


Effects of climate change: Struggles of small-scale farmers

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Abstract

The main objective of this study is to document the lived experiences of small-scale farmers amidst climate change. It is a qualitative study utilizing a phenomenological approach where 18 farmers of the Municipality of Banaybanay as the research participants using focus group discussions and in-depth interviews. The research question on the experiences and challenges which yielded five major themes to include uncertainties of weather, man-made unsustainable actions, and activities, financial challenges, financially unstable and unable to continue rice production, and poor and difficult economic & living conditions. Meanwhile, in terms of coping mechanisms and mitigation measures of the farmers, five essential themes emerged namely: crop-livestock diversification, water impound, crop management, strategizing farming techniques, and individualized/personalized interventions. Finally, awareness of environmental concerns and causes, initiative and innovations in crop management, consideration of alternative ways in farming, empowerment of farmers, and role of government's intervention to local farmers were the five essential themes that emerged on the insights of the farmers.

Keywords: climate change, small-scale farmers, experiences, challenges, struggles, Banaybanay, Philippines

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1. Introduction

One of the most serious and most pervasive global threats that humanity is facing in the recent time is climate change. This phenomenon had greatly affect food security in the local, national and global settings. In the same manner, the social, economic, and environmental systems were also disrupted by climate change which had affected the availability and affordability of food, water and health utilities. From the global perspective, this climate change disrupted food availability, accessibility, and food quality. Records show that the earth's climatic condition has always been changing and it was observed over the past billion years that it was always moving towards change continually primarily because also of earth-related changes and movements such as volcanic-related activities, plate movements, solar radiation changes, and many other factors. These identified changes are the main reasons for the increase of carbon dioxide (CO₂) concentration, increase temperature, and increase and decrease of rainfall. Moreover, in the past 100 years more particularly in the last 20 years, evidence suggested that human-related activities contributed to the identified changes (NASA, 2020; United States Environmental Protection Agency, 2016).

Any changes in the climatic conditions could have major impacts on crops production. For instance, rivers and streams will be affected by extremely dry conditions. This resulted in the decline of the level of the water in the ground, not enough irrigation water and much worst is major crop losses. In the same manner, during the extreme wet season, farmers would experience excessive runoff, increasing flood peaks, severe erosion, flooding resulting in lodging of standing crops, and landslides (Lizumi & Ramankutty, 2015; Parmeshwar et al., 2014). Climate change can be a major concern most particularly in the sector of agriculture, as agriculture plays various roles in national and even local economic systems in our country. Thus, it is very critical that the agriculture sector must adjust to the possible adverse results of climate change as it must cope up with the challenge of providing food for the increasing populace. To do these, the determination, development, and practical application of mitigation-related activities as well as adaptation-related activities are a must (International Food Policy Research Institute, 2015; Cruz, 2017).

On one hand, although Filipino crop and livestock growers and producers were found to have the minimal capacity in adjusting to the identified changes, fortunately, they find ways to survive and cope up over a while. In the same manner, information revealed that 70% of the Philippine calamities such as typhoons and floods. RA 10121 or the Philippine Disaster Risk Reduction and Management Act of 2010 (DRRM Act) was enacted into law. This law helped transform the system of managing disaster in the country into Disaster Risk Reduction (DRR) as compared to its previous relief and response to the disaster management system. It overturned Presidential Decree No. 1566, which had been in effect since 1978. This law was approved last May 27, 2010 (RA 10121, 2010; Cruz, 2017).

Consequently, the local rice farmers of Banaybanay, Davao Oriental have been struggling with the effect of climate change such as severe drought and flood. In addition, the too much reliance of agriculture on rainfall along with the possible scenario of limited water for irrigation contributed to the increasing exposure of crop producers and growers to the negative results of climate variability and change. In the same manner, the possible adjustment in the start of rainfall could change the usual pattern of the rainfall and could have serious effects on crop production. With climate changes, water is too much or too little will continuously persist at a higher intensity. Furthermore, rice farmers also struggled from the presence of pests and diseases, changes in the growth of crop patterns, changes in hydrological pattern, and change in water resources. These conditions cause crop losses, reduce yields and decrease productivity resulting in meager income (Banaybanay MAGRO, 2019; Cruz et al., 2017).

Many pieces of research have been conducted internationally related to climate change. In addition, there are also studies on the measures which include mitigation and adaptation as well as coping mechanisms of the affected sectors. These affected sectors include the agriculture sector of which is considered the most affected one. In the Philippines also, some research has been recorded that presented the adverse effects of climate change. However, the researcher has not come across any study at the local level that dealt with the struggles and experiences of small-scale rice farmers on climate change. Therefore, this study was conducted to present and provide relevant ideas and information that would be part of the knowledge creation and data bank on the effects of climate change to our local rice producers.

1.1 Purpose of the Study

The purpose of this phenomenological study is to understand, analyze and document the farming experiences and the transformative benefits acquired by the farmers of Davao Oriental specifically in Banaybanay. In addition, this also focused especially on their insights and experiences on how the rice farmers who have been into farming for more than 10 years adapt to the impacts of climate change. In addition, the researcher also aims to identify the effects, challenges, and needs of farmers and corresponding interventions that the national and local governments extend to those who were severely affected by climate change. As an agricultural technician and an extension worker, I am interested in understanding the processes of the farmers on their resiliency to the phenomenon to possibly recommend policies and guidelines to develop a Local Government Unit extension system. Finally, this study aims to spread awareness among local citizens of Banaybanay on the effects of climate change.

1.2 Research Questions

The study attempted to describe the views, perceptions, and experiences of the farmers in Banaybanay. Specifically, this sought to answer the following questions:

- What are the experiences and challenges of the small-scale farmers during the course of climate change?
- What coping mechanisms and mitigation measures that the farmers adapted?
- How can their level of awareness and insights help them to cope up the problem of climate change?

