INNSPUB

Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 14, No. 6, p. 1-12, 2019
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Does agricultural insurance in Northern Philippines reduce income losses of farmers from different risks that they face

Vilma D. Conrado*

College of Arts and Sciences, Cagayan State University, Carig Sur, Tuguegarao City, Philippines

Article published on June 30, 2019

Key words: Agricultural insurance, Net farm income, Shocks and risks, Corn farmers, Philippines.

Abstract

The study was conducted to determine whether agricultural insurance of the Philippine Crop Insurance Corporation can reduce income loss from different risks faced by the corn farmers in Cagayan Valley Region, Northern Philippines. The data collected through a collaborative project on "Evaluation of the Impact of Agricultural Insurance on Farmers" of the Cagayan State University and the Philippine Institute for Development Studies were used in this study. A total of 500 randomly taken samples 250 corn farmers with insurance matched with 250 farmers without insurance were taken from the list of the registered farmers. The farmers with insurance were further categorized as to those who received indemnity claim (125) and did not receive indemnity claim (125). These made up the three treatment groups. For each of the treatments, three strata were formed according to farm size: (1-0.5ha & below; greater than 0.5 to 1 ha and greater than 1ha). Descriptive statistics were used and mean net farm income was computed. The t-test was used to test the simple difference in net income per hectare within the three treatment groups. The farmers cited drought, typhoon and flood as the most severe shocks they encountered. Results further reveal that net farm income of farmers with insurance with claims was significantly higher at 5 percent level than those farmers without insurance for all farm size. Similarly, farmers with insurance with claims have higher net incomes than farmers with insurance but without indemnity claims in both years studied. Thus, agricultural insurance reduced income losses of corn farmers from different risks they experienced if an indemnity claim is received. It is therefore recommended that policies on indemnity coverage and assessment of damage to claim indemnity should be reviewed.

***Corresponding Author:** D. Conrado ✉ vilmadconrado@yahoo.com

Introduction

The world's population especially for the developing countries still rely on agriculture as a means of food and income security. These countries are exposed to adverse natural events such as droughts, typhoons, floods, pest and diseases. The economic costs of these major disasters and shocks may even increase further in the future because of climate change (Nnadi, F.N. *et al*, 2013). Risk and shocks are the pressing problems of farmers and therefore risk is a daily reality among farmers (Reyes, *et al*, 2017). Income of farm household fluctuate largely due to shocks. (Kwon, C. W., 2006), these shocks push farmers below from where they are and set them downward from their usual economic activities which led to considerable movements in and out of poverty among households engaged in agriculture. Changes in inequality and poverty after the drought depends on environmental variables and constraints on income (Hurley, T. M., 2010). Many households in the Philippines, especially those that belong to the bottom 40 percent are deemed vulnerable to these shocks. Reyes, C.M. *et al.* (2010) found that the poor is not homogenous group. Those who were classified as poor at any point in time consist of the chronic poor and the transient poor and that the transient poor comprised a significant portion of the poor. About one-third of the poor households were transient poor while half of those considered as food poor were previously nonpoor. Among these households are engaged in agriculture

The transient poor are considered vulnerable to various economic and natural shocks so they have to be protected against these shocks. The movement up and down the poverty is being aggravated by extreme events such as floods, drought, typhoon, occurrence of pest and diseases – and without their knowing these farmers are being trap from poverty (Reyes, C. M. at al (2010) and Kovacevic, R. M., & Pflug, G. C. (2011). Poverty trapping refers to the fact that poor people in developing countries cannot escape their poverty without help from outside. Because farmers lack access to off-farm income and therefore they fail to protect their income against agroclimatic risks. (Reardon, T., & Taylor, J. E. (1996). Shocks erode smallholder farmers' long-term livelihood potential through loss of productive assets. (Hansen, J., *et al.,* 2019). Natural disasters can extremely disrupt farmers and others whose income depends on agriculture (crop, animals and fisheries). The volatility of income remains a major challenge for farm household management and the design of risk management tools.

People in poverty, with capital already at or below critical capital cannot be helped with respect to ruin probability by introducing an insurance system, because they find themselves already in the poverty trap. They need direct subsistence payments. For households with capital above but near the critical capital, the trapping probability increases if insurance is introduced, since the premium payments reduce the ability to create growth. Kovacevic, R. M., & Pflug, G. C. (2011).

