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# DETERMINANTS OF ADAPTATION STRATEGIES TO CLIMATE CHANGE IMPACTS AMONG WOMEN FARMERS IN CABINTAN, ORMOC CITY, LEYTE

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Climate change impacts have been increasingly affecting the lives of many people, including women farmers, in developing countries. This study aimed to determine the factors affecting adaptation to climate change impacts by women farmers in Brgy. Cabintan, Ormoc City. Data were gathered by interviewing 103 female vegetable farmers in Cabintan. The women farmer-respondents were mostly married with an average age of 40. The most common climatic hazards that they experienced in their farm were typhoons and drought. To be able to adapt to the impacts of typhoon and drought or heat stress, the women farmers employed several strategies, the topmost of which were: (1) plotting or mounding of land, (2) watering, and (3) water impounding. The significant variables that affected the women farmers' decision to adopt the adaptation strategies to typhoon are farming experience in years, climate change awareness, access to agricultural extension, access to agricultural credit, number of children attending school, age, working hours per day, and number of years spent in school. In addition, the significant variables that affect women farmers' decision to employ more than one adaptation strategy to drought or heat stress impacts are working hours per day, age, number of children attending school, number of years spent in school, and perceived future loss due to drought or heat stress impacts. It is recommended that the government should provide more seminars about climate change and its impacts and also about new and effective adaptation techniques that the Cabintan women farmers can employ in their farm.

**Keywords**: women farmers, vegetable cultivation, adaptation strategies

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# 1. INTRODUCTION

Climate change is rapidly rising as a global critical development issue affecting many sectors in the world. It is deemed to be one of the most severe threats to sustainable development (Akinnagbe & Irohibe, 2015). It increasingly affects the lives of many people, particularly those of the poor in developing countries. One of the sectors that are greatly affected by climate change impacts is the agriculture sector, specifically vegetable production (Schreinemachers et al., 2017). Vegetable production is cultivating and harvesting vegetable crops to sell it to the market for human consumption. It provides an auspicious economic opportunity for lowering rural poverty and unemployment in developing countries (Schreinemachers et al., 2017). However, vegetable production is currently suffering from the impacts of climate change. Vegetables are more susceptible to extreme environmental effects such as high temperatures and soil moisture stress. Examples of impacts of climate change in vegetable production include decrease in productivity and decrease in the quality of vegetables that are harvested and sold to the market (Naik et al., 2017). The decline in vegetable productivity may cause food insecurity, which can further lead to malnutrition and hunger.

Women play an important role in vegetable production. Unfortunately, the role of women and their contribution to farm activities are not that recognized (Kumari & Laxmikant, 2015). It was found in a study conducted in Pakistan that women farmers provided the majority of labor input in planting, hoeing, and harvesting activities. However, women dealt with crucial constraints in accomplishing vegetable production activities which include the adoption of mitigation strategies against climate change impacts. They have less access to information, technology, inputs and credit compared to men (Ozkan et al., 2000).

Men and women have different resources and assets in tackling climate change. Women are most reliant on natural capital for their livelihood. When there is drought, men have the opportunity to seek a paid job such as contractual work in the cities, road-repair work, or gold-mining work. However, women need resources (water, forests, land) to be able to obtain income to provide their families' needs. Women also have less physical capital. They have no access to land ownership since the owner of the land is always the male head of the family. Women's human capital (their level of education and health) is far lower than that of men. Regarding financial capital, it should be noted that women do not have a considerable capacity to save because they use all their income on their children's food, health and education (González & Saulière, 2011). With these constraints and lack of resources and assets, women are more sensitive to climate shocks.

With the impacts of climate change becoming more apparent, the need for adaptation strategies is becoming important. Therefore, there is a need for a study to determine what affects the decision of women farmers whether to adopt or not the adaptation strategies to climate change impacts. These factors can be helpful tools in drawing policy recommendations to improve the productivity of vegetable farms in Cabintan.

Cabintan is an upland barangay in Ormoc City, Leyte. It is known as the vegetable bowl of Eastern Visayas because it is the major supplier of vegetables in the region (Saulan, 2016). However, due to natural hazards such as excessive rains, typhoons and droughts, the vegetable cultivation in Cabintan has been affected. Therefore, it is also necessary to assess the adaptation strategies to climate change impacts as well as the determinants for adopting these adaptation strategies of women farmers in Cabintan. Also, studies concerning about adaptation strategies to climate change impacts in vegetable cultivation are rare.

