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ASSESSING THE IMPACT OF SUPER TYPHOON YOLANDA (HAIYAN) ON THE LIVELIHOOD OF COCONUT DEPENDENT FARMERS IN KANANGA, LEYTE AND SOGOD, SOUTHERN LEYTE, PHILIPPINES

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The coconut industry was heavily devastated when super typhoon Yolanda (internationally known as Haiyan) hit Eastern Visayas, Philippines in November 2013. This study aims to assess the impact of super typhoon Yolanda on the livelihood of coconut farmers in Leyte by determining the lost income of farmers from the coconut harvests after the devastation of the super typhoon. A face-to-face interview was conducted among 150 randomly selected respondents in Kananga, Leyte and Sogod, Southern Leyte. Difference-in-difference analysis was used to estimate the impact of the super typhoon on coconut production. Results show that the impact of super typhoon Yolanda translates to a reduction in coconut income by PHP 10,882.18 (USD 217.64) per hectare per cropping. The income of coconut farmers significantly decreased after the devastation of super typhoon Yolanda. Prices of copra, the main product of coconut, have increased by 21.93% after the typhoon incident because of the substantial reduction of production in Leyte. In response, majority of coconut dependent farmers pursued the replanting of coconuts after the devastation of the super typhoon. Considering the unprecedented challenges faced by small scale coconut farmers, it is recommended that the government and non-government organizations promote climate-resilient agricultural practices in coconut farming.

Keywords*:* impact assessment, coconut farmers, gross margin analysis, adaptation strategies

1. INTRODUCTION

On November 8, 2013, super typhoon Yolanda (international name Haiyan), considered as the most powerful storm to make landfall recorded in

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history, struck the Philippines. The National Disaster Risk Reduction Management Council (NDRRMC) (2016) reported that a total of 3,424,593 families or 16,078,181 persons were affected in 12,139 barangays in 44 provinces, 591 municipalities and 57 cities of regions IV-A, IV-B, V, VI, VII, VIII, X, XI, and CARAGA. In Region 8 or Eastern Visayas alone, the total damage cost is estimated at P68,707,360,318 (NDRRMC, 2016).

The coconut sector, the second most important agricultural sector in the Philippines in terms of planted area, number of dependents, and share of agricultural exports, has faced the biggest challenge after suffering the typhoon's wrath. According to the Philippine Statistics Authority (PSA) (2016), coconut used to be the most extensively cultivated crop in Eastern Visayas producing 1,769,952,000 nuts per year. In Eastern Visayas region, where the super typhoon Yolanda caused the most devastation, an estimated 33 million coconut trees, across 295,191 hectares of land, have been damaged putting at risk the livelihoods of more than one million farming households (Rodriguez, 2014).

More than the essential post-disaster needs of the government, the need to rehabilitate the livelihood of those affected coconut farmers is essential in the recovery from the worst typhoon catastrophe that hit Leyte, Philippines. Special attention should be given to small scale coconut farmers because they are considered among the poorest of the poor in the agricultural communities (Balisacan, 1992; Rodriguez et al., 2007; Pabuayon et al., 2009). Despite declining productivity, agriculture, especially the coconut sector, remains at the core of the government's strategy to sustain economic growth and reduce poverty (Seriño & Seriño, 2016).

Under Memorandum Order No. 62 issued in December 2013, the Presidential Assistant for Rehabilitation and Recovery (PARR) was established to put together an over-all strategic vision and integrated short-term, medium-term, and long-term plans and programs for Yolanda-affected areas (NEDA, 2013). In addition, a Yolanda Recovery and Rehabilitation Program (YRRP) that is being implemented in the affected provinces including Region 8, has four action plans to help the coconut farmers. These are debris management (which includes timber disposal and utilization), replanting, fertilization and intercropping. Despite positive government efforts on the need for an inclusive and consultative rehabilitation process, there is still a lack of clear mechanisms to ensure affected communities to effectively participate in rehabilitation and recovery of their livelihoods. In fact, in a study by Sherwood et al. in 2015, 30% are not aware that the government has reconstruction and recovery plans.