Food security is one of the highest problems that the governments have to face in the third millennium. The complexity of this problem justifies the performance of researches, in view of finding viable solutions, not only in agriculture, but in other branches of activity too. Among them, the field of insurances is to be noted by its struggles to adapt to the new challenges. Mârza, B., Angelescu, C., & Tindeche, C. (2015). Could agricultural insurance be an effective safety net that can significantly reduce poverty among agricultural households (Reyes, C.M. *et al*, 2010 and Raimund M. Kovacevici and George CH Pflug, 2011). Agricultural insurance has gained increasing attention over the last years (Gehrke, E., 2014) a risk management tool designed to even out agricultural risks and address the consequences of natural disasters to make losses more bearable, especially to the marginalized farmers. Climate change has the potential to significantly affect small-scale farmers' livelihoods by either decreasing or increasing the crop revenues (Ochieng, J., Kirimi, L., & Mathenge, M. (2016). Much of the energies these farmers go into coping with these shocks and into day-to-day survival. (Dercon, S., 2005).

The impact of these natural hazards on economic well-being and human sufferings has increased alarmingly (UNISDR, 2007), which lead to uncertainty of future income of the farmers resulting to poverty.

Agricultural insurance is also seen as a coping strategy to shocks and risks and has been introduced in developing countries to help agricultural households cope with weather risks. Many government subsidized crop insurance has been used by a number of developed countries as a mechanism to reduce farm income instability by reducing yield risks (Hueth, D. L., & Furtan, W. H. (Eds.). (2012). Households exposed to shocks try to smooth their consumption relative to income by using their supply of labor to compensate loss income, they save and accumulate productive assets as their coping strategies (Gabriella, B. *et al.,* 2013). Jing Cai (2016) found that agricultural insurance provision increases the insured crop production by 16 percent and raises borrowing by 29 percent but it does not affect total household savings. However, it does affect the relative proportion of flexible-term savings (Jing Cai, 2016). It transfers covariate weather risks outside the local community and provides liquidity in the aftermath of a shock (Skees and Barnett 2006; Barnett and Mahul 2007; Barnett *et al*., 2008; Carter 2009).

The insurance indemnity payments are expected to help households to recover from the damage caused by the weather shock while others hoped that index insurance would enable households to make investment decisions involving higher risk and higher project opportunities. However, there is little evidence of whether index insurance (Miranda and Farrin 2012; World Bank Group 2013; Carter *et al*.,) indeed provides its expected benefit (Miranda and Farrin 2012; World Bank Group 2013; Carter *et al*., 2014; Greatrex *et al*., 2015). According to Smith, V. H. (2016), index insurance schemes are subject to considerable basic risk and families often do not receive an index insurance indemnity when they experience a substantial crop loss on their farms. In a study made by Veronika Bertram-Huemmery *et al.,* (2015, 2017) they found that those households purchasing the indexed-based livestock insurance in Mongolia recover faster from shock-induce asset losses than the non-insured households. There is significant positive effect of the indexed-based livestock insurance indemnity payments on herd size after one to two years, help herders avoid selling and slaughtering animals to smooth their productive asset base and relieve assets from their credit constraints.

Matsuda, A., Takahashi, K., & Ikegami, M. (2019).found that that they increase pastoral household's income and milk production in Ethiopa during drought years. Likewise, insured households receive more informal transfers when they obtain payouts and they tend to reduce cash savings and livestock holdings. The pastoralists with a herd size around the poverty-trap threshold increase their livestock numbers after receiving payouts. Likewise, Ifft, J., Wu, S., & Kuethe, T. (2014) found that insurance availability is associated with an increase of at least 4 percent in pastureland values. This increase is comparable with increases generated by other government programs but is much smaller than total farmland value increases experienced in recent years. The insurance program in Mexico implemented as a social safety net, farmers receiving these indemnity payments allow farmers to cultivate a larger land area in the growing season following a weather shock, have larger per capita expenditures and income in the subsequent year. These results suggest the insurance payments can make smallholder farmers more resilient to shocks, Ritchie, E. R., *et al.,* (2016). Stoeffler, Q., Wouter, G., Catherine, G., & Michael, C. (2016) found that there is no impact of agricultural insurance on cotton production. However, significant impacts were found on several activities and assets such as field investments, sesame cultivation and livestock herding. The results are contrasted between the specialization of the farms and the two countries: Italian farms use management tools to include crop insurance to improve their income and to reduce its volatility. French farms on the other hand use the same instruments to increase their income and therefore its volatility while they tend to substitute payments to production.

These results question the efficiency of structural policies aimed at stabilizing the farmers' income. Enjolras, G., *et al.,* (2012). Binding credit market constraints and incomplete insurance can reduce investment in activities with high expected profits. Binding credit market constraints and incomplete insurance can reduce investment in activities with high expected profits. Karlan, D. *et al.,* (2014).