1.3 Theoretical Lens

This study is anchored on Stern's theory (2006) which states that there is a possibility that climate change affected the source of livelihood of the affected population more particularly in developing countries as it has impacts on the economic, environmental, and social. The effect of global warming affected not just the poor and developing nations but was considered universal. Those wealthy nations are also strongly resistant to this negative effect of climate change. Another theory significant to this study is presented by Few (2007). He theorized that the changes in climatic situation contributed to the universal concerns of disease which are expected to increase in the coming years. However, he also said that these impacts might not be the same across every region. He also said that the growing worldwide problems on health from the impacts of the calamities are agitated by climate change. Lastly, as indicated by Weber (2010) that environmental change and changeability are generally recognized by individuals through their perceptions of climatic factors that influence their day-to-day living. In this examination, respondents were posed with inquiries concerning changes in temperature, precipitation, and dry spell and how can it influence their lives.

2. Literature review

2.1 *Climate Change on Global Perception*

The atmosphere is constantly changing and this will persist for several years to come. In any event, the current environmental shift, which began in the late 1960s and has been attributed to a large extent to human activity, has progressed at an alarming rate. As individuals try to improve their expectations for everyday conveniences, with the accompanying modernization of urban and rural conditions through the arrangement of frameworks, a premium is placed on the world's assets, particularly petroleum and forests assets. Carbon dioxide, a notable bi-product of non-renewable energy source utilization and woodland freedom, has been implicated, alongside other ozone-depleting substances such as methane, nitrous oxide, and chlorofluorocarbon, as being primarily responsible for the current dangerous atmospheric deviation (Ekpoh, 2015; Buis, 2019; NASA, 2020; Friedlingstein, 2019).

In addition, humans are gradually impacting the climate and the global temperature through fossil fuel burning, forests devastation, and rearing animals. This contributed a huge quantity of greenhouse gases to the atmosphere's already existing ones, magnifying the greenhouse effect and contributing to global warming. The greenhouse effect is primarily the consequence of climate change. Some gases in the atmosphere behave as greenhouse glass, trapping heat from the sun and preventing it from escaping into space, causing warming of the earth. Many of these greenhouse gases (i.e. carbon dioxide, methane, nitrous oxide, and fluorinated gases) are created naturally, but human activity is increasing their levels in the atmosphere. The most major contributor to global warming is CO₂ produced by humans. By 2020, it has increased to 48 percent above pre-industrial levels in the atmosphere (before 1750). Other greenhouse gases are also increased as a result of human interventions. For instance, methane which has limited atmospheric lives is a stronger greenhouse gas than CO₂. Similarly, nitrous oxide is a long-lasting greenhouse gas and build-up in the air for decades or more (European Commission, 2020; NASA, 2020, USGCRP, 2017).

Likewise, human activities on Earth are changing the normal greenhouse effect. Given the last 100 years, the use of fossil fuels (coal and oil) has raised the quantity of carbon dioxide (CO₂) in the atmosphere. This happens primarily because the process of burning coal or oil produces CO₂. This was produced by the mixture of carbon in the air with oxygen. In addition, human intervention such as land clearing for the purposes of crop production, industries, and other human-induced activities has been found out to affect greenhouse gas concentrations. Meanwhile, human activities have warmed our planet by more than 95 percent over the last 50 years according to the Intergovernmental Panel on Climate Change (IPCC). In addition, it was also revealed that industrialized activities which help develop our civilization today have increased the atmospheric carbon dioxide levels in the last 15 decades. The group also determined that human-produced greenhouse gases (i.e. carbon dioxide, methane, and nitrous oxide) are more probably to blame for a large amount of the recorded increase in the temperature of the earth during the last 5 decades (NASA, 2020; Herring, 2020; IPCC Fifth Assessment Report, 2014).

Similarly, the scientific community acknowledges that climate change is taking place. They also agreed that climate change is primarily caused by humans and will have serious health consequences. This encompasses a wide range of health consequences that may have an impact on a variety of health outcomes. Extreme and climatic and weather occurrences, as well as ozone changes, can all affect the amount and pattern of morbidity and death. In addition, the changes in weather patterns and climatic factors may also create ecological situations that can promote changes in the locations, time, and prevalence of particular communicable diseases in specific areas. Also, the changes in the availability of water and productivity of agriculture, on the other hand, especially in some parts of Africa and Asia, may result in undernutrition (Field et al., 2014; Smith et al., 2014).

Likewise, this change in climatic conditions, as an environmental concern, has an impact on every area of human life, including the environment and social communities. It is also considered a major challenge and a

hazard to humanity. Changes in climatic conditions have the greatest impact on agricultural production and rural communities in the agricultural industry. Smallholder farmers, particularly in developing nations, are one of the most affected social groups by climate change. This is because; climatic changes are forecasted to change the outbreaks of pests and diseases. It will also increase the severity and frequency of droughts and floods which could increase the chances of limited yield and the failure in crops and livestock production. Because there is a close link between agricultural production and smallholder farmers' household income, the negative impact of climate change on crop production increases farmers' susceptibility. As a result, climate change has an impact not only on farmers' agricultural yield but also on their family's well-being and food security (Shikuku et al., 2017; Menike & Arachchi, 2016; Alam et al., 2017; Abid et al., 2016).

Finally, environmental change puts agriculturists underneath the destitution line and makes a new desire for innovations. The effect of climate change particularly on the country's poorest individual should not be disregarded. The latest report of the United Nation gave an account of environmental change presumed that the warming of the planet will hit the poor the hardest, especially the individuals who rely upon farming and fisheries for income and survival. Environmental change will make new poor amongst now and 2100, in low, medium, and high-pay nations and endanger manageable improvement as indicated by the report discharged by the IPCC. They included that rice and corn farmers will encounter the most significant declines in the reduction of yields while the same decreased product yields, together with the developing populace, will drive up nourishment costs, making food more expensive for those in poverty (Ranada, 2014; IPCC, 2014).