However, not all coconut farmers in Leyte suffered from the typhoon, just like the province of Southern Leyte which remained stable in their coconut production. In fact, the damage in the productive sector (includes agriculture and fisheries, mining and quarrying, trade, industry and services, and tourism) in this province is only P38,996,970 compared to P13,671,372,044 in Leyte province (NDRRMC, 2016). This shows a large margin of the damage between the two provinces on Leyte island. A comparative analysis between heavily affected coconut areas and less heavily affected will be conducted to assess the impact of damaging typhoons in coconut production.

The objective of this study is to assess the impact of super typhoon Haiyan (locally named Yolanda) to the livelihood of coconut farmers in Leyte by comparing performance of coconut production in Kananga, Leyte (heavily affected area) and Sogod, Southern Leyte (less affected area). Specifically, this study aims to (i) determine the income of the farmers from the coconut harvests before and after the typhoon; (ii) determine the changes of the prices of coconut or copra in Southern Leyte after the typhoon; (iii) identify alternative livelihood pursued by the coconut farmers after typhoon Yolanda; and (iv) provide inputs to policy formulation that will help the coconut farmers who were greatly affected by the typhoon.

2. REVIEW OF LITERATURE

In two papers, Barro (2006 and 2009) has shown that the infrequent occurrence of economic disasters has a greater effect on average citizens' welfare, especially for developing countries that usually suffer from natural disasters of all types. Although the Philippines is very much vulnerable to these disasters, most of the people have always been hesitant about these events and does not even take precautionary measure prior to the disasters. Ravago and Mapa (2014), have indicated that households that have taken precautionary measures prior to the typhoon have higher chances of recovering. These precautionary measures include savings, asset accumulation, and various instruments of (mostly informal) insurance that can be drawn upon to cope with the disaster.

Cavallo & Noy (2010) showed that poorer countries are likely to suffer more from future disasters. Still, these countries are also unlikely to be able to adopt the counter-cyclical fiscal policies that can pay for reconstruction. This constraint will make disasters' adverse consequences more severe in poorer developing countries which include the Philippines. In addition, with the changing climatic conditions, more frequent and damaging typhoons are expected

in the Philippines and in Eastern Visayas where Leyte island is located (Hilario et al., 2009; Seriño, 2014). Coconut production and livelihoods of small scale farmers will be adversely affected (Chandra et al., 2017; Giles et al., 2019).

In a report by the National Economic and Development Authority (NEDA) (2015), two key policy issues were considered for the recovery of the coconut farmers. This is through financing for recovery and reconstruction, and property and business tax relief. Also, existing programs must be accelerated, such as the Philippine Integrated Coconut Industry Poverty Reduction Roadmap to assist coconut farmers.

A report by Verzani (2013), indicated that the Department of Agriculture's Acting Undersecretary for Field Operations (DA-UFO) has stated that the DA's recovery efforts will focus on rebuilding agricultural infrastructure and restoring the livelihoods of farmers and fishing communities in the affected regions of the Visayas. Fallen coconut trees/palms are to be cleared and converted into coco-lumber via a DA cash-for-work program. Selling lumber from downed coconut trees is a potential source of short-term income; however, affected communities are currently unable to take full advantage of this due to a lack of chainsaws and sawmills in the country (USAID, 2014).

The government had implemented projects such as the Reconstruction Assistance on Yolanda (RAY) for the fast recovery of the affected people. Although its support is very important, it is not enough to rely much on government while waiting for that six to nine years maturity of the coconut. Additionally, some coconut farmers planted banana trees and vegetables which they aim to use as a food supply for the family (McDougall et al., 2019). However, it will take some time before these new crops can mature and can yield any income (Alvarez et al., 2015). In an audit report of the Commission on Audit (2014), they have admitted that quick action was not possible due to longstanding policies/ procedures that required extensive, time-consuming processes, delaying the delivery of vital supplies and other forms of assistance.

There is substantial literature documenting the assistance provided by both government and non-government organizations to the typhoon victims. However, there are no clear mechanisms in the literature that describe and assess the impact of extreme weather events such as destructive typhoons on the livelihood of small scale coconut farmers.