Different countries have experienced several problems in agricultural insurance. Farzaneh, M., Allahyari *et al.,* (2017) found that more than one half of the farmers studied, low indemnity rate paid by insurance companies as the main problem of insurance services. There is a long period of indemnity payment was another major problem of insurance services. Informing silk farmers about damage assessment schedules and about indemnity payment in a timely manner were the most important factors rated by the farmers for insurance adoption.

Governments in developing countries have been increasingly involved in the support of agricultural insurance programs in recent years (World Development Report 2000/2001). The Philippines is prone to both geological and hydrometeorological hazards. The primary concern is to reduce the risks on the communities exposed to the threats of climate change impact and disaster. The Cagayan Valley Region of the Philippines, an agriculture-based economy is composed of five provinces. Palay and corn are the two major agricultural commodities bringing annual recognition to the region in terms of production and contribution to output. The volume of production for corn declined from 2014 to 2015 by 2.9 percent largely due to the effects of drought and typhoon Lando and Nona. Both the area harvested and productivity of corn were affected. As a natural catch basin, the alluvial plain, where most of the livelihood and settlements are located, is also to frequent flooding either as a consequence of monsoon rains or typhoons accompanied with heavy precipitation. Sedimentation reduces the holding capacity of the Cagayan River with excessive flood waters inundating low lying areas. (CVRDP)

Recognizing vulnerability to risk as a major constraint to agricultural productivity and improved welfare, the Philippine government created the Philippine Crop Insurance Corporation (PCIC) in 1989 to provide a “multi-peril” crop insurance product for rice and corn farmers, designed to help ameliorate the consequences of the many agricultural risks posed by typhoons, floods, droughts, and various pests and crop diseases. The Philippine Crop Insurance Corporation (PCIC) is a government owned and controlled corporation created as the implementing agency of the government's agricultural insurance program. The PCIC's principal mandate is to provide insurance protection to farmers against losses arising from natural calamities, plant diseases and pest infestations of their palay and corn crops as well as other crops. PCIC appropriations are used for the full cost of insurance premiums of farmers and fisher folks, provided that the beneficiaries are the subsistence farmers and fisherfolk registered under the Registry System for Basic Sectors in Agriculture (RSBSA). While crop insurance as a risk management tool has the potential to smoothen up the abrupt decrease in income of farmers due to these risks, information on subscription of crop insurance is limited. Reyes, C.M. and Sonny N. Domingo (2009) did an assessment of the PCIC and identified constraints in operating the program such as high overhead cost, need for larger investment fund, and question of sustainability. The results of secondary data assessment and key informant interviews revealed that PCIC has captured only a small segment of its target clientele, particularly the subsistence farmers, due to logistical and marketing constraints. Moreover, farmer dependence on informal credit, particularly in rural farming communities, seems to have also created a nonviable setting for a crop insurance program.

In light of climate change, changing weather trends and more repeatedly occurring natural disasters, a wave of innovative approaches to insuring agricultural production risks, particularly index-based insurance products, have been proposed and implemented.

However, the results of many of these projects were disappointing, raising the question whether microinsurance could provide viable coverage for agricultural production risks at all (Gehrke, E. (2014). Reyes *et al.,* in her evaluation of the agricultural insurance in the Philippines mentioned the following problems in the implementation of the PIC: Low level of awareness among farmers. About PCIC program, Crop insuance cover for some programs is below production cost and is below cover ceiling for programs providing free insurance premium, Low penetration rate, especially in certain regions and groups of farmers, Limited coverage of special programs, Clients not aware of how the indemnity amounts were determined, No long-term national policy/long term-funding on agricultural insurance, inaccurate list in the Registry System of Basic Sectors in Agriculture (RSBSA) which is used by PCIC to determine who should be given free insurance premium for the 2014 and 2015 RSBSA programs. With these developments in the crop insurance of the country such as the increase in budg*et al*location, scaling up risk transfers and increase in commodity coverage, the research on agricultural insurance is scant and therefore this study posed the question: Does agricultural insurance agricultural insurance reduce income losses of farmers from different risks that they face? Hence, it is in this light that the impact of the agricultural insurance program of the PCIC on agricultural producers particularly rice and corn in Cagayan Valley region be evaluated. First, it presents the risk and shocks experienced by farmers, amount of indemnity claim, the net farm income on corn then the impact of the agricultural insurance to net farm income.