This study was conducted to determine the different factors that influence the decision of women farmers in Cabintan whether to adopt the adaptation strategies to climate change impacts or not. This study also focuses on women farmers because, in today's society, they are not often recognized with their contributions on their farm. Therefore, they have less access to resources or benefits such as loans and trainings. The results of this study might be useful in determining what factors related to women farming must be changed to encourage women farmers to adopt some adaptation strategies to climate change impacts. Results of this may also be a helpful tool in drawing policy implications concerning the use of adaptation strategies to climate change impacts among women farmers.

## 2. METHODOLOGY

### Data collection procedure

The study used primary and secondary data. The secondary data from the project entitled “Livelihood and Needs Assessment of Women Farmers in Ormoc-Kananga Mountain Ranges” by Centino et al. (2018) was used. The data that were not covered and collected in the project was obtained by conducting face-to-face interviews with the same set of respondents using pre-tested questionnaires.

**Sample size**

The population of women farmers in Ormoc City was 985 with a sample size of 284. Using Slovin's formula for proportional sampling, it was determined that 103 would be the sample size for Brgy. Cabintan. This study covered only Brgy. Cabintan, so only the data from Cabintan women farmers were used.

**Econometric Models**

There were three econometric models used in the study. The variables used for the econometric models were based on different studies related to adaptation to climate change impacts in agriculture (Jin, Wang, and Gao (2015); Ndamani and Watanabe (2015); and Kidemu and Anjulo (2016)).

The first two models were analyzed using binary logistic regression while the third model used Poisson regression to do a robustness check for model 2. The first model was employed to determine the relevant variables that influence the women farmers' decision to use the adaptation strategies to typhoon impacts. The model below was employed:

$$\begin{aligned} Typhoon\_Adopt = {} & \beta_0 + \beta_1 age + \beta_2 schoolyears + \beta_3 farming\_exp + \beta_4 farminc \\ & + \beta_5 nonfarminc + \beta_6 hh\_size + \beta_7 farm\_size + \beta_8 child6below + \beta_9 childschool \\ & + \beta_{10} CC\_awareness + \beta_{11} access\_extension + \beta_{12} access\_credit \\ & + \beta_{13} sbenefitsAS\_awareness + \beta_{14} decisionresourceuse + \beta_{15} FBO\_member \\ & + \beta_{16} work\_con + \beta_{17} perceievd\_loss + e \end{aligned} \quad (1)$$

Based on the survey, all women farmers who experienced drought/heat stress in their farm employed adaptation strategies to drought/heat stress impacts. Thus, the second model was employed. The second model aimed to determine the relevant factors that affect the decision of the women farmers to employ more than one adaptation strategy to drought/heat stress impacts. The second model is as follows:

$$\begin{aligned} \text{DivAdapt\_Drought} = {} & \beta_0 + \beta_1 age + \beta_2 schoolyears + \beta_3 farming\_exp + \beta_4 logfarminc \\ & + \beta_5 hh\_size + \beta_6 farm\_size + \beta_7 child6below + \beta_8 childschool + \beta_9 CC\_awareness \\ & + \beta_{10} access\_extension + \beta_{11} access\_credit + \beta_{12} sbenefitsAS\_awareness \\ & + \beta_{13} decisionresourceuse + \beta_{14} FBO\_member + \beta_{15} work\_con \\ & + \beta_{16} perceievd\_loss + e \end{aligned} \quad (2)$$

Model 3 had the same independent variables as model 2. The dependent variable is a count variable measuring the number of adaptation strategies for drought/heat stress impacts employed by the women farmers who experienced drought/heat stress in their farms. The third model is as follows:

$$\begin{aligned} AdaptStrat\_Drought = {} & \beta_0 + \beta_1 age + \beta_2 schoolyears + \beta_3 farming\_exp + \beta_4 logfarminc \\ & + \beta_5 hh\_size + \beta_6 farm\_size + \beta_7 child6below + \beta_8 childschool + \beta_9 CC\_awareness \\ & + \beta_{10} access\_extension + \beta_{11} access\_credit + \beta_{12} sbenefitsAS\_awareness \\ & + \beta_{13} decisionresourceuse + \beta_{14} FBO\_member + \beta_{15} work\_con \\ & + \beta_{16} perceievd\_loss + e \end{aligned} \tag{3}$$

where:

*Typhoon_Adopt* = dummy variable for adoption of adaptation strategies of women farmers: 1 for adopt, 0 for not to adopt

*DivAdapt_Drought* = dummy variable for diversification of adaptation strategies for drought impacts

*AdaptStrat_Drought* = number of adaptation strategies to drought/heat stress impacts employed by the women farmers

*age* = age of the respondent in years

*schoolyears* = number of years spent in school

*farming_exp* = farming experience of respondent in years

*farminc* = income of respondent from farming in pesos (model 1)