3. METHODOLOGY

To assess the impact of super typhoon Yolanda to the coconut farmers in Leyte, we compare areas that are greatly affected and slightly affected. The study was conducted in the municipality of Kananga, a first class municipality in the province of Leyte which represents greatly affected area of Leyte. Leyte province is one of the hugely devastated areas when super typhoon in Eastern Visayas (NDRRMC, 2016; Seriño et al., 2017). Figure 1 shows that the province of Leyte lies within the eye of the super typhoon, severely damaging coconut production (NDRRMC, 2016).

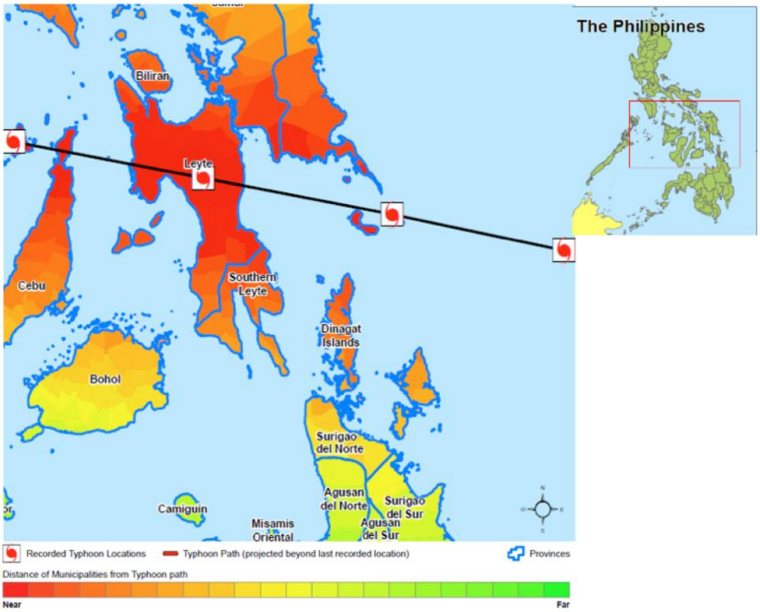

Figure 1. Path of the super typhoon Yolanda on November 8, 2013
(Source: Shelter Cluster Philippines, 2013)

For the sake of comparison, a survey was also conducted in the municipality of Sogod, a second class municipality in the province of Southern Leyte which represents the area where the damage in agriculture is relatively smaller compared to Kananga. A random sample of respondents was drawn from two clusters, which in this case is Kananga and Sogod. Sixty (60) coconut farmers were interviewed from Sogod and ninety respondents (90) were interviewed from Kananga.

A pre-tested questionnaire was used in a face-to-face interview. The survey gathered information on the income from the coconut harvests before and after the typhoon. Secondary data was also gathered to determine the change in the price of copra before and after the typhoon.

The data was analyzed through descriptive analysis, gross-margin analysis, difference-in-differences analysis and first-difference regression analysis.

Gross-Margin Analysis

Gross-margin is simply equal to the total revenue minus the total variable cost. In equation,

$$\text{Gross Margin} = \text{Total Revenue} - \text{Total Variable Cost} \quad (1)$$

Regression Analysis

First-Difference Model

The first-difference estimator is an approach used to address the problem of omitted variables in econometrics with panel data. In this case, we estimate the effect of the variables that changed over time from coconut production income.

$$\Delta \text{income}_t = \beta_0 + \beta_1 \Delta \text{affected}_t + \beta_2 \Delta \text{trees}_t + \Delta \varepsilon_t \quad (2)$$

where:
income = income from coconut production
affected = if the coconut farm was affected by typhoon; 1 if affected and 0 otherwise
trees = number of coconut trees
ε = error term

Difference-in-Differences Model

Difference-in-differences is a tool to estimate treatment effects comparing the pre- and post-treatment differences in the outcome of a treatment and a control group. In this case, we estimate the effect on the income from coconut production before and after the typhoon. In a regression, this can be estimated as follows:

$$\text{income} = \beta_0 + \beta_1 \text{year\_dummy} + \beta_2 \text{affected} + \beta_3 \text{year\_dummy*affected} + \varepsilon \quad (3)$$

where:
income = income from coconut production before and after typhoon;
year_dummy = dummy variable for two time periods, 2013 and 2016, represented by 0 for 2013 and 1 for 2016
affected = dummy variable for treatment/intervention; 0 for slightly affected and 1 for greatly affected
year_dummy*affected = dummy variable representing the relationship of time and intervention
ε = remaining error

