
Strategies Use by Garlic Growers in Coping with Climate Variability in Occidental Mindoro, Philippines

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Declaro-Ruedas, Mary Yole Apple

College of Agriculture, Occidental Mindoro State College, San Jose, Occidental Mindoro, Philippines
E-mail Address: tsinelas_yole@yahoo.com, Phone: +63 (908) 896-1782

Abstract

The study determined garlic grower's perception on livelihoods' vulnerability to climate variability, the coping strategies employed, and the relationship between the profile and their coping mechanism to climate variability. Correlational research design was employed in this study. The respondents were randomly selected from the registered list of garlic growers in the municipalities of San Jose, Magsaysay, Calintaan, Rizal, Looc and Lubang of Occidental Mindoro, Philippines. Survey, interview guide and observation with the garlic growers and farmer leaders were done. Result showed vulnerability to climate variability indicators that were always perceived were pest and disease, lack of water supply and low quality of crops. The coping strategies that was always practiced was irrigating the land more during dry season using water pumps, since garlic is usually planted in the months of December to April. However, respondents indicated they 'never' got crop insurance and do not let their land be leased or rented by other farmers. Further, age and farming experience have significant relationship with coping mechanism employed.

Keywords: garlic, coping mechanism, climate variability, crop insurance

Introduction

Agriculture is firmly connected to climate factors and therefore is threatened by climate change (Shaffril et al., 2018). Changes in climate can have direct effects on crop yields and production costs, as well as indirect effects on relative crop prices (Attavanich, Rashford, Adams, & McCarl, 2014).

Climate variability measures the variation in the mean state and other statistics of the climate over the long term, climate change, on the other hand, measures variation in either the mean state of the climate or in its variability, persisting for an extended period, typically decades or longer (World Meteorological Association, 2020). Philippine agriculture has been traditionally exposed to the many hazards and risks from typhoons and droughts even before the on-set of climate change. Agriculture is highly sensitive to climate variability and weather extremes, such as droughts, floods and severe storms. The changing climate has impact on water availability and its quality, agricultural production, food quality which has an impact on vulnerable groups.

Six of the 10 countries most vulnerable to climate change are in the Asia-Pacific. Bangladesh tops the list followed by India, Nepal, the Philippines, Afghanistan and Myanmar (Mahaato, 2014). The Philippine agriculture is already under pressure from increasing demands for food and the parallel problem of depletion land and water resources caused by overuse and contamination. Impacts of climate variability and change cause an additional risk for agriculture. In addition, small-scale farmers like the garlic growers of Occidental Mindoro, Philippines are dependent on timely and sufficient rainfall during the monsoon for a high crop yield. However, with the changing climate, farmers are being exposed to too many risks including droughts, floods, pest and diseases of crops as well as market irregularities.

Garlic together with watermelon, corn, and onion is one of the most profitable farm enterprises ventured by the farmers in Occidental Mindoro, Philippines. However, its production is highly seasonal (Dar, 2017). Thus, production is greatly influenced by the changes in climate. Declaro-Ruedas and Ruedas (2014) reported that “highly serious” problems of onion (which is also a bulb crop like garlic) growers in Occidental Mindoro is the changing weather condition, low price, presence of onion/garlic cartels, high marketing and transportation cost, and lack of storage facilities. Further, PSA (2014) enumerated the common production problems encountered by garlic farmers, which includes bad weather condition/calamities, occurrence of pests and diseases, high cost of inputs and lack of capital.

In due course, climatic change could greatly affect agriculture in terms of crops productivity, growth rates, photosynthesis and transpiration rates, moisture availability and others (Mahato, 2014). The vulnerability of small-scale agriculture to climate variability is caused by the inherent weather-sensitivity of agricultural livelihoods and the chronic poverty that plagues the sector. Adaptation has been recognized as an important strategy to reduce these impacts because it can lower vulnerability, and can increase resilience to climate change.

Thus, the exposure to these changes may have forced farmers to cope with the climatic variability by changing certain production practices and looking for alternative livelihood strategies. Hence, this study was conducted to understand how garlic growers respond to climatic variations that affect their production.