2.2 Climate Change in the Philippines

The world risk report in 2017 mentioned that the country is the third most susceptible country to climate change. Climate change has several results in the Philippines, including annual GDP losses, an adjustment in the patterns and distribution of rainfall, droughts, biodiversity and food security threat, sea-level rise, health risks of the public, and endanger the susceptible population (women and indigenous people). Moreover, it was also revealed that tropical cyclone is the most common natural hazard in the country due to their geographic locations. In addition, climate change magnified the threat and vulnerabilities that afflicted the country's agriculture and food production as well as the vulnerable and marginalized families and individuals. In the same way, the country also is one of the leading countries affected by climate change, with the increase of stronger typhoons, extreme droughts, severe floods, and shifting rainfall patterns incidences — all of which worsen the existing food insecurity, scarcity, and environmental degradation (National Integrated Climate Change Database Information and Exchange System, 2021; Worldbank, 2013; Wingard & Anne-Sophie Brändlin, 2013; Parks, 2021).

Furthermore, the country experienced on average twenty (20) tropical cyclones annually which resulted in billions of pesos worth of damages. In addition, the strength of the typhoons experienced by the country is getting extra powerful based on the analysis of the 59-year data. Accordingly, the Philippine crops and fisheries growers and producers have been the recipient of the negative impact of the unpredictable rainfall, severe droughts, extreme flooding, and stronger tropical cyclones. In addition, these growers and producers also stay as the most underprivileged and deprived groups of the population in the country. This is primarily because of their too much reliance on natural resources and makes them susceptible to the adverse effects of climate variability. This scenario makes the poverty eradication programs and efforts of the government more difficult. Lastly, this can also attribute to too much reliance on the environment and the services of the agricultural production systems (Parks, 2021; FAO, 2021; Ordinario, 2017).

Likewise, the country is anticipated to see more severe droughts. This was experienced during the latest El Niño event which happened in the year 2015 to the year 2016 and according to some experts, this was aggravated by global warming. During this time, around 413,456 crops growers and producers were affected by a severe and long period of droughts as recorded by the Department of Agriculture. The severe drought was due to drier-than-normal weather scenarios in the country lasting up to more than one planting season. This abnormal

phenomenon generated a huge amount of damage to water resources resulted in lesser quantity stored in major reservoirs and watersheds areas. As a result, the allocation for water for household and agriculture usage is greatly reduced. In most cases, water for agriculture use is preferably less prioritized as compared to household and industrial consumption especially during extreme drought (NICCDIES, 2021; World Bank, 2019; Stuecker et al., 2013).

Lastly, the production of rice in the country faces several problems and limitations. These include among others, the increasing human population, reduction of agricultural production area, soaring cost of agricultural inputs, improper drainage, and the limited number of irrigation infrastructure. These constraints were aggravated by the vulnerability of the rice sector to climate change which ruthlessly affects rice production. For example, following a series of heavy rains, paddy fields experience severe drainage issues, resulting in a considerable drop in rice production in quality and quantity (SEARCA, 2014; Osborne et al., 2013; Stuecker et al., 2018).

2.3 Vulnerability of the Philippines to Climate Change

The latest report as assessed by the IPCC, this climate change phenomenon would result in new numbers of poor individuals up to the year 2100. Scarcity causes calamities susceptibility and the poor and marginalized are most at risk. The ADB (Asian Development Bank) research on the economics of this phenomenon revealed that the Philippines will drop 6 percent of its Gross Domestic Products (GDP) yearly by 2100 if the treats of this phenomenon are ignored. In like manner, if the country spends 0.5 percent of its GDP in adaptation efforts, it can avoid losses up to 4 percent of GDP by 2100 (NICCDIES, 2021, ADB & World Bank, 2021; IPCC, 2014).

Furthermore, there are major rainfall changes in patterns and distributions in the country. There is a prediction that by 2020, rainfall will drop in the majority parts of the country apart from the areas in Luzon. In terms of extreme rainfall, however, by the years 2020 and 2050, the frequency of the number of days with high rainfall with values of more than 200 millimeters is predicted to rise due to global warming. Moreover, there are threats also to natural ecosystems in the Philippines. In the country, it was estimated that at least one million hectares of grasslands are extremely susceptible to climate change in the years to come. The majority of grassland in the highlands is vulnerable to fire, especially during prolonged periods of drought and a slight amount of rainfall throughout the year. Similarly, it was estimated that at least 98 percent of Southeast Asia's coral reefs would diminish by 2050, much worse, it was predicted that it would face extinction if the present global warming would continue. Lastly, IPCC noted that the maximum fish capture potential of country's seas will decline by up to 50 percent between 2051 and 2060, compared to 2001-2010 values (NICCDIES, 2021; Suh & Pomeroy, 2020; UNDP, 2016; IPCC, 2014; ADB & World Bank, 2021).

Consequently, there will be a declining rice yield in the country. Grain output will decline by at least 10 percent for every one-degree centigrade increase in the dry season. This estimate is according to the International Rice Research Institute (IRRI). On the other hand, there was also a higher sea-level increase in the Philippines. The Philippines has the highest observed sea-level rise, at 60 centimeters which is thrice the global average of 19 centimeters. As a result, 60 percent of the Local Government Units situated in coastal provinces, municipalities, and cities as well as around 13.6 million individuals have a higher chance of being relocated (NICCDIES, 2021; Cruz et al., 2017, ADB & World Bank, 2021).