*logfarminc* = log of farm income (model 2 and 3)

*nonfarminc* = income of respondent from non-farming activities

*hh_size* = household size of the respondent

*farmsize* = farm size in hectares

*child6below* = number of children below 6 years old

*childschool* = number of children attending school

*weatherinfo* = dummy variable for access to weather information: 1 for yes, 0 for no

*access_extension* = dummy variable for access to agricultural extension services: 1 for yes, 0 for no

*access_credit* = dummy variable for access to agricultural credit: 1 for yes, 0 for no

*CC_awareness* = dummy variable for climate change awareness: 1 for aware, 0 for not aware

*benefitsAS_awareness* = dummy variable for awareness and perception of the problem and the potential benefits of adopting: 1 for yes, 0 for no *decisionresourceuse* = dummy variable for access and control over resources: 1 for yes, 0 for no

*FBO_member* = dummy variable for membership of farmer-based organizations: 1 for yes, 0 for no

*work_con* = working condition (working hour per day)

*perceived_loss* = perceived future loss caused by climate change in pesos

*e* = error term

**Analytical Tools Used**

The regression analyses for this study were simulated per climate change impact. The climate change impacts that were observed in the area are droughts or heat stress and typhoons. The analytical tool that was used for the first two models is the binary logistic regression since the dependent variables of the two models are both dummy or binary variables. These were: (1) whether to adopt or not the adaptation strategies to typhoon impacts; and (2) whether to diversify or not the adaptation strategies to drought. With several independent variables and one binary dependent variable, the probability or the likelihood that a case is in a particular category can be calculated using the following formula (Schüppert, 2009/heat stress impacts. The third model was analyzed using Poisson regression.

**Binary Logistic Regression**

With several independent variables and one binary dependent variable, the probability or the likelihood that a case is in a particular category can be calculated using the following formula (Schüppert, 2009):

$$P(Y) = \frac{e^{b_0+b_1X_1+b_2X_2+\cdots+b_nX_n}}{1+e^{b_0+b_1X_1+b_2X_2+\cdots+b_nX_n}} \quad (4)$$

where:

P = the probability of Y occurring

e = natural logarithm base

$b_0$ = interception at y-axis

$b_1$ = line gradient

$b_n$ = regression coefficient of $X_n$

$X_1$ = predictor variable

Figure 3 shows the graph of the logistic function. This implies that as P(Y) ranges from 0 to 1, the logit ranges from -∞ to +∞ (Schüppert, 2009).

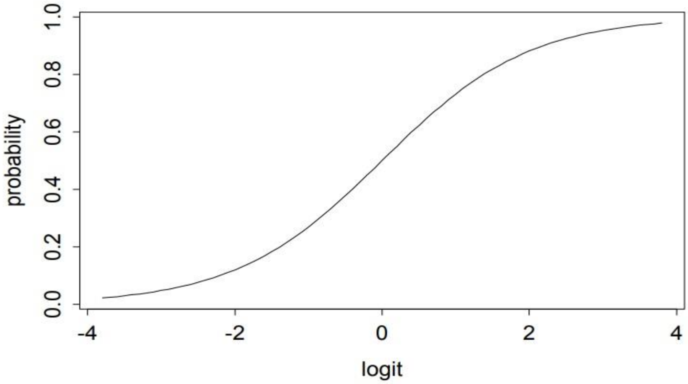

Figure 3: The logistic function graph (Rodriguez, 2007)

**Post-estimation Techniques**

Post-estimation techniques or diagnostic tests (e.g., test for omitted variables, heteroscedasticity test, test for multicollinearity, and test for non-normality of residuals) were also conducted to test the validity of the data and the results of the regression analysis.

## 3. RESULTS AND DISCUSSION

**Socio-Demographic Characteristics of Women Farmers**

The socio-demographic characteristics of the Cabintan women farmers who are categorized into adopters and non-adopters of typhoon adaptation strategies are presented in Table 1. The highest percentage of the respondents (66%) are middle-aged (22 – 44 years old). Of the 87 adopters, nearly two-thirds (65.5%) are middle-aged, and of the 16 non-adopters, more than two-thirds (68.8%) were also middle-aged. The mean age of the respondents in both categories is 41 years old.

The highest percentage of the respondents (69% of the adopters and 56.3% of the non-adopters) have elementary education. More than one-fourth (27.5% of the adopters and 31.3 of the non-adopters) reach high school, while only few are able to enter college. The mean number of school years is seven (7) years for the non-adopters and six (6) years for the adopters.