4. RESULTS AND DISCUSSION

Socio-demographic characteristics of the respondents

Table 1 shows the socio-demographic profile of the respondents. This shows that the average age of coconut farmers in Sogod and Kananga is 60 and 54 years old, respectively. Out of 137 respondents, 72 (52.55%) of them are males and 65 (47.45%) are females. In terms of civil status, 68.61% of the respondents are married, 18.98% are widowed, and 5.11% are single. The educational attainment of a farmer is an important factor in the farm's productivity. However, results showed that coconut farmers in Sogod and Kananga have relatively low educational attainment. Of the 137 respondents, 37 (27.21%) have attended elementary; 26 (19.12%) were elementary graduates, and 4 (2.94%) have not attended any formal education at all. 25 (18.38%) are high school level; 15 (11.03%) are high school graduate; 15 (11.03%) are college level; and only 14 (9.56%) are college graduate. The average annual on-farm income of Sogod farmers is PHP 46,249 and PHP 69,055 for Kananga farmers. This shows that farmers in Kananga have higher average on-farm income compared to Sogod farmers after Yolanda. This can be explained by the active sugar cane industry in the area which serves as an alternative source of income. Southern Leyte's economy, on the other side, relies so much on the coconut industry. Even if they were not affected by the typhoon, the minimal size of their land area could not earn a higher on-farm income compared to Kananga. The average annual non-farm income of Sogod farmers is PHP 108, 496, while PHP 115, 819 for Kananga farmers. Non-farm income in two areas is mostly from household members who are working with regular monthly salaries. The average annual remittance received by Sogod farmers is PHP 33, 017 and PHP 14, 620 in Kananga. This shows that more respondents in Sogod are receiving higher remittances than Kananga, which can be explained by remittances received internationally.

Table 1. Socio-demographic characteristics of the respondents

	Sogod		Kananga		Total	
	n	Percent	n	Percent	n	Percent
Average Age	60		54		57	
Sex						
Male	28	49.12%	44	55.00%	72	52.55%
Female	29	50.88%	36	45.00%	65	47.45%
Civil Status						
Single	4	7.02%	3	3.75%	7	5.11%
Married	31	54.39%	63	78.75%	94	68.61%
Widowed	17	29.82%	9	11.25%	26	18.98%
Live-in	2	3.51%	4	5.00%	6	4.38%
Separated	3	5.26%	1	1.25%	4	2.92%
Educational attainment						
No education	2	3.51%	2	2.53%	4	2.94%
Elementary level	7	12.28%	30	37.97%	37	27.21%
Elementary graduate	14	24.56%	12	15.19%	26	19.12%
High school level	10	17.54%	15	18.99%	25	18.38%
High school graduate	7	12.28%	8	10.13%	15	11.03%
College level	8	14.04%	7	8.86%	15	11.03%
College graduate	9	15.79%	5	6.33%	14	9.56%
Annual income						
Average annual on-farm income	46,249.12		69,055.82		54,497.13	
Average annual non-farm income	108,496.50		115,819.80		112,750.50	
Average annual remittance received	33,017.54		14,620.25		22,330.88	
Total	57		80		137	

The typhoon has undeniably reduced the number of coconut trees in Leyte. However, the municipality of Kananga has relatively decreased more compared to Sogod. Before the typhoon, a hectare of coconut farms in Sogod has an average of 122 coconut trees, while Kananga has 112 per hectare. The average coconut trees in Sogod have decreased to 118/ha after the typhoon, while the average coconut trees in Kananga have tremendously decreased to 33/ha after the typhoon. This shows that Sogod area has suffered minimal damage as far as the number of coconut trees is concerned. Figure 2 shows the comparison of the number of coconut trees before and after the super typhoon.