Similarly, there will be more public health emergencies in the country as rising temperatures bring diseases like dengue fever, malaria, cholera, and typhoid to the surface. Records revealed that in 1998, where the biggest El Niño phenomena in Philippine history happened, the country logged an estimated 40,000 infections caused by dengue, 1,200 cases of cholera, and around 1,000 cases of typhoid fever. Lastly, It is projected that there would be a shortage of water as water scarcity is a global problem caused not just by climate change but also due to fast urbanization, and population expansion. This was noted by the WRI (World Resources Institute) study which made mentioned that the country would face a soaring level of scarcity of water in the coming year 2040. Out of 167 countries, the country was ranked 57th most likely to be water strained in 2040. With this information, it is

expected that agriculture which is considered a primary component of the Philippine economy and makes use of the large percentage of the workforce will face the burden of water shortages by that year (NICCDIES, 2021; WRI, 2015).

In summary, the susceptibility of the agriculture sector to the irregularities of nature is an old-aged puzzle which up to now needed to be answered even by the wisest of this civilized world. In the majority of the cases, the population is left with no other options than to adapt to these changes and will utilize what they already possessed. In the case of our country, where producing crops and fisheries and raising livestock is the primary source of income for the majority of the population in the rural areas, there is always the challenge to perform better even amid this destructive phenomenon (FAO, 2021; ADB & World Bank, 2021).

2.4 Climate Change Effects on the Agriculture Sector

There is a significant effect of climate change in the agriculture and fisheries sector. For instance, the increase in temperature and carbon dioxide can boost agricultural production in some areas. However, to completely make this statement true, there is a need to satisfy the nutrient requirements, the right moisture level of the soil, the availability of water, and other factors important to production. Meanwhile, severe drought and extreme flooding can also change which could result in more challenges for crop and fisheries producers and growers as well as livestock raisers. This scenario also provided additional hazards to the safety of food for the consumption of the general population. In the same manner, the increase of the temperature of the water which disturbed the environment has the greater possibility of causing movement of the habitat of the majority of the fish and shellfish. Overall, this phenomenon may make it more difficult for the implementation of agriculture and fisheries-related activities such as growing crops, raising livestock, and production of fish. Therefore, it is highly encouraged that the potential results of climate change must be evaluated against other varying elements that potentially affect farm production like farming practices alteration and the technologies being used (USGCRP, 2014; Atanga & Tankpa, 2021; FAO, 2021).

In addition, the most difficult and adverse effects of climate change are on the sector of agriculture. This is primarily because of the climate extremes as characterized by severe droughts, excessive & frequent flooding and rising temperatures is one of the many reasons for the losses of crops and affected the livelihood of farmers. These also threaten the food security of the communities on the entire planet. In addition, this phenomenon will also expect to increase the numbers of pests, diseases, and weeds that could affect the production in agriculture. Furthermore, the increase of temperature and the irregularities of rainfall in quantity and duration, the frequent severe weather disturbances, and the severe occurrence of pests and diseases are some of the negative results of this climatic variability affecting the vulnerable sector of agriculture. Moreover, there is also a reduction in crop production which was mostly caused also by high temperature as it encourages the presence of weeds, pests, and diseases. Finally, some factors can also contribute to the adverse effect of climate change in agricultural production to include land loss, disrupted planting seasons, and the difficulties in the identification of what to plant and the period of planting (United States Environmental Protection Agency, 2016; FAO, 2021; ADB, 2014).

Moreover, climate change's effects on agriculture have had and will continue to have serious economic and food security consequences. This is because according to various studies, climate change has negatively influenced the productivity of agriculture, its income-sharing, agriculture services, crop and livestock growers and producer's health, and the policies on support by the government. It was also discovered that income sharing is significantly unequal. Climate change is contributing to this widened economic gap, as impoverished crops and livestock producers are more affected by the adverse effect of climatic change. There have also been studies that suggest that irregular rainfall, droughts, floods, and poor infrastructure reduce farmers' ability to secure food. Finally, climate change results in changes in agricultural income as found out in the study involving farmers in Malaysia. It found out that there is a tendency that the farmers will shift from rice paddy production to other high valued crops (mango, coconut, palm oil, cocoa, banana, etc.), which is upsetting because these agricultural areas

are no anymore suitable for cultivating paddy as a direct result to climatic change (Alam et al., 2017; Chemura et al., 2020; Atanga & Tankpa, 2021; Cooper et al., 2019; Mbuli, 2021).

2.5 Effects of Climate Change on Rice Farmers

Some studies discovered that climatic changes have an extensive impact on the farming of rice as well as on rice farmers. It showed that when temperatures rise and precipitation falls, both the net income and rental fee per hectare of the agricultural production suffered. Specifically, a one percent increase in January temperature reduced the value of irrigated rice net income by 0.5 percent. However, this could potentially reduce the dry land rice net income by more than 10 percent. In terms of production, another study showed that climate change is expected to affect rice yields as shown in the result that a 4 percent rise in temperature will increase the chances of rice crops damage due to lack of water by 27 percent to as high as 46 percent. In the same manner, another study indicated that climate change impacts are high in the tropics most particularly rice. This is primarily because excessive temperature can reduce the period for filling grains. In the same manner, extreme temperatures can result in grain and seed volume reduction during the flowering stage (Ajetomobi & Ajiboye, 2013; Arnell et al., 2019; Rosenzweig et al., 2014; Shrestha et al., 2016).

Moreover, in Malaysia which has a tropical climate, the extreme temperature was one of the problems in rice production as revealed in the results of several studies. For example, a 12 percent decrease in the rice yield during the major season while 31.3 percent in the non-major season which will last up to the year 2030 were recorded in another study as the temperature increases coupled with rainfall pattern changes. Meanwhile, in the United States of America (USA), the increased carbon dioxide concentration of 850 parts per million volume and temperature of 380C on the particular variety of rice (M206) in California, USA can cause a 16 percent production loss (Firdaus et al., 2020; Firdaus et al., 2014; Azdawiyah et al., 2016; Vaghefi, 2016; Wang et al., 2021).