Table 1. Socio-demographic characteristics of women farmers in Cabintan, Ormoc City, Leyte, 2017

| VARIABLE | VARIABLE CATEGORIES | ADOPTER CATEGORY | | | | | |
|---|---|---|---|---|---|---|---|
| | | Adopters | | Non-adopters | | Total | |
| | | n | % | n | % | n | % |
| **Age** | Middle age (20-44) | 57 | 65.5 | 11 | 68.8 | 68 | 66.0 |
| | Old age (45-59) | 24 | 27.6 | 3 | 18.8 | 27 | 26.2 |
| | Senior (60 and above) | 6 | 6.9 | 2 | 12.5 | 8 | 7.8 |
| | TOTAL | 87 | 100.0 | 16 | 100.0 | 103 | 100.0 |
| | Mean | 41 | | 41 | | 41 | |
| **Education** | Elementary | 60 | 69.0 | 9 | 56.3 | 69 | 67.0 |
| | High School | 24 | 27.5 | 5 | 31.3 | 29 | 28.1 |
| | College | 3 | 3.4 | 2 | 12.5 | 5 | 4.9 |
| | TOTAL | 87 | 100.0 | 16 | 100.0 | 103 | 100.0 |
| | Mean (years) | 6 | | 7 | | 6 | |
| **Marital Status** | Single | 1 | 1.1 | 0 | 0.0 | 1 | 1.0 |
| | Married | 67 | 77.0 | 14 | 87.5 | 81 | 78.6 |
| | Widowed | 3 | 3.4 | 1 | 6.2 | 4 | 3.9 |
| | Live-in | 16 | 18.4 | 1 | 0.0 | 17 | 16.5 |
| | TOTAL | 87 | 100.0 | 16 | 100.0 | 103 | 100.0 |
| **Household size** | 1 to 2 | 9 | 10.3 | 3 | 18.8 | 12 | 11.7 |
| | 3 to 4 | 33 | 37.9 | 5 | 31.2 | 39 | 36.9 |
| | 5 to 7 | 34 | 39.1 | 7 | 43.8 | 41 | 39.8 |
| | 8 and above | 11 | 12.6 | 1 | 6.2 | 12 | 11.7 |
| | TOTAL | 87 | 100.0 | 16 | 100.0 | 103 | 100.0 |
| | Mean | 5 | | 5 | | 5 | |
| **No. of children attending school** | 0 | 18 | 20.7 | 5 | 31.2 | 23 | 22.3 |
| | 1 to 4 | 61 | 70.1 | 10 | 62.5 | 71 | 68.9 |
| | 5 to 8 | 8 | 9.2 | 1 | 6.2 | 9 | 8.7 |
| | TOTAL | 87 | 100.0 | 16 | 100.0 | 103 | 100.0 |
| | Mean | 2 | | 2 | | 2 | |

*Note: The references on disaggregating the respondents is through the adaptation strategies related to typhoons.*

Most of the women farmers (77% of the adopters and 87.5% of the non-adopters) are married. Around two-fifths (39.1% of the adopters and 43.8% of the non-adopters) have a household size of 5 to 7 members. The mean household size for both categories is five (5). Most of the respondents (70.1% of the adopters and 62.5% of the non-adopters) have one (1) to four (4) children attending school. The mean number of children attending school for both categories is two (2). The highest percentage of adopters (52.9%) have no children below six (6) years old, while the highest percentage of the non-adopters (43.8%) have one child below six (6) years old. The mean number of children below six (6) years old for both categories is one (1).

**Adaptation strategies to typhoon and drought/heat stress impacts**

The women vegetable farmers in Cabintan employed several adaptation strategies to typhoon impacts (Table 2). The mostly used adaptation strategy is plotting or mounding of land. It is the process of constructing elevated plots with canals on the side to prevent the vegetables from being damaged by floodwater caused by typhoons. This adaptation strategy, according to the respondents, is inexpensive and easy to adopt.

Table 2. Adaptation strategies of women farmers to typhoon impacts in Cabintan, Ormoc City, Leyte, 2017

| ADAPTATION STRATEGIES TO TYPHOON IMPACTS* | N (n = 87) | % |
|---|---|---|
| Plotting/mounding of the soil | 77 | 88.5 |
| Construction of drainage canal | 29 | 33.3 |
| Early harvesting | 16 | 18.4 |
| Delay planting of crops | 15 | 17.2 |
| Use of plastic mulch | 10 | 11.5 |
| Stopped planting vegetables | 3 | 3.4 |
| Did not plant | 1 | 1.1 |
| Use of protected structure | 1 | 1.1 |

**Multiple response*

Sixteen of the 87 respondents (18.4%) who used some adaption strategies also reveal that to minimize the damage of crops due to typhoons, they harvest their vegetables early. Some (17.2%) said they delay the planting of their vegetables, waiting for the typhoon to pass. Only few used plastic mulch to cover the vegetable plots because according to the respondents, this adaptation strategy is costly.