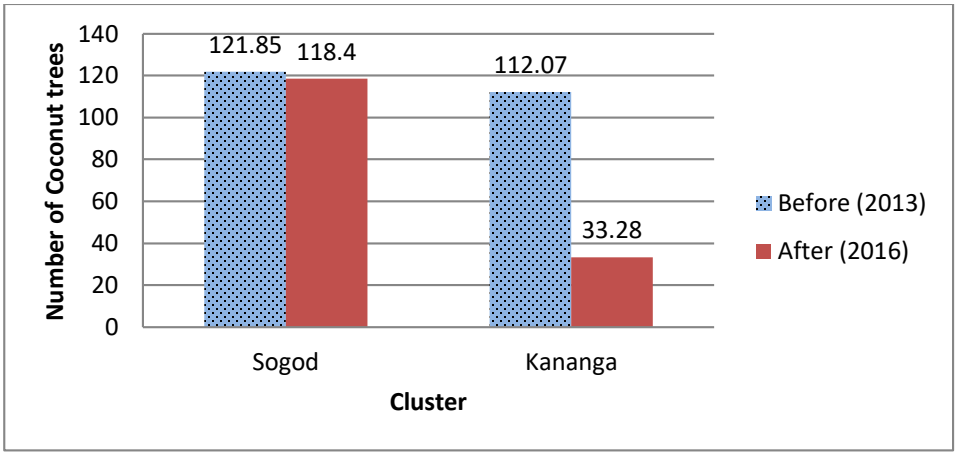

Figure 1. Graphical presentation on the number of coconut trees before and after typhoon in Sogod and Kananga, 2017.

Gross-Margin Analysis

The gross margin of coconut production in Sogod, Southern Leyte has increased compared to the gross margin before typhoon Yolanda. Sogod recorded a gross margin amounting to PHP 9,001.18/ha in 2016 compared to PHP 6,438.84/ha in 2013. Thus, the increase is P2,562.34 per ha. The theory behind this increment is due to the decrease in the coconut supply in Leyte following the devastation of the super typhoon. A reduction in coconut supply has an associated increase in the price which conforms to the law of supply. The decrease in productivity is offset or compensated by the rise in copra price per kilogram.

On the other hand, the gross margin of coconut production in Kananga, Leyte has decreased compared to the gross margin before typhoon Yolanda. Results show that the gross margin after the super typhoon is valued at PHP 778.63/ha compared to PHP 9,098.47/ha in 2013. Thus the income from coconut has decreased by PHP 8,319.84/ha. This drastic decrease is a reflection of the destruction of typhoon to agriculture, specifically to the coconut trees. There are still 60 (75%) coconut farmers and tenants who have not harvested from coconut since the typhoon struck.

As shown in Table 2, total revenue dropped by PHP 10,572 (89.72%) which is explained by the extreme decrease in the quantity of coconut harvest. The total variable cost has also drastically decreased by 83.89% as the volume of coconut production does not need many laborers anymore.

Table 1. Gross margin of coconut production per hectare in Sogod and Kananga, 2017

	Sogod		Kananga	
	Before (2013)	After (2016)	Before (2013)	After (2016)
Total Revenue	8,712.98	13,264.06	11,783.14	1,211.13
Total Variable Cost	2,274.14	4,262.89	2,684.67	432.50
Gross Margin	**6,438.84**	**9,001.18**	**9,098.47**	**778.63**

Regression Analysis

First-difference model

The first-difference model tests if the change in income is significant before and after the super typhoon, controlling for variables that are fixed within the period. The regression result revealed that the R-squared has a value of 0.50. This means that 50% of the variation of income is explained by the explanatory variables in the model. The variable affected is highly significant at 1%. This implies that typhoon Yolanda has a significant effect on the change in the income of coconut farmers. Statistically, if the farm is greatly affected by the typhoon, there is an associated decrease in the gross margin by PHP 5,006.93/ha, ceteris paribus. This result is consistent with the hypothesis that the typhoon has a negative impact on the farmer's income.

Table 3. First-difference regression model results of coconut farmer respondents in Sogod and Kananga, 2017.