Furthermore, rice is considered the most important crop for consumption for the majority (accounted for at least 80 percent) of the Filipinos. Meanwhile, rice yearly production cost is estimated to be at least 2 billion pesos. Also, of the 5.4 million hectares of area suited for agriculture in the Philippines, it was estimated that at least 4.4 million hectares (accounted for at least 81 percent) are primarily dedicated for the production of rice. This sector also is a primary source of income for more than 2 million families together with the estimated millions and thousands of farm laborers, wholesalers, and buyers. In addition, comparing it with the data worldwide, the country produces an estimated 3 percent of the world's rice. Based on this information, it is very vital to determine the aspects that contributed to the changes in rice production in the country to meet the future and current demand for food security. This is also the reason why the country's rice sector received too much attention in the policies and funding from the government which centered on the promotion of rice self-sufficiency and improving the revenue of rice farmers while at the same time ensuring that the rice prices are inexpensive to the part of the consuming public (SEARCA, 2014; Haefele, 2014; Fischer, 2015; ADB & World Bank, 2021).

In addition, climate variability has also resulted in a production loss of several crops at various stages including, of course, rice. For instance, according to the Philippine Department of Agriculture, rice production losses were greatest during the start of the panicle emergence up to the stages of flowering. It was estimated that the losses are up to 100 percent and 70 percent, for panicle and flowering phases, respectively when the rice crop is flooded for 7 days. In the same manner, El Niño Southern Oscillation (ENSO) occurrence also put the country's agriculture in jeopardy. In terms of impact, the year 2010 was one of the driest and most extensive in the last decade. A total of 977,208 hectares (nearly the entire country) were found to be dry, causing an estimated loss of \$580 million in agriculture (BAS, 2021; Pulhin et al., 2016; Pulhin & Tapia 2015).

Moreover, climate effects on rice production are highly seasonal and vary greatly by region in the Philippines. For example, the production systems of rice in highland areas which are highly dependent on the

amount of rainfall are much susceptible to the unpredictability of the moisture of the soil as compared to irrigation-dependent rice production this is according to the result of the study. Furthermore, the findings demonstrated that around 10 percent of the difference in the abnormality in the production of rice on a nationwide level is connected with the changes in the moisture of the soil. These changes are significantly had a negative correlation with an indicator that captures El Niño Southern Oscillation (ENSO) variability. As a result, while temperature fluctuation is currently of minor consequence in the country, climate estimates in the coming years suggested that temperatures may often surpass established limitations to the production of rice if global warming remains unchecked. Lastly, farmers and fisherfolk in the country have been the recipients of damages and production losses because of the unpredictable rainfall, severe droughts, extreme floods, and stronger tropical typhoons. The current information shows that they stay to be considered as marginalized and underprivileged groups in the country. This is primarily because of their over-reliance on the resources for agricultural production such as land and water which made them more susceptible to the adverse effect of extreme climatic changes and in return makes poverty reduction initiatives more complicated (NSCB, 2014; Stuecker, 2018).

2.6 Climate Change Adaptation and Mitigation Measures

Adaptation is a term that refers to a society's or ecosystem's reaction to the adverse effects of climate change. Protective (preventive) and opportunistic (responses that take advantage of opportunities) responses are both possible. Adaptation solutions range from those used widely throughout multiple geographic regions to those used only in specific areas. Because adaptation is context-dependent, it's critical to comprehend the specific geographic, social, and environmental settings that determine how certain adaptation measures are carried out and their level of effectiveness. Furthermore, it can take the form of current behaviors (present adaptation) used in reaction to current climate variability or in anticipation of future climate change, or plans or strategies used to mitigate anticipated climate change impacts (future adaptation). While climate change is inherently futuristic, the issue in research is to enable not only adaptation responses to future climatic circumstances but also adequate responses to the current challenge. Finally, agricultural sector adaptation is critical for smallholder farmers' livelihoods to be more resilient amid climate change (EPA, 2014; Barnett et al., 2015; Pulhin et al., 2016; Le Thi Hong Phuong et al., 2018).

In addition, the adaptation of the crops and livestock producers and growers to climate unpredictability has sparked the interest of several researchers from various areas of interest. For example, a considerable quantity of academic studies and researches has been devoted to the adaptive activities of crops and livestock growers and producers and their motivations. Specifically, the adaptation of new crop planting patterns, the use of new rice varieties, the change of cropping calendar, the use of organic fertilizers and natural pesticides, and the use of water pumps to supply irrigation water are among the adaptations made to address the change in climate. It was also found out that the most prevalent adaptation to climate change of the majority of the farmers is the usage of new rice varieties that can withstand extreme climatic conditions such as severe drought and or too much water. In addition, it was also revealed according to studies that rice farmers used the smallest amount of tillage as one of the measures for adaptation used by the farmers. Other adaptation measures and activities include the use of bunds in drainage, the application of right and correct fertilizer, the use of crop and livelihood diversification technologies, the use of better and improved rice varieties, insecticide, establishments of plant nurseries, and modification of dates to plant and to harvest. In other studies, the significance of limited tillage in minimizing flood and runoff, improving soil fertility and climate resiliency, and safeguarding the ecosystem has been emphasized also by several researchers. Lastly, using the technology on alternate wetting and drying, intercropping with short-term crops, limiting inorganic fertilizers through the application of precision farming, using rice crop varieties identified with little methane emissions, enhanced tillage, recycling of agricultural waste into useful organic production inputs, and developing an integrated rice farming system are all identified as mitigation and adaptation strategies (Sugihardjo et al., 2017; Onyeneke, 2021; Hussain et al., 2020; Kuntashula et al., 2014; Richards et al., 2014; Aryal, 2017).