Materials and methods

Study Area

The study was undertaken in the northern part of the Philippines, the Cagayan Valley region. The region is a natural catch basin of the largest watershed of the country and crisscrossed by the longest river network, the Cagayan River. Sedimentation of the river reduces the holding capacity of the with excessive flood waters inundating low lying areas where corn is mostly grown. The region is also the major producer of corn (1st rank) in the country.

Fig. 1. Map of the Philippines showing the Cagayan Valley Region.

Data, Respondents and Sampling

The data collected through a collaborative project on "Evaluation of the Impact of Agricultural Insurance on Farmers" of the Cagayan State University and the Philippine Institute for Development Studies which was implemented by the author were used in this study. It covers the corn farmers in the northern part of the Philippines – the Cagayan Valley Region. A total of 500 respondents (250 with insurance and 250 without insurance) were randomly selected from the list of the registered farmers under the Registry System for Basic Sector in Agriculture (RSBSA). The RSBSA is the basis of agricultural insurance subsidy to farmers and fisher folks. Stratified random sampling was used to select the 250 respondents with insurance based from the list of the PCIC, categorized into those who received claim (125) and did not receive indemnity claim (125). Finding the matched comparison, without agricultural insurance, was conducted based on the farm size, geographical

location or municipality, land tenure and source of irrigation water of the selected samples in with insurance. The following are the treatments groups: 1) Treatment 1 - corn farmers with crop insurance and receive indemnity claims payment from the PCIC, 2) Treatment 2 - corn farmers with crop insurance but did not receive indemnity payment from PCIC and were located in areas where there were claims, 3) Treatment 2 - Corn farmers who did not avail of crop insurance but have characteristics as those of treatment samples.

Data Analysis

The household as the unit of analysis. Descriptive statistics such as means, standard deviation and frequency counts were used. Net income of corn was computed as follows:

Net farm income: $\pi_i = R_i - (PC_i + pr_i) + ip_i$

where: π_i = net farm income of farmer i

R_i = total farm revenue or gross income of farmer *i*

PC_i = cost of production incurred by farmer i

pr_i = amount of insurance premium paid by farmer i

ip_i = amount of indemnity claims received by farmer i

A simple test of difference of means within the three treatments of net farm income on corn production was used to determine the impact of agricultural insurance net farm income on corn production. The t-test was used to test the difference of net income per hectare of the treatment groups.

Results and discussions

Characteristics of Farms

The characteristics of the corn farms of the respondents is presented in Table 1.

Table 2. Characteristics of corn farms of respondents by treatment group, Region 2, 2016.

Variables	With Insurance			Without Insurance	All Farms (Pooled)
	With Claims	Without Claims	With & Without Claims		
Ave. number of corn farm parcels	2.1	1.8	1.95	1.8	1.9
Land Ownership (%)					
Fully owned	50.80	50.29	50.55	55.33	52.86
Tenanted	45.45	41.14	43.37	39.64	41.57
Others	3.74	8.57	6.08	5.03	5.57
Topography					
Broad plain	50.80	38.86	45.03	39.05	42.14
Hilly/rolling	34.76	45.71	40.06	45.27	42.57
River/flood plain	14.44	15.43	14.92	15.68	15.29
Access to Irrigation (%)					
None/ Rainfed	99.47	98.26	98.89	97.31	98.12
With irrigation	0.53	1.74	1.11	2.69	1.88
Cropping System used by farmer					
Monocropping	97.86	98.86	98.34	97.34	97.86
Intercropping	2.14	1.14	1.66	2.66	2.14
Corn Variety Planted (%)					
2014: Hybrid variety	96.53	96.72	96.62	94.84	95.76
Non-hybrid variety	3.47	3.28	3.38	5.16	4.24
2015: Hybrid variety	96.66	96.68	50	94.59	95.66
Non-hybrid variety	3.34	3.32	50	5.41	4.34

Farmers planted an average of 2 parcels for their corn production for all farms, which means that their farms are located in different places as indicated in Table 1. Around 53 52.86 of the parcels are fully owned by the respondents while 41.57 percent are tenanted. There is higher percentage among the farmers without insurance who fully own their corn parcels (55.33 percent) than the farmers with insurance (50.55 percent). Corn parcels of farms are broad plains (42.14 percent) and hilly/rolling lands, 42.57 percent. River flood plain is an area that is prone to flooding due to a river or stream over flowing its banks while hilly or rolling parcels are those that are haracterized by gently rolling hills continuing for a long distance and prone to soil erosion. The prevalent cropping system used by farmers in their corn farm is mono-cropping with

97.86 percent of the total parcels planted to corn and 2.14 percent practiced intercropping.