VARIABLES	Income
Affected by typhoon	-5,006.93***
	(1,451.83)
No. of coconut trees	51.14***
	(7.15)
Constant	2,971.86***
	(915.89)
Observations	137
R-squared	0.500

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Difference-in-Differences

Regression analysis on the difference-in-differences yields three coefficients. This includes the coefficient of the weather shock variable (typhoon Yolanda), coefficient of the effect of time period (before and after typhoon) and the difference-in-difference estimator which captures the impact of super typhoon on coconut production.

The coefficient of β_2 (year_dummy) is 2,659.63 which is significant at 10%, implies that regardless of the weather shock, there is a significant difference in the gross margin of coconut farmers between Sogod and Kananga by PHP 2,659.63 per hectare. This only showed the pure effect of the passage of time in the absence of weather shock. This can be explained by the increase of prices of copra/coconut or increased volume from production due to the additional mature-bearing coconut trees which yields higher gross margin in the span of three years.

The coefficient of β_3 is -10,882.18, which is highly significant at 1%. This implies that the impact of the super typhoon on the coconut income of farmers is PHP 10,882.18 per hectare per cropping. This also shows how the typhoon negatively affected their livelihood. This negative impact is mainly because of the uprooted trees by the typhoon which decreased the number of coconut-bearing trees.

Table 4. Coefficients and standard error from difference-in-difference regression results.

VARIABLES	Income
Affected by typhoon	2,562.33*
	(1,317.53)
Year_dummy	2,659.63*
	(1,423.84)
Impact of typhoon	-10,882.18***
	(1,863.27)
Constant	6,438.84***
	(1,006.81)
Observations	274
R-squared	0.181

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Price Change of Copra

Price being a factor in the total revenue equation plays a crucial function of the computation of gross margin. As the price of copra increases, total revenue tends to increase, causing the gross margin to increase. In the typhoon Yolanda case, the typhoon had significantly reduced production volume in the province of Leyte. Consequently, it is associated with an increase in copra price as the law of supply worked during the period. The Leyte province did not indicate the average price of copra in November 2013, in which the typhoon devastated the area. Southern Leyte continued its production with a remarkable increase in copra price from P19.38/kg in October to P23.63/kg in November and continued its increase to P24.74/kg in December and P26.82/kg in January. The copra price stabilized to P28/kg in February and March (PSA, 2017).

If we evaluate the price growth of copra per kilo from October 2013 to April 2014 (point of reference to typhoon Yolanda), the price has increased by 22% from October to November 2013. This associated increase in price can be explained by the law of supply benefiting the coconut farmers in Southern Leyte. However, this increase cannot be explained by the reduction of coconut production alone because there are still other factors that could influence the price of copra just like the number of substitutes of coconut oil (Fiji, 2012 & Estal, 2014).

Figure 3 shows the line graph of prices of copra in Leyte and Southern Leyte. As seen in the graph, there was a spike increase in copra price after the typhoon Yolanda, which is explained by the reduction of supply in Leyte province. However, prices of copra in the long run after typhoon have increased generally. This just shows that there are still other factors that could influence the price of copra and not just the occurrence of typhoons or any other natural disasters.

Adaptation

The main challenge of the affected farmers is how they will adapt after the typhoon. This is a test of the resiliency of the farmers. As shown in Table 5, results showed that 25 (43.86%) of the respondents from Sogod had developed an adaptation after the typhoon. Their adaptation strategy was mostly replanting or replacing the coconut trees uprooted by the strong wind. Thirty-two (56.14%) have not developed an adaptation strategy because in the first place, there were no uprooted trees by the typhoon, or the fallen trees are not significant to the overall production. However, in the case of Kananga, seventy (87.5%) respondents have developed an adaptation strategy after the typhoon due to a higher opportunity cost of the uprooted coconut trees. Out of 80 respondents, 53 have replanted given that the government and their associations distributed coconut

seedlings for replanting. Aside from replanting, some have adapted new farming practices such as planting cacao from the Department of Agriculture's grant, have accessed to credit, intercropped & multi-cropped, pursued other means to generate additional income such as livestock farming, and enhancing or transforming the then coconut farm into a sugar cane plantation. However, despite the damage, there are still farmers who have no adaptation strategies after the typhoon. Ten (12.5%) respondents have not adapted because they have not received any form of assistance, such as seedlings, or they have no resources to buy seedlings for replanting coconuts. This suggests that these farmers have low adaptive capacity after the typhoon.