Meanwhile, in agricultural output, combining both organic and inorganic farm production input is also a significant climate change adaptation method. Soil fertility plays a key role in agricultural production. It can be depleted due to the increased frequency of flood, soil erosion, runoff, and washing of nutrients away due to climate change. In addition, the level of the pH of the soil can also be altered along with some of the soil qualities such as soil's water holding capacity and bulk density which can also be affected by climate change. The proper application of organic and chemical fertilizers can help improve the level of the fertility of the soil and the production which can lower the sensitivity to climate change of the farmers. Meanwhile, the uses of rice cultivars that mature early, for example, are better suited to dealing with delayed start and early cessation of rain. In the same manner, the establishment of drainage and bund in agricultural systems can also help mitigate climate hazards. These measures help farmers adapt to climate change by reducing the negative effects of floods and erosion on agricultural and farm production areas (Unique-Kulima, 2017; Hussain et al., 2017; Shrestha et al., 2016; Onyeneke, 2018).

Moreover, it is also critical to establish and adjust actions/policies to limit the effects of climatic variability. This will be realized by implementing a climate-smart agriculture system that aligns with the Sustainable Food and Agriculture goals of the Food and Agriculture Organization. This covers the development of resilient crop cultivars that can survive with extreme temperatures and high rainfall. Included also are the changing crop varieties, planting period, and cropping systems which can provide higher crop durability in extreme occurrences. On other hand, farmers' two main responses to fluctuations in rainfall were to shift the sowing period based on the availability of irrigation water and to plant various varieties of rice. Other practices of rice farmers that were recorded are early planting while maintaining good drainage in their respective rice areas. They also installed drainage outlets and used water pumps to drain faster the surplus irrigation water from their fields. Over half of farmers restore water loss from their fields in response to temperature changes that hasten the evaporation of water from the field. Finally, there are also primary farmer's practices to mitigate the negative impact of climate change. Among these is the increasing application both in quantity and timing of fertilizers, herbicides, and pesticides; using of different rice cultivars and new rice seeds every cropping season; applying insects treatment for seeds; changing sowing/planting period; pumping and spraying of irrigation water in the field; reducing crops density; sowing a large number of seeds; leaving the area idle for some time; and renting the land to major corporations (Arora, 2019; Mahdu, 2019; Hussain et al., 2020; Shrestha et al., 2016).

Meanwhile, there are also authors of the research that offer some essential initiatives to increase the capacity of the farmers in the long run and can able to mitigate the adverse impact as well as to adapt to climatic variability and change occurrences. One of these is to raise the level of climate change knowledge and understanding among schoolchildren, farmers, and government officials at the local level. This is primarily because according to the study, the increased knowledge and understanding of farmers on climate variability appeared to be an advantage in designing local adaptation options. The greater the number of adaptation strategies applied, the more likely they can get water for their farms. Further, if technologies serve as a hindrance to making water available, the more likely they will get water from the river manually (Maung et al. 2016; Pulhin, et al., 2016).

Consequently, in another research, it was revealed that to improve the livelihood of farmers, they autonomously changed their rice production practices and techniques which will be adaptive to climate change-related events. An example of this one is the changing of the rice cropping calendar and choosing of more seasonal rice varieties. This is to increase their rice productivity. Several farmers also have been using more chemical fertilizers and pesticides. At the same time, farmers are increasingly using machines rather than animals and manual labor. While adopting new practices, some farmers have been autonomously reducing their emission of greenhouse gases, by applying System of Rice Intensification (SRI) technology, recycling cow dung, using natural compost, and crop rotation. Build more reservoirs, canals, and community ponds around houses and rice fields to harvest and store rainwater and runoff. Innovate and promote appropriate usage of mechanized farming and agriculture inputs (Hussain et al., 2020; Shrestha et al., 2016).

Additionally, the results of another study also revealed that the use of appropriate irrigation technologies and facilities has proven to be a successful measure to adapt climatic variability and lessen its negative effects on rice farming. In addition, it was also found out that the designing of water protection impoundments is also found to be an effective adaptation measure. Other effective measures also included the planting of trees for reforestation and protection and using crop rotation technologies are also some of the innovative innovations. The findings of another study also revealed that farmers with a high adaptive capacity implemented among others strategies such as the use of drought-tolerant and early maturing rice cultivars, changing sowing dates, using organic and inorganic fertilizers, and the applying right irrigation technologies. Consequently, it was also revealed that to improve the adaptive capacity of the farmers, they are required also to be empowered by increasing their adaptive capacities through the use of effective and appropriate farming activities and technologies in the local setting. Finally, the respondents who have found to have a low level of adaptive capacities tried to enhance their irrigation-related activities, planting trees in the field, and increasing the usage of soil and water conservation technologies (Akhtar et al., 2019; Ali, 2021).

In the local setting, the Philippines through its Department of Agriculture implemented an innovative approach known as Climate-Resilient Agriculture (CRA). This was conceptualized and implemented to encourage a resilient country more particularly on livelihood and environmental aspects. The main objective of this approach is to improve the productivity of the agricultural sector, to increase income sustainably and ecologically friendly, to train the communities and agricultural systems, to reduce the emissions of greenhouse gasses in the atmosphere, and to increase the capacity to sequester carbon. In line with this approach, the Department in 2014, through its System-Wide Climate Change Office (DA-SWCCO) started the Adaptation and Mitigation Initiative in Agriculture (AMIA) program. This program was able to address the negative challenges brought about by climatic variability in the agriculture and fishery sector. It also helped assess and monitor the positive contribution of its various adaptation interventions. For the past several years, this office was able to develop a large number of matured and replicable climate-resilient technologies showcased in their various AMIA communities. In the same manner, given that the office prioritizes climate change resiliency among others, these climate change resiliency efforts were now mainstreamed in the various initiatives, plans, programs, and activities of the Department of Agriculture. This was accomplished by the implementation of effective strategies such as the use of crop diversification technologies, climate-resilient varieties, appropriate mechanization, business development, climate-information services, financing schemes, extensions and information sharing, management information systems databases, and appropriate soil and water conservation technologies (Department of Agriculture, 2019).