Generally, farmers in in the region do not irrigate their corn farms. Most of the corn farmers (96 percent) are using hybrid variety. There is a higher percentage of farmers with insurance using hybrid variety (96.67 percent) than those famers without insurance with 94.59 percent.

Risk and Shocks Experienced by Farmers

Table 2. Frequency and percent distribution of significant natural disaster/ shocks experienced by corn farmers during the past two years by Treatment Group, Cagayan Valley Region.

Type of Shock	With Insurance						Without Insurance		Total (Pooled)	
	With Claim		Without Claims		Total					
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Total number of respondents	118		132		250		250		500	
Most Severe Shock Experienced										
Drought	60	50.8	66	50.0	126	50.4	141	56.4	267	53.4
Typhoon	41	34.7	52	39.4	93	37.2	87	34.8	180	36.0
Flood	10	8.5	8	6.1	18	7.2	16	6.4	34	6.8
Pest infestation and others	3	2.5	2	1.5	4	1.6	1	0.4	6	1.2
Second Most Severe Shock Experienced										
Drought	32	27.1	43	32.6	75	30.0	74	29.6	149	29.8
Typhoon	28	23.7	38	28.8	66	26.4	64	25.6	130	26.0
Flood	10	8.5	7	5.3	17	6.8	17	6.8	34	6.8
Pest infestation and others	2	1.7	3	2.3	5	2.0	0	0	5	1

The natural disasters during the study period that caused difficulty/ problem among households are shown in Table 2. The farmer-respondents were asked to identify the shocks then ranked the two most most severe and the second most severe. The natural shocks experienced by farmers are typhoon, flood, drought and pest and diseases. Results show that the most severe natural disaster or shock experienced by the farmers is drought with 53 percent followed by typhoon with 36 percent of the total respondents.

In terms of the second most severe shock, the highest is drought which was experienced by 29.8 percent of the total respondents followed again by flood with 26 percent of the total respondents experienced it. Farmers without insurance have higher percentage (56.4 percent) who experienced drought as the most severe shock than the with insurance group which is 50.4 percent. This suggests that farmers should all the more be encouraged to get insurance coverage for their crop.

Amount of Indemnity Claims

Table 3. Average Amount of indemnity claim received by cause of loss and ratio of indemnity received to estimate crop damage of corn farmers with insurance and with claims, Region 2, 2015.

Cause of Loss	With Insurance, With Claims			
	FS1	FS2	FS3	All
Average Amount of Indemnity Claim Received By Cause of Loss				
Drought, not enough water	2,000	2,891	8,063	5,445
Typhoon, flood		1,411	4,442	3,452
Others		4,000		4,000
Ratio of Indemnity Received to Estimated Crop Damage				
2014	0.13	0.23	0.24	0.24
2015	0.13	0.20	0.41	0.32

Table 3 shows that for farmers who received indemnity claims, the average amount of indemnity claims received for drought-damaged crop was ₱5,445 and the ratio of indemnity payments to estimated crop damage 24 percent and 32 percent for year 2014 and 2015, respectively. The bigger amount of claim

for drought-damaged because when drought damages corn farms, corn plants do not grow and form corn grains, therefore no harvest is expected. While those damaged by typhoon, it is still possible that partial damage occurs and corn plants have still the tendency to recover and bear fruit. The ratio of indemnity payment received is higher in large farms than in small farm. These findings indicate that the indemnity claim in crop insurance cannot cover all the crop loss during shocks. Farmers are not risk taker and therefore it is difficult to convince them to pay for the premium if later they will receive only one-third of the amount of loss due to disasters such us typhoon, flood and drought despite the higher subsidy rate from the government.

Utilization of Indemnity Claim

Table 4. Utilization of indemnity claim payment of corn farmers by farm size, Cagayan Valley Region, Northern Philippines.

Source	With Insurance With Claims			
	FS1	FS2	FS3	All
Frequency				
Used to pay for farm production inputs	7	22	45	74
Used to pay my existing loan so that I could renew my loan		2	3	5
Used to buy food for my family		3		3
Used to pay for my children's education		1	1	2
Used to pay for my family's medical bills		1		1
Others	2	1	6	9
Total	9	30	55	94
Percent of those with Claims				
Used to pay for farm production inputs	100.00	75.86	93.75	88.10
Used to pay my existing loan so that I could renew my loan		6.90	6.25	5.95
Used to buy food for my family		10.34	0.00	3.57
Used to pay for my children's education		3.45	2.08	2.38
Used to pay for my family's medical bills		3.45	0.00	1.19
Others	28.57	3.45	12.50	10.71

The utilization of indemnity claims payment indicates that 88.10 percent of the farmers utilize their indemnity claims to pay farm production inputs (Table 4). This is observed in all farm size groups. There are few who used to pay existing loans (5.96) and to buy food for the family (3.57 percent). The findings reveal that farmers are in debt in their production since bulk of their indemnity claims are used to pay their production inputs.