The adaptation strategies to drought/heat stress impacts used by the Cabintan women farmers are presented in Table 3. The most commonly used adaptation strategies are watering and water impounding. Watering is a common practice in dealing with heat stress. Water impounding is the practice of keeping enough supply of water by digging a hole through a piece of soil and covering it with a waterproofed canvas (locally known as “trapal”) to create a well where the water is stored. Some farmers also used drum containers to store water for their farms.

Table 3. Adaptation strategies of women farmers to drought/heat stress impacts in Cabintan, Ormoc City, Leyte, 2017

| ADAPTATION STRATEGIES TO DROUGHT/ HEAT STRESS IMPACTS* | N (n = 54) | % |
|---|---|---|
| Water impounding | 51 | 94.4 |
| Watering of plants manually | 43 | 79.6 |
| Delay planting of crops | 7 | 13.0 |
| Change crop planted | 6 | 11.1 |
| Buy water pumps | 4 | 7.4 |
| Plant drought-tolerant crops/early maturing crops | 2 | 3.7 |
| Reduce number of crops planted | 1 | 1.9 |
| Use drip irrigation | 0 | 0.0 |
| Plastic mulching | 0 | 0.0 |

**Multiple response*

**Factors affecting women farmers' decision to adopt the adaptation strategies to climate change impacts**

This section presents the results of the binary logistic regression of models 1 and 2 as well as the results of the Poisson regression of model 3.

**Determinants of adaptation strategies to typhoon impacts**

Table 4 shows the logit regression of the first model which aims to determine the factors that affect the decision of the women farmers to adopt the adaptation strategies to typhoon impacts. The statistically significant variables include age of the respondents (*Age*), number of children attending school (*ChildSchool*), farming experience in years (*Farming_exp*), number of working hours per day (*Work_con*), climate change awareness (*CC_awareness*), access to agricultural extension services (*Access_extension*), and access to agricultural credit (*Access_credit*).

Table 4. Factors affecting women farmers' decision to adopt adaptation strategies to typhoon impacts in Cabintan, Ormoc City, Leyte, 2017

| Variables | Coefficients | Standard Errors |
|---|---|---|
| Age | -0.0922** | 0.0416 |
| Number of children below 6 years old | -0.929 | 0.712 |
| Number of children attending school | -1.311** | 0.662 |
| Household size | 0.691 | 0.524 |
| Number of years spent in school | -0.450** | 0.199 |
| Farming experience in years | 0.161** | 0.0736 |
| Farm income | -1.28E-05 | 3.42e-05 |
| Non-farm income | -0.000141 | 8.65e-05 |
| Farm size | 0.0399 | 0.871 |
| Work hours per day | -0.539* | 0.305 |
| FBO membership | -0.896 | 0.812 |
| Climate change awareness | 6.620** | 2.652 |
| Awareness of the benefits of adaptation strategies | 0.0707 | 1.155 |
| Access to agricultural extension | 1.692* | 0.872 |
| Access to agricultural credit | 2.596** | 1.108 |
| Decision on resource use | -0.848 | 1.218 |
| Perceived future loss due to typhoon impacts | 2.50E-05 | 2.46e-05 |
| Constant | 2.038 | 3.507 |
| Observations | 103 | |
| Pseudo R2 | 0.3485 | |
| Prob > chi2 | 0.0199 | |
| Log likelihood | -28.978633 | |
| Marginal effect after logit | .95045899 | |
| Legend: *** sig at 1%, ** sig at 5%, * sig at 10% | | |

Based on the findings, farming experience in years (*Farming_exp*), climate change awareness (*CC_awareness*), access to agricultural extension services (*Access_extension*), and access to agricultural credit (*Access_credit*) were positively correlated (at 5%, 5%, 10%, and 5% respectively) with the decision of the women farmers to adopt the adaptation strategies to typhoon impacts. This result suggests that a one-year increase in farming experience increases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 0.161. If a women farmer has more experience in farming, she would likely be more knowledgeable about the effects that typhoons could have on their farm. Therefore, more experienced women farmers are more likely to adopt the adaptation strategies.

The result for climate change awareness means that awareness of climate change increases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 6.620. This implies that in order to encourage the women farmers to adopt the adaptation strategies, dissemination of information about climate change and its impacts must be done. Having access to agricultural extension services also increases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 1.692. Extension services may increase the women farmers' knowledge about the effects of climate change as well as how to mitigate them. Therefore, more access to extension services increases the probability that they will adopt the adaptation strategies. Also, access to agricultural credit increases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 2.596. If women farmers have something to borrow money from, they would more likely to adopt the adaptation strategies as employing them incurs more cost.

