
Distance from nearest road (km)	0.96	1.17	0.21	0.86	3.49	2.63	1.44	0.89	-0.55	1.44	0.89	-0.55
Distance from insurance office (km)	22.43	22.73	0.3	5.19	5.80	0.61	22.29	21.86	-0.43	17.27	17.07	-0.19
Distance from extension off. (km)	14.18	15.84	1.66	4.88	5.21	0.32	16.7	18.44	1.73	11.77	13.20	1.43
No. of Farmers	77	77		67	67		69	69		213	213	

***,**,* represent significance at 1, 5, and 10 percent levels in mean differences.