It is hoped that agricultural insurance facilitate the access of farmers to agricultural loans. In times of disasters, if the farmer received indemnity claim, the farmer has something to pay his loan rather them be put in indebtedness and hence they can borrow again for their next cropping season.

This does not however assure them to plant again and apply the required amount of inputs for the next cropping season unless the farmer has to borrow again for the next cropping season. It cannot be denied therefore the importance of the lending institution as conduit for the crop insurance of PCIC to the farmers' corn production activity. However, PCIC has to review the system of assessing losses and the amount of indemnity considering the cost of production.

The net income of corn farmers in the Cagayan Valley Region for the cropping years 2014 and 2015 as presented in Table 5 shows that corn farmers who availed of crop insurance with indemnity claims have generally higher income than those without insurance although there is no clear pattern across farm size. However, small farms have higher net income than the larger farm size. The higher net income of the farmers who received indemnity claims may be explained by the indemnity claims they received which is added to the net income. Although the indemnity payments received covers around one-third only of loss due to crop damage, it is found to be higher than the insurance premium. Thus, the net effect to income is positive compared to farmers with

insurance without claim and farmers without insurance. These farmers received nothing during the occurrence of shocks. This result to the decrease in net income worsening economic their economic conditions particularly those without insurance and those with insurance but without indemnity claimed. Said farmers had more difficulty to recover from crop damage in comparison with those with claims.

Net Incomes of Corn Farmers

Table 5. Comparison of net income of corn farmers with and without insurance in Region 2 for the cropping years 2014 and 2015.

Farm Size	With Insurance		Without Insurance
	With Claims	Without Claims	
2014			
0.5 ha & below		3,443.21	- 107.39
>0.5 ha to 1.0 ha		220.99	- 745.65
>1.0 ha	1,498.10	191.10	- 0.80
All Farm Sizes	1,498.10	219.89	- 3.49
2015			
0.5 ha & below	2,376.97	1,178.09	385.41
>0.5 ha to 1.0 ha	1,287.96	861.96	1,120.54
>1.0 ha	2,763.43	- 454.22	414.81
All Farm Sizes	2,098.30	187.67	635.56

The corn farmers have higher income in 2015 than in 2014. The region experienced shocks in 2015 causing a decline from 2014 in the gross value added of agriculture and fishery sector. The setback in the growth of agriculture and fishery sector in 2015 was attributed to the extreme weather events (typhoons Egay, Lando, Ineng and Nona) and adverse effects of the El Niño which started in the second year of the year (Natioanl Economic and Development Authority, 2016). There is no pattern across farm size in terms of the net income on corn production. This may be explained by the fact that many of the farmers who own more than one parcel did not avail crop insurance for all the parcels but only part of the parcels. Those farmers with large farm size usually own more than one parcel, on the average two parcels. In 2015, there were more shocks but farmers with insurance and did not received indemnity claim tend to have incurred added loss due to the premium payment than those without insurance, especially for large farms.

Estimated Impact of Agricultural Insurance

Table 5. Statistical comparison of income (PhP) between farmers with and without agricultural insurance, Region 2, cropping years 2014 and 2015.

Farm size	$Y_{with\ insurance} - Y_{without\ insurance}$		$Y_{with\ claims} - Y_{without\ claims}$		$Y_{with\ claims} - Y_{without\ insurance}$	
	2014	2015	2014	2015	2014	2015
1 ha. & below	710.54^{ns}	66.98^{ns}	717.74^{ns}	714.41^{ns}	$1,501.59^{ns}$	$1,462.74^{**}$
> 1 ha.	142.95^{ns}	372.48^{ns}	$1,657.08^{**}$	$2,823.77^{**}$	581.02^{ns}	946.43^{ns}
All farm sizes	489.67^{ns}	-283.87^{ns}	$1,278.22^{**}$	$1,910.63^{**}$	$2,115.31^{*}$	$1,914.51^{**}$

Note: Y = net income from corn production (on a per-hectare basis);

$^{n.s.}$not significant; * significant at 10%; ** significant at 5%; *** significant at 1%

To estimate the impact of agricultural insurance on net income of farmers on corn production in the Cagayan Valley region, t-test of means for the statistical comparison of net income per hectare of corn production, Table 6 reveals that there is statistical significant differences at 5 percent level between net farm incomes of those farmers with insurance with claims and those without insurance for all farm size in 2015 and at 10 percent level of significance in 2014. This means that the farmers with insurance with claim have significantly higher net incomes per hectare than those without insurance. Similarly, farmers with insurance with claims have higher net incomes than farmers with insurance but without indemnity claims in both years 2014 and 2015.