Likewise, various studies show that extension services in agriculture are important in improving the capacity of various crops and livestock growers and producers to address the negative impact of climate change. In terms of the role of the agricultural extension workers, they can facilitate and implement appropriate policies and programs, provide significant information and management of the latest farming methodologies, and also develop the capacities of affected individuals. In addition, these services also were able to create a high level of consciousness on the climate change-related concerns while trying to seek effective means of building the resiliency and capacity of susceptible populations and areas in the management of these adverse effects. In the same manner, in the delivery of these services, there are various methodologies identified and being used globally. These include among others the conduct of farmer field schools, distributions of reading materials, conduct of radio programs, and lastly establishments of demonstration farms. Finally, another important role of extension is to establish a strong linkage between and among producers to concern agencies, appropriate market, providers of production inputs, and other rural actors (Maponya & Mpandeli, 2013; Rickards et al., 2018; Antwi-Agyei & Stringer, 2021).

At the local level, the Municipality of Banaybanay issued a series of ordinances regarding on preservation of the environment. Municipal Ordinance No. 2014-03 is an ordinance prohibiting any person to burn rice hays within the territorial jurisdiction of the Municipality of Banaybanay this is according to Republic Act 10086 or the Organic Agriculture Act of 2012. Another Municipal Ordinance also was issued by the legislative department

of Banaybanay, the Municipal Ordinance No. 2014-04, or an ordinance that helps institutionalize, promote, and develop organic agriculture in the Municipality of Banaybanay, Davao Oriental. These policies set up and defined the responsibilities of the municipal government for the protection of life, advancing the rights of all individuals for sufficient food, autonomy, peace, and order, sustainable income, and equity (Banaybanay LGU, 2014). In summary, climate change is real and various pieces of evidence pointed out that this was caused by various human activities. There is also the notion that aside from human interventions, the observed changes in the past years will most likely be part of the natural movement of the earth. While many are to be discovered, this climatic change along with scientific inquiries and theories have been discussed and presented systematically. Thus, I commend the contributory factor of this research that is to understand clearly the actual impacts of an anthropogenic phenomenon on the lives of the small-scale farmers to understand them well, to give them adaptation and mitigation information, and to address what would be the best intervention suitable for a location-specific area.

3. Methodology

3.1 Research Design

The research approach that was used in this particular study was qualitative using phenomenological inquiry. This qualitative phenomenological research used in-depth interviews and focus group discussions as the methodologies. This phenomenological type of study tried to comprehend the insights of the individuals, their perspective, ideas, and knowledge concerning a particular event, circumstances, and or occurrences. In this case, the climate change phenomenon (Creswell, 2013). The qualitative phenomenological is a method utilized in this study for it explored the structure of consciousness in individual experiences. It contributed to much more meaningful ideas and perceptions of the experiences and insights of the participants. The results therefore of this phenomenological research are a description of the vital structure of the participants (Holloway, 1997).

The researcher employed the two-common phenomenological qualitative research approaches, the in-depth interview and focus group discussions (FGD). In-depth interviews are ideal for the collection of appropriate data and information on one's history, experiences, and point of view, more specifically when handling issues and subject matter on the experiences. Meanwhile, focused group discussion is a method of data collection in qualitative research that can help the researcher effectively through learning the life experiences and norms that exist within the scope and views of the study. Consequently, this FGD was intended to support the information gathered from in-depth interviews to create themes out of the information gathered by the researcher (Nyumba et al., 2018; Kumar, 2017).

The research design carries a vital influence on the dependability of the results that a study tried to attain. It provides a solid base for the research and helps the investigator organize ideas. The research is qualitative and concerned with the intricacies of the meaning of the context of the study and it is considered uncontrolled and non-experimental. Qualitative research is primarily an investigative type of study. This type of study was utilized to acquire knowledge and information on the fundamental grounds, options, and motivating factors. Lastly, it provided significant ideas and information on the presented concerns while helping the development of ideas and was used to discover patterns in understanding and opinions in the problems presented.

3.2 Research Participants

This contains the description of the participants and describes the reasons why they are selected and their appropriate numbers, sampling type as well as selection strategies. The identification of the research participants is one of the most vital jobs in the designing phase of the research. This is because the research participants are the primary source of data and information and in this case, they provided information on their climate change-related personal experiences, culture, understanding, capabilities, and capacities. In terms of the selection of the participants, it was guided by the research questions and the theories used in this study. In addition, the

research participants were selected using purposive sampling methodology. Accordingly, this sampling methodology was employed to identify a certain group of individuals and if the research participants are not easy to identify (Creswell, 2013).

The participants of this study were identified throughout the rice-based barangay of Banaybanay. In addition, so that the information was completely recorded during the conduct of the interviews, a device was used for recording purposes. In the same manner, the use of pseudonyms was also utilized as the personal information that were shared by the interviewees is considered not to be disclosed. There are 18 research participants, 9 each for FGD and in-depth interviews. The number of research participants for FGD is 6 to 9 individuals. Too many participants make it difficult for each one to participate while lesser than seven would be limited the potential of collective wisdom. There were two technical questions to decide when designing a focused study; (1) whether to have homogenous in a group; and, (2) how many groups to have (Stewart & Shamdasani, 1990).