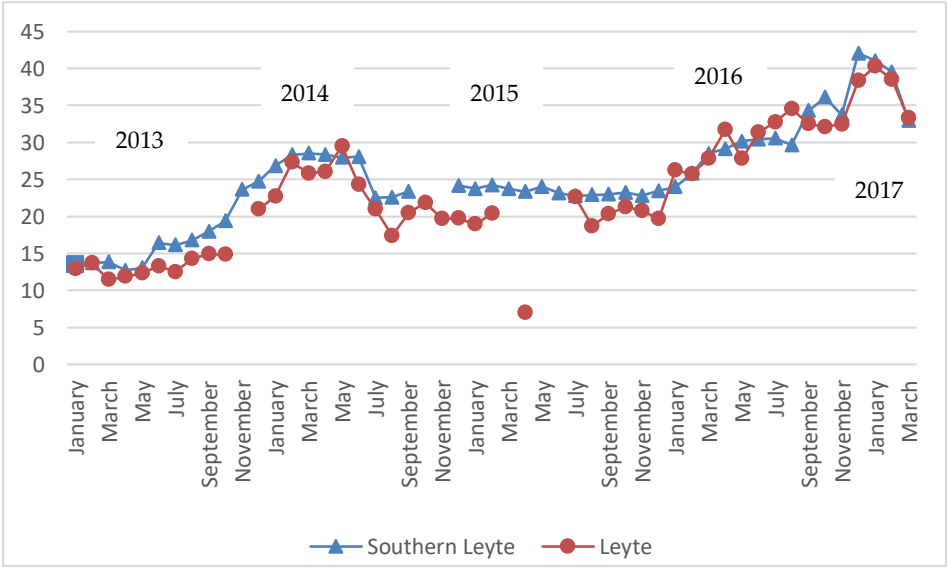

Figure 3. Price of copra per kilo from January 2013 to March 2017 (PSA, 2017)

Table 5. Adaptation and/or non-adaptation of coconut farmers after typhoon Yolanda in Sogod and Kananga, 2017

	Sogod		Kananga		Total	
	n	Percent	n	Percent	n	Percent
has adaptation	25	43.86%	70	87.50%	95	69.34%
has no adaptation	32	56.14%	10	12.50%	42	30.66%
Total	57	100%	80	100%	137	100%

Table 6 shows the breakdown of the farmers' adaptation strategies in Sogod and Kananga. Results showed that the most common adaptation of the farmers after the typhoon is by replanting coconut trees to replace the damaged ones. In Sogod, 22 (38.6%) have replanted while 65 (81.25%) in Kananga. Next to replanting, the farmers have adapted through intercropping and multiple cropping. Only 3 (5.26%) have intercropped or multiple cropped in Sogod while 32 (40%) in Kananga. Thirteen (16.25%) farmers in Kananga have pursued other means to generate additional income, such as laborers for construction and carpentry, laborers for farming, and etc. Also, in Kananga, 10 (12.5%) have ventured into livestock farming; 7 (8.75%) have adopted new farming practices; and a few have established coconut farmers' organization, farmed to other places and accessed to credit as a form of adaptation. As expected, Kananga farmers have adapted more strategies than those in Sogod since they were greatly affected by the super typhoon.

Table 6. Coconut farmers' adaptation strategis in Sogod and Kananga, 2017

	Sogod		Kananga	
Farmer's Adaptation*	n	Percent	n	Percent
replanting coconut	22	38.60%	65	81.25%
inter cropping/multiple cropping	3	5.26%	32	40.00%
accessed to credit	0	0%	1	1.25%
adapting new farming practices	0	0%	7	8.75%
pursued other means to generate additional income	0	0%	13	16.25%
livestock farming	0	0%	10	12.50%
farming to other places	0	0%	1	1.25%
establishment of coconut farmers organization	0	0%	1	1.25%
Others	0	0%	2	2.50%