When farmers are grouped according to farm size, t-test also reveals that for farms greater than 1.0 ha, there is a significant difference in net incomes on corn production between the farmers with insurance with claims and the farmers with insurance without claims at 5 percent level of significance in 2014 and 2015. This means that the farmers with insurance with claims have significantly higher net income on corn production than those farmers with insurance but without claims. For small farm size group (1.0 ha and below), there is also a significant difference between the net income of farmers with insurance with claims and the farmers without insurance in 2015. This means that farmers with insurance have significantly higher net income on corn production than farmers without crop insurance.

The findings indicate that agricultural insurance reduce income losses of corn farmers from different risks that they experience. This shows the importance of receiving an indemnity claims when farmers are affected by shocks. There is significant impact of receiving indemnity claims on the net income of farmers. This maybe due to the fact that insurance premium payment is an additional cost in corn production therefore net income declines if the farmer does not receive indemnity despite the loss due to farm damages caused by disasters.

Conclusion

Farmers experienced several shocks in their corn production. Receiving an indemnity claim from insurance has significant impact on the net income of farmers on corn production. Hence, agricultural insurance in Northern Philippines reduce income losses of farmers from different risks that they face when they receive indemnity claims, despite the low indemnity claims the farmers received. This concludes the importance of receiving of indemnity claims when farmers are affected by shocks. In light of these findings, it is recommended that policies, programs and efforts of the government and the PCIC efforts be directed towards enhancing the factors that increase the availment of agricultural insurance such as discounts to those who do not own their farms and those who use hybrid varieties. The indemnity coverage and assessment of damage to claim indemnity should be reviewed. Intensive awareness campaign and education about the agricultural insurance should be made for farmers to appreciate the importance of insurance. Further study in Region 2 on the farmer's attitudes toward agricultural insurance and other studies that may affect the performance and availment of agricultural insurance in Region 2.

Acknowledgement

This study uses data collected through a collaborative project of the Cagayan State University with the generous funding of the Philippine Institute for Development Studies "the Evaluation of the Impact of Agricultural Insurance of the PCIC on Agricultural Producers". The author is grateful to the enumerators and Jocelyn D. Tuscano, Beatriz Oñate, Erwin Torio, and Jane Umengan for the fruitful cooperation for supervising the collection of the household surveys. The Philippine Institute for Development Studies that generously funded, excellent research technical assistance, helpful and the critical comment on the quality of data gathered. Ms. Niña Klare Paat and Jezreel Pattaguan who diligently edited and reviewed the data for statistical analysis. This paper benefiited from the report of the project. The responsibility for the content lies solely with the author.

References

Bertram-Huemmer V, Kraehnert K. 2015. Does index insurance help households recover from disaster. German Institute for Economic Research (DIW) Discussion Paper 1515.

Bertram-Huemmer V, Kraehnert K. 2017. Does index insurance help households recover from disaster? Evidence from IBLI Mongolia. American Journal of Agricultural Economics **100(1),** 145-171.

Bertram-Huemmer, Veronika, Kraehnert, Kati. 2015. Does index insurance help households recover from disaster? Evidence from IBLI Mongolia, DIW Discussion Papers, No. 1515, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin.

Celia M, Reyes, Aubrey D, Tabuga, Christian D, Mina Ronina D, Asis and Maria Blesila, Datu G. 2014. Chronic and Transient Poverty PIDS Discussion Peper Series No. 2010-30 (Revised).

Dercon S. (2005). Insurance against poverty. Oxford University Press.

Enjolras G, Capitanio F, Aubert M, Adinolfi F. 2012. Direct payments, crop insurance and the volatility of farm income. Some evidence in France and in Italy (No. 706-2016-48354).

Farzaneh M, Allahyari MS, Damalas CA, Seidavi A. 2017. Crop insurance as a risk management tool in agriculture: The case of silk farmers in northern Iran. Land Use Policy **64,** 225-232.