The age of the respondents (*Age*), number of children attending school (*ChildSchool*), number of years spent in school (*Schoolyears*), and number of work hours per day (*Work_con*) are negatively correlated (at 5%, 5%, 5%, and 10% respectively) with the decision of the women farmers to adopt the adaptation strategies to typhoon impacts. An increase in the age of the respondents by one year decreases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 0.0922. This means that as they get older, they are more reluctant to adopt the adaptation strategies. This is because older farmers are more accustomed to the traditional practices in farming; therefore, they are more reluctant to learn new practices that can be employed in the farms.

An increase in the number of children attending school by one decreases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 1.311. If a woman farmer has more children who are still studying, she would likely decide to allocate a considerable portion of their revenue for the educational needs of her children, thus having less budget for such adaptation strategies that require labor. This would likely cause her to choose not to adopt the adaptation strategies. A one-year increase in the number of years spent in school decreases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 0.450. Several women farmers that were interviewed are only at elementary level with 3 to 4 years spent in school. During this time, they were not yet aware of climate change. With little years spent in school, they are less likely to adopt the adaptation strategies.

Lastly, for the working hours per day of the women farmers, a one-hour increase in work hours per day decreases the log-odds of the decision of the women farmers to adopt the adaptation strategies to typhoon impacts by 0.539. This result corresponds to the result of the study of Kidemu & Anjulo (2016). If women spend more time working on the farm, she would have less time participating in decision-making activities, which in turn indicates less access to climate change adaptation mechanisms.

Regression diagnostic tests are also employed to check the viability of the data and the results. The model is homoskedastic since the chi-square p-value of the Breusch-Pagan test is equal to 0.06265. There is no omitted variable in the model since the p-value of the Ramsey RESET test for Omitted Variables is equal to 0.0902. Also, there is no multicollinearity problem since the mean Variance Inflation Factor (VIF) is equal to 1.93 which is less than 10. However, the residuals are not normal since the p-value of the Shapiro-Wilk test for normal data is 0.000 which rejects the null hypothesis that the residuals are normal. Finally, the model is significant since its p-value is equal to 0.0199 which is less than 0.05.

**Determinants of adaptation strategies to drought/heat stress impacts**

The factors influencing the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts are shown in Table 5. With the increasing temperature, one adaptation strategy might not be enough. Therefore, some of the women farmers employ more than one adaptation strategy. The statistically significant variables that influenced the decision of the women farmers to employ more than one adaptation strategy to drought/heat stress impacts are age of the respondents (*Age*), number of children attending school (*ChildSchool*), number of years spent in school (*Scholyears*), number of working hours per day (*Work_con*), and perceived future loss due to drought/heat stress impacts (*Perceived_loss*).

Among the significant variables, only the number of working hours per day (Work_con), which is significant at 10% level of significance, positively correlates with the decision of the women farmers to diversify their adaptation strategy to drought/heat stress impacts. A one-hour increase in the working hours per day increases the log-odds of the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts by 1.731. One of the most commonly used adaptation strategies for drought is watering which is relatively easier to employ. If women farmers work more hours on the farm, they would likely have more time in employing other adaptation strategies to drought.

Table 5. Factors affecting the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts in Cabintan, Ormoc City, Leyte, 2017

| Variables | Coefficients | Standard Errors |
|---|---|---|
| Age | -0.537* | 0.274 |
| Number of children below 6 years old | -1.049 | 3.420 |
| Number of children attending school | -5.056* | 2.755 |
| Household size | 1.264 | 1.145 |
| Number of years spent in school | -1.591* | 0.868 |
| Farming experience in years | 0.300 | 0.184 |
| Log of farm income | 1.699 | 1.040 |
| Farm size | -4.965 | 4.000 |
| Work hours per day | 1.731* | 1.022 |
| FBO membership | 2.014 | 1.751 |
| Climate change awareness | -5.251 | 5.793 |
| Awareness of the benefits of adaptation strategies | 4.481 | 3.778 |
| Access to agricultural extension | -0.617 | 1.729 |
| Access to agricultural credit | -3.751 | 2.429 |
| Decision on resource use | 0.273 | 2.806 |
| Perceived future loss due to typhoon impacts | -7.25e-05** | 3.03e-05 |
| Constant | 16.09 | 12.97 |
| Observations | 50 | |
| Pseudo R2 | 0.5930 | |
| Prob > chi2 | 0.0055 | |
| Log likelihood | -11.661438 | |
| Marginal effect after logit | .97469032 | |
| Legend: *** sig at 1%, ** sig at 5%, * sig at 10% | | |