*multiple response

5. CONCLUSIONS AND RECOMMENDATIONS

The income of coconut farmers had significantly reduced after the devastation of the super typhoon Yolanda. Results show that the estimated gross margin value from coconut production in Sogod is PHP 9,001.18/ha in 2016 compared to PHP 6,438.84/ha in 2013, suggesting an increase in the value of PHP 2,562.34 per ha. However, the gross margin value from coconut production in Kananga has decreased from PHP 9,098.47 per ha in 2013 to only PHP 778.63/ha

in 2016. The gross margin analysis shows that coconut farmers in Kananga had lost PHP 8,319.84/ha income from coconut farming. However, different regression models in this study had quantified the lost income with the variables that could influence the gross margin. The difference-in-difference model reveals that the mean change in the gross margin from before and after the typhoon is significantly lower by 10,882.18. This shows that the super typhoon Yolanda has decreased the gross margin of the coconut farmers in Kananga by PHP 10,882 per hectare per cropping. Several regression results posted a negative association between the typhoon and the gross margin from coconut production, which implies that indeed the typhoon had significantly reduced the income of coconut farmers greatly affected by the super typhoon.

The price of copra is also affected by the typhoon. Typhoon Yolanda had significantly reduced the volume of production in the province of Leyte. The immediate response in the market translates to higher prices of copra. This conforms to the law of supply where price increases if there is less supply in the market. Results in this study revealed that the province of Southern Leyte had continued its production after typhoon with a remarkable increase in the price of copra from PHP 19.38/kg in October to PHP 23.63/kg in November 2013. This continued its increase to PHP 24.74/kg in December 2013 and PHP 26.82/kg in January 2014 until it stabilized to PHP 28/kg in February and March 2014. This increase benefited the coconut farmers in Southern Leyte.

Although Kananga was badly hit by the typhoon and the coconut farmers' income were affected, the farmers have shown resiliency because 87.5% have developed an adaptation after the typhoon, mostly by replanting or replacing the coconut trees. This adaptation is highly supported by the Philippine Coconut Authority (2016) under the Department of Agriculture and farmers' organizations, associations, and cooperatives in Kananga. Aside from replanting, some have ventured into livestock farming to generate additional income and adapted new farming practices such as enhancing the sugar cane industry, which is a common practice nowadays in Kananga. Thus, we can conclude that although Kananga was badly hit by the typhoon, the affected coconut farmers have an alternative option on what to do with their land by transforming it into a sugar cane plantation.

Although the resiliency of the Kananga farmers is promising, 12.5% of the respondents have not adapted because they have not received any form of assistance such as seedlings or they have no resources to buy seedlings for replanting coconuts. This indicates that they have low adaptive capacity after the typhoon. Given that they have a low adaptive capacity, the government should intervene by providing additional inputs such as coconut seedlings that are

sufficient to cover the damaged farms. This should be done immediately because the farmers are incurring higher opportunity cost with their idle farm. However, the government might not only provide coconut seedlings in Leyte area but also assist on other farming and non-farming practices that would generate alternative income for the coconut farmers.

The latest propagation technology from the Philippine Coconut Authority (PCA) (2016), which is the coconut somatic embryogenesis technology (Cset), can be one of the potential solutions to this problem. This is to augment the rehabilitation and adaptive strategies of the coconut farmers. However, since the project is a work-in-progress, it should be fast-tracked as the Philippines is very vulnerable to these typhoons and this can happen anytime soon.

Research on the comparative analysis of coconut production with other crops can also be conducted to determine which crop could be more profitable than coconuts. Other than that, determining what combination of crops is best to be intercropped with coconut trees would also be interesting for the farmers to maximize their land. This would promote coconut farmers to diversify their crops that are profit-maximizing and, at the same time, fast yielding, so when the crisis arises, they have options to harvest faster. This intervention should be coupled with adequate farmers training so that they could easily adapt to technology and innovations (Chandra et al., 2017; Seriño and Ratilla, 2017)

The government should take part in the rebuilding of the coconut farmers by providing them the needs for coconut production since, based on the results of the study, not all were being assisted by the government. This includes the 12.5% non-adaptive coconut farmers in Kananga. In addition, since the results of this study reveals that the farmers in Kananga have not fully recovered yet from the super typhoon, it is high time to conduct revisit and realignment of the government policies they have implemented before. If this will be done, the budget may be efficiently used by the government.

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