Objectives of the study:

The study determined the garlic growers’ strategies for coping with climate variability in Occidental Mindoro, Philippines.

The specific objectives were to:

- Determine the garlic growers’ perception of their livelihoods’ vulnerability to climate variability;
- Identify the coping strategies employed by garlic growers in response to climate variability; and

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- Determine the relationship between the garlic growers' profile and the coping mechanism employed in response to climate variability.

Methodology

The study was conducted in the garlic growing municipalities of Occidental Mindoro, Philippines, namely: San Jose, Magsaysay, Rizal, Calintaan, Looc and Lubang. The province of Occidental Mindoro, Philippines falls in the latitude of 13°6'8.68"N and the longitude of 120°45'54.46"E.

The 235 garlic growers were the respondents of the study. The list of registered garlic growers was taken from the Municipal Agriculture Office of the different municipalities. With the absence of official list, the names of the garlic growers were gathered from the Mindoro Allium Growers Multipurpose Cooperative (MAGRO MPC) and their clustered members in the different municipalities. They were selected using simple random sampling. The garlic growers were selected based on the following criteria: they have planted garlic for at least three consecutive cropping season, owned the land they till, and a registered garlic growers in the municipality.

This study used descriptive research design. Survey was used to gather the needed information in the study. Part I consisted of the garlic growers' profile. While, Part II determined their perception on their livelihoods' vulnerability to climate variability, and Part III identified the coping strategies employed by garlic growers in response to climate variability. Perception and coping strategies were measured using a 5-point Likert scale. Mean, and ranges were used to determine the profile variables. The Pearson Moment Correlation were used to test the relationship between the garlic growers' profile and the coping mechanism employed in response to climate variability. The instrument was validated by technical experts in the Municipal Agricultural Office. Their suggestions and corrections were considered in the final production of the questionnaire. The data was gathered on June 2018 – May 2019.

Results and Discussion

Perception on Livelihoods' Vulnerability to Climate Variability

According to Fadina & Barjolle (2015), climate change has an effect on agriculture and livelihood. In addition, Afful (2016) posited that climate change and climate variability may pose a negative influence on crop production. In areas, for example, where irrigation is insufficient, crops wither and die, thus reducing the yield. The reduced yield could further mean reduced profit and increased poverty.

Result shows that the vulnerability of garlic to climate variability perceived by respondents were pest and disease ($\bar{x}=4.60$), lack of water supply ($\bar{x}=4.73$) and low quality of crops ($\bar{x}=4.52$). This holds true with the study of Poudel & Duex (2017) that farmers are using small irrigation systems from small tributaries, which depends on rainfall for the discharge; however, many of them are drying up and farmers perceive climate change as the main driver. Further, garlic growers had resorted to

expensive fungicide and other chemicals to optimize the production due to changing weather condition.

Table 1: Perception on vulnerability of livelihood to climate variability

	\bar{x} (max =5.50)
Cause of pest and diseases	4.60
High cost of farm inputs	3.68
Lack of water supply	4.73
Poor soil condition	2.31
Low quality of crops	4.52
Decreasing production	3.90
Grand mean	3.96

Coping Strategies Employed by Garlic Growers in Response to Climate Variability

Farming households in the Philippines are most vulnerable to climate change and variability due to their climate/weather-sensitive livelihood and lack of resources to finance adaptation measures (Defesta & Rapera, 2014).

Coping with natural 'variability' of climate has been a constant challenge faced by farmers. Garlic growers were asked about their coping strategies in the face of climate variability. The results reported by the growers from the different municipalities in Occidental Mindoro, Philippines are presented in Table 2.

The garlic growers in Occidental Mindoro are more likely to adopt frequent irrigation as a coping strategy ($\bar{x}=4.76$), since garlic is usually planted in the months of December to April, which is considered dry season. They had been using groundwater through shallow tube well during the peak growing season, when there is no water from the irrigation canals.