The age of the respondents (*Age*), number of children attending school (*ChildSchool*), number of years spent in school (*Scholyears*), and perceived future loss due to drought/heat stress impacts (*Perceived_loss*) are negatively related (at 10%, 10%, 10%, and 5%, respectively) to the dependent variable. For the age of respondents, a one-year increase in their age decreases the log-odds of the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts by 0.537. An increase in the number of children attending school by 1 decreases the log-odds of the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts by 5.056. A one-year increase in the number of years spent in school also decreases the log-odds of the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts by 1.591. Lastly, a unit increase in the perceived future loss due to drought/heat stress impacts decreases the log-odds of the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts by 0.000725.

Diagnostic tests are also employed for the second model. The Breusch-Pagan test indicated that the model is not heteroskedastic since the p-value= 0.0935 is less than 0.05. This means that the null hypothesis that there is homoskedasticity cannot be rejected. However, the model has omitted variables since the p-value of the Ramsey RESET test is 0.0058. There is no multicollinearity sine the mean VIF is equal to 2.19 which is less than 10. The residuals are not normal since the p-value of the Shapiro-Wilk test is 0.035 which rejects the null hypothesis that the residuals are normal. However, the Kernel density estimate graph shows that the residuals are almost normal. The model is also significant since p-value is equal to 0.0055.

Table 6 shows the results of the Poisson regression (Model 3). Poisson regression is done in order to do a robustness check for Model 2. Only farming experience in years (Farming_exp) and log of farm income (logfarminc) are positively significant at 5% and 1%, respectively. The result in farming experience implies that a one-year increase in farming experience translates to an increase in the number of adaptation strategies to drought/heat stress employed by one. In addition, a 1% increase in farm income translates to an increase in the number of adaptation strategies to drought/heat stress employed by one.

Diagnostic tests are also employed for the third model. The model is homoskedastic since the chi-square p-value of the Breusch-Pagan test is equal to 0.06. There is an omitted variable problem in the model since the p-value of the Ramsey RESET test for Omitted Variables is equal to 0.009. Also, there is no multicollinearity problem since the mean Variance Inflation Factor (VIF) is equal to 1.98 which is less than 10. However, the residuals are not normal since the p-value of the Shapiro-Wilk test for normal data is 0.014 which rejects the null hypothesis that the residuals are normal. However, the Kernel density estimate graph shows that the residuals were almost normal. Finally, the model is significant since its p-value is equal to 0.0049 which is less than 0.05.

Table 6. Factors affecting the decision of the women farmers to increase their adaptation strategies to drought/heat stress impacts in Cabintan, Ormoc City, Leyte, 2017

| Variables | Coefficients | Standard Errors |
|---|---|---|
| Age | -0.015 | 0.014 |
| Number of children below 6 years old | 0.190 | 0.188 |
| Number of children attending school | -0.101 | 0.108 |
| Household size | -0.321 | 0.084 |
| Number of years spent in school | -0.027 | 0.052 |
| Farming experience in years | 0.033** | 0.015 |
| Log of farm income | 0.364*** | 0.108 |
| Farm size | 0.156 | 0.194 |
| Work hours per day | 0.028 | 0.064 |
| FBO membership | 0.132 | 0.230 |
| Climate change awareness | -0.453 | 0.470 |
| Awareness of the benefits of adaptation strategies | 0.002 | 0.411 |
| Access to agricultural extension | -0.047 | 0.242 |
| Access to agricultural credit | -0.084 | 0.299 |
| Decision on resource use | 0.347 | 0.457 |
| Perceived future loss due to typhoon impacts | -5.45e-06 | 3.50e-06 |
| Constant | -2.586 | 1.300 |
| Observations | 96 | |
| Pseudo R2 | 0.1199 | |
| Prob > chi2 | 0.0049 | |
| Legend: *** sig at 1%, ** sig at 5%, * sig at 10% | | |

## 4. IMPLICATIONS AND RECOMMENDATIONS

This study reveals important information about the profile of the women vegetable farmers in Cabintan. Most of them are middle-aged, married and have a low level of education as most of them are only able to attain elementary education. Most of them also have a big household size with 5 to 7 members. Most of them rely solely on vegetable farming as the primary source of livelihood. They are highly involved in vegetable farming. Their biggest roles are on keeping records of farm activities and expenses, selling the produce, accounting of the sales and budgeting their income, and assessing whether or not they have gained in their vegetable farming venture. They also play a significant role in borrowing money for capital when needed.