Gehrke E. 2014. The insurability framework applied to agricultural microinsurance: What do we know, what can we learn?. The Geneva Papers on Risk and Insurance-Issues and Practice **39(2),** 264-279.

Hansen J, Hellin J, Rosenstock T, Fisher E, Cairns J, Stirling C, Campbell B. 2019. Climate risk management and rural poverty reduction. Agricultural Systems **172,** 28-46.

Hea, Juan, Roderick Rejesusa, Xiaoyong Zhenga, Jose Yorobe, Jr. 2014. Advantageous Selection in Crop Insurance: Evidence from the Philippines. Department of Agricultural and Resource Economics, University of the Philippines-Los Lanos. www4.ncsu.edu/-jhe10/files/selection.pdf

Hueth DL, Furtan WH. 2012. Economics of agricultural crop insurance: theory and evidence (Vol. 4). Springer Science & Business Media.

Hurley TM. 2010. A review of agricultural production risk in the developing world (No. 881-2016-64503).

Ifft J, Wu S, Kuethe T. 2014. The impact of pasture insurance on farmland values. Agricultural and Resource Economics Review **43(3),** 390-405.

Karlan D, Osei R, Osei-Akoto I, Udry C. 2014. Agricultural decisions after relaxing credit and risk constraints. The Quarterly Journal of Economics **129(2),** 597-652.

Kovacevic RM, Pflug GC. 2011. Does insurance help to escape the poverty trap. A ruin theoretic approach. Journal of Risk and Insurance 78(4), 1003-1028.

Kwon CW, Orazem PF, Otto DM. 2006. Off-farm labor supply responses to permanent and transitory farm income. Agricultural Economics **34(1),** 59-67.

Lansigan, Felino P. 2017. Evaluation of the Impact of Agricultural Insurance Program of the Philippine Crop Insurance Corporation on Agricultural Producers in Region IV-A (CALABARZON). © Philippine Institute for Development Studies. http://hdl.handle.net/11540/7249.

Mahul, Olivier and Charles J. Stutly. 2010. Government Support to Agricultural Insurance: Challenges and Options for Developing Countries, The World Bank, Washington Dc, 2010, 1818 H Street NW, Washington DC 20433, Internet: www.worldbank.org

Mârza B, Angelescu C, Tindeche C. 2015. Agricultural insurances and food security. The new climate change challenges. Procedia Economics and Finance **27,** 594-599.

Matsuda A, Takahashi K, Ikegami M. 2019. Direct and indirect impact of index-based livestock insurance in Southern Ethiopia. The Geneva Papers on Risk and Insurance-Issues and Practice 1-22.

Nnadi FN. 2013. J. Chikaire1*, J. A. Echetama1, R. A. Ihenacho 2, P. C. Umunnakwe1 and C. O. Utazi 2. Agricultural insurance: A strategic tool for climate change adaptation in the agricultural sector, Net Journal of Agricultural Science, Vol. **1(1),** pp. 1-9, March 2013.

Ochieng J, Kirimi L, Mathenge M. 2016. Effects of climate variability and change on agricultural production: The case of small scale farmers in Kenya. NJAS-Wageningen Journal of Life Sciences **77,** 71-78.

Reardon T, Taylor JE. 1996. Agroclimatic shock, income inequality, and poverty: Evidence from Burkina Faso. World Development **24(5),** 901-914.

Reyes Celia M, Adrian D, Agbon, Christian Mina and Arkin Arboneda D. 2017. Crop Insurance Program of the Philippine Crop Insurance Corporation (PCIC): Integrative Report from the Five Case Regions in the Philippines, PIDS Discussion Paper Series No. 2017-39.

Reyes CM. 2014. Addressing Transient Poverty: Evaluation of the Philippine Crop Insurance Program. Philippine Institute for Development Studies, Manila, Philippines.

Reyes, Celia and Sonny M. Domingo N. 2009. Crop Insurance: Security for Farmers and Agricultural Stakeholders in the Face of Seasonal Climate Variability, PIDS Discussion Paper Series No. 2009-12).

Ritchie ER, de Janvry A, Sadoulet E. 2016. Weather index insurance and shock coping: Evidence from Mexicos CADENA program. World Bank Policy Research Working Paper **7715.**

Smith VH. 2016. Producer insurance and risk management options for smallholder farmers. The World Bank Research Observer **31(2),** 271-289.

Snaebjorn Gunnsteinsson. 2012. Hidden Information and Market Failures for Crop Insurance in the Philippines, Innovations for Poverty Action. 101 Whitney Avenue New Haven, CT 6510 USA, contact@poverty-action.org.