The garlic growers also employ change garlic variety ($\bar{x} =3.52$) from the native variety of Mindoro I to Lubang or Ilocos white variety, practice crop diversification ($\bar{x} =3.71$), wherein farmers cultivate more than one variety of crop belonging to the same or different species in a given area in the form of rotations and or intercropping., and use organic fertilizer ($\bar{x} =2.86$) to reduce cost of production.

Ndamani & Watanabe (2016) also found out that farmers in Ghana use drought-tolerant and early maturing varieties and change of planting date to adapt to dry spells, droughts and floods. They also use crop rotation and mixed cropping strategies to reduce effects of dry spell on crop plants. While, some of the farmers also claimed that they used composting and mulching to conserve soil moisture and improve soil fertility so as to increase their crop production.

Asrat and Simane (2018) revealed that the use of improved crop varieties, agroforestry practices, soil conservation practices, irrigation practices, and adjusting

planting dates are the most important adaptation strategies by smallholder farmers in North-West Ethiopia. However, adaptation decision is location-specific and influenced by key drivers such as socioeconomic, environmental, and institutional factors.

According to a study conducted by the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), “crop insurance, a risk management tool, is a key to the farmers’ financial stability, enabling them to continue production despite severe weather and other challenges that impact their business” (Fernandez, 2014). However, it is sad to note that getting crop insurance ($\bar{x}=1.00$) was never employed as a coping strategy and also leasing the land ($\bar{x}=1.00$) to other farmers.

Table 2: Coping strategies employed by the garlic growers

Coping strategies	\bar{x} (max =5.50)
Change garlic variety	3.52
Build a water-harvesting scheme	1.58
Irrigate more (drought)	4.76
Crop diversification (mixed/multicropping)	3.71
Crop rotation	1.71
Change in cropping calendar	2.84
Get crop insurance	1.09
Change amount of land for garlic production	1.73
Implement soil conservation techniques	2.30
Crop-livestock integration	2.74
Use organic fertilizer	2.86
Use of chemical inputs	3.52
Find off-farm job	3.52
Lease the land	1.00
Grand Mean	2.63

Relationship between Garlic Growers’ Profile and Coping Mechanism to Climate Variability

Table 3 presents the relationship between garlic growers’ profile and their coping mechanism to the climate variability. Belay et al (2017) indicated that education, family size, gender, age, livestock ownership, farming experience, frequency of contact with extension agents, farm size, access to market, access to climate information and income were the key factors determining farmers’ choice of adaptation practice.

Results show that age and farming experience is ‘significantly related’ to the coping mechanism employed by the garlic growers. This corroborates with Uddin (2014) that age is negative and significantly (at 10% level) related to farmers’ adaptive strategies to climate change effects. This implies that the probability of adaptation

significantly decreases the older a farmer is. It can be predicted that such farmers have less interest or less incentives in taking climate change adaptation measures. Perhaps older farmers do not see the necessity to adapt to climate change effects. Moreover, these older farmers may be more “set in their ways”, interested in following traditional methods familiar to them rather than adopting modern farming techniques (Uddin, Bokelmann, Entsminger, 2014).

Fadina & Barjolle (2015) indicate that farming experience positively and significantly affected the choice of all strategies except the diversification of income-generating activities

Table 3: Garlic growers’ profile and coping strategies

Profile Variables	Computed <i>r</i>
Age	0.101
Farming experience	0.075
Number of years spent in formal education	0.033
Frequency of contacts with extension providers in one cropping season	0.056

* $P \leq 0.05$

Conclusion and Recommendations

The vulnerability to climate variability indicators that were always perceived were pest and disease, lack of water supply and low quality of crops. The coping strategies that was always practiced was irrigating the land more during dry season using water pumps, since garlic is usually planted in the months of December to April. However, respondents indicated they ‘never’ got crop insurance and do not let their land be leased or rented by other farmers. Further, age and farming experience have significant relationship with coping mechanism employed.

Based on the findings and conclusions drawn from the study, the researcher recommends the following: conduct similar study with farmers planting other commodities such as rice, tobacco, vegetables, and corn. Correlate other variables such as source of information, income and membership with organization with the employed coping mechanisms of the farmers.

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