Majority of the women farmers are aware of climate change and its impacts. In fact, they have experienced a number of these climate change impacts, including typhoons, floods, drought/heat stress and increased pest infestation. However, the climate change impacts that they considered to have affected their vegetable farming the most are typhoons and drought or heat stress as these can cause substantial damage to their crops. In minimizing crop losses, women farmers with their husbands and other household members use adaptation strategies that are affordable and easy to adopt. The most commonly used adaptation strategy to mitigate the impacts of typhoons is plotting or mounding of land. It is the process of constructing elevated plots with canals on the side to prevent the vegetables from being damaged by floodwater caused by typhoons. This adaptation strategy, according to the respondents, is inexpensive and easy to adopt.

Based on the findings of the binary logistic regression analysis of the first model, farming experience in years (Farming_exp), climate change awareness (CC_awareness), access to agricultural extension services (Access_extension), and access to agricultural credit (Access_credit) are positively correlated (at 5%, 5%, 10%, and 5% respectively) with the decision of the women farmers to adopt the adaptation strategies to typhoon impacts. This means that those with higher number of years in farming experience, high level of awareness of climate change, better access to agricultural extension services and better access to agricultural credit had higher tendencies to adopt some strategies to mitigate typhoon impacts.

Results of the binary logistic regression analysis of the first model also show that age of the respondents (Age), number of children attending school (ChildSchool), number of years spent in school (Schoolyears), and number of working hours per day (Work_con) are negatively correlated (at 5%, 5%, 5%, and 10% respectively) with the decision of the women farmers to adopt adaptation strategies to mitigate typhoon impacts.

Meanwhile, the results of the binary logistic regression of the second model show that working hours per day (Work_con) positively correlated (at 10%) with the decision of the women farmers to diversify their adaptation strategies to drought/heat stress impacts. On the other hand, age of the respondents (Age), number of children attending school (ChildSchool), number of years spent in school (Schoolyears), and perceived future loss due to drought/heat stress impacts

(Perceived_loss) are negatively correlated (at 10%, 10%, 10%, and 5% respectively) with the dependent variable.

Results of the Poisson regression show that farming experience in years (Farming_exp) and log of farm income (logfarminc) are positively correlated (5% and 1% respectively) with the dependent variable (AdaptStrat_Drought) which measures the number of adaptation strategies to drought/heat stress impacts employed by the respondents.

There are 54 women farmers who experienced negative impacts of drought/heat stress on their vegetable farmers. All of them used adaptation strategies to mitigate the impacts of drought/heat stress. More than three-fourths of them (76%) even used more than one adaptation strategies. The most common strategies used are water impounding and watering the plants manually. In impounding water, vegetable farm owners (some with the help of hired labor) dig a hole in the soil and cover it with a waterproof canvas (locally known as "trapal") to create a well where the water is stored. Based on the findings of the binary logistic regression of the second model, the number of working hours per day (Work_con), which is significant at 10% level of significance, positively correlates with the decision of the women farmers to diversify their adaptation strategy to drought/heat stress impacts. On the other hand, age of the respondents (Age), number of children attending school (ChildSchool), number of years spent in school (Scholyears), and perceived future loss due to drought/heat stress impacts (Perceived_loss) are negatively related (at 10%, 10%, 10%, and 5% respectively) to the dependent variable.

It is recommended that the government and other concerned development agencies should provide more seminars about climate change and its impacts and also about new and effective adaptation techniques that Cabintan women farmers can employ in their farms. This will help women farmers cope with the impacts of climate change. The study reveals that climate change awareness and access to extension services positively influence their decision to adopt adaptation strategies. However, it is also revealed that their adaptation strategies to climate change impacts may not be effective anymore. Therefore, it will be beneficial if they will be taught new techniques that they can employ. The government should also provide seminars about the importance of postharvest storage of vegetables. Giving of storage facilities to help the women farmers keep their produce fresh and marketable is also recommended. The storage facilities can help prevent their products from getting rotten during transportation.

The government and non-government organizations may also provide lending opportunities with low interests to the women farmers to give additional help should they face lack of capital due to low productivity caused by climate change impacts. The government may subsidize some protected structures to the women farmers in Cabintan as this protective structure is deemed to be effective in protecting their crops/vegetables.

Since Cabintan is considered as the vegetable bowl in Eastern Visayas, agricultural extension workers and other concerned development agencies must find time to visit the farmers in order to understand the problems that they have encountered. This can serve as their bases in designing and implementing interventions that can help sustain profitable vegetable farming in the area.

For further studies, the vulnerability index of Cabintan women farmers can also be computed to assess their vulnerability to climate change impacts.

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