3.3 Data Collection

The identified participants for this research were then asked to sign for their consent before their participation. The terms of their participation were also discussed. The FGD and in-depth interviews methods were used by the researcher in drawing out information from the participants about how the engagement practices affected their insights as farmers. Conversely, a face-to-face mode of interview was also used. It is a communicatively rich approach of exchange in which gestural aspects of the discourse were viable to the participants (Gibson & Brown, 2009). During these informal conversations and formal interviews with the participants about their actual experiences, pen and paper are the constant implementations of the researcher aside from voice recording to enable clear data collection and analysis. The researcher made questions were asked in a flexible manner and with wording that was contextually appropriate. This aimed to ask all the questions sensitively to the conversational structure but not necessarily in order. As stated, semi-structured interviews guided the conversation and allowed participants to provide information that is important to them but not necessarily reflected in the interview questions (Walshaw, 2015). During the data gathering, the researcher validated the answer several times to confirm the reasons and insights of the informant during the in-depth interview. The researcher also revisited the area to perform the FGD wherein themes that were arising during the in-depth interview were affirmed in the FGD.

3.4 Data Analysis

The gathered data were analyzed following the recommended and appropriate procedures. These include the conduct of in-depth interviews and FGD, transcription of recorded data, and notes translation including all the angles in the investigation. These were done to obtain factual findings of the research study. After tardy transcription of the different responses of the eighteen (18) key informants, the researcher sought the assistance of the data analyst. The data were then transmitted to the analyst. This is for theme identification and provided significant support to the researcher for theme analysis. Accordingly, this thematic analysis is a process of analyzing information based on commonalities, relationships, and differences. Thematic relates to the aim of searching for aggregated themes with the data. There were three identified steps were taken during the data analysis. These are reduction of data, verification, and conclusion (Gibson & Brown, 2009).

The themes that were generated were identified given the various responses and descriptions of the participants. These were also anchored on the research questions that were formulated beforehand. Since a qualitative study holds no restrictions, other concerns that were shared by the participants were also taken into consideration during the interview. However, only the substantial data were put into writing as requested by most of the participants, and the research's account of this study was also presented during the investigation to finalize the result of the study. When a certain phenomenon arises that refers to the existing results and theories to test whether such claims are coherent with the existing principles or a manifestation of new evidence in the study's field of focus. As a researcher, I recorded the observations during the in-depth interview and FGD and perform

further research on the impact of the answers. Research questions were translated from English to Bisaya dialect, if necessary, for a better understanding of the questions.

Data reductions were used in data analysis. This simply means that the data and information that were not useful for the study were deleted and modified for the easy understanding of various readers. In this part of the study, I asked the expertise of the data analyst more specifically during the management and organization of large volumes of qualitative information. This was done so that it is easy for me to do the merger, manage, sort, and categorize the data. The interpretive analysis in three stages was conducted like deconstruction, interpretation, and reconstruction. Deconstruction means breaking the data into components to identify that data for inclusion. This requires a thorough reading of the transcript of the FGD and then breaking down data into parts or codes to come up with the best description of the topic. Next is interpretation. Interpretation is to provide emphasis and make sense of the knowledge of the data being coded. In particular, it compared data codes and categories from the transcription and the important topics within the research. This was followed by reconstruction. Reconstruction was done to recreate and repack the important codes and themes that can show the link and the information obtained from the interpretation stage. This was also done to explain this information based on the existed understanding and theories (Bogdan & Biklen, 2003; Corbin & Strauss, 2007; Miles & Huberman, 1994).

4. Results

4.1 Profile of the Participants

Key Informants. The key informants of this study were 9 rice farmers from the rice-producing barangays of the municipality of Banaybanay. To maintain confidentiality, pseudonyms were used and given to the participants as shown in Table 1.

Focus Group. Selected from the rice-producing barangays of the municipality of Banaybanay were 9 rice farmers who formed part of the focus group discussions (FGD). There was 1 FGD session conducted. The identity of the participants was not disclosed instead pseudonyms were used as shown in Table 1. This is to maintain privacy and confidentiality.

Table 1

Participant's Information

No.	Assumed Name	Gender	Land Ownership	Study Group
1.	RC 18	Male	Land Owner	In-depth Interview
2.	Hybrid Rice 101	Female	Tenant	In-depth Interview
3.	STW	Male	Land Owner	In-depth Interview
4.	Rice Duck Farmer	Female	Land Owner	In-depth Interview
5.	Stem Borer	Male	Land Owner	In-depth Interview
6.	Carabao Holder	Male	Land Owner	In-depth Interview
7.	Mechanized Farmer	Female	Land Owner	In-depth Interview
8.	Mag-uumang Sikat	Male	Land Owner	In-depth Interview
9.	HY Rice Variety	Female	Land Owner	In-depth Interview
10.	IPM Ako	Male	Tenant	Focus Group
11.	RCM User	Male	Tenant	Focus Group
12.	Combine Harvester	Male	Land Owner	Focus Group
13.	Rice Farmer	Male	Tenant	Focus Group
14.	Green Leaf Hopper	Female	Tenant	Focus Group
15.	Flood Free Farmer	Female	Land Owner	Focus Group
16.	Masagana 99	Male	Land Owner	Focus Group
17.	Banaybanay Rice	Female	Tenant	Focus Group
18.	Rice Grower 77	Female	Tenant	Focus Group

The majority of the research participants were farmers and are beneficiaries of various rice production-related programs and projects implemented by the researcher. During my interactions with them, I

learned their struggles not just with the changing climate but also other issues and concerns just to produce grain and rice for our table. In addition, I was also informed of their various experiences to increase their yield and their adaptation and mitigation interventions and initiatives in the observed change of our climate. Moreover, based on my interactions with the research participants, it just increased my resolve in serving this sector of our society and how important to help them in their endeavor of providing food for our table.

4.2 Categorization of Data

After the conduct of data collection, the researcher immediately went over his notes and recorder to transcribe and translate these notes. This is to come up with factual findings. In addition, after the transcription, the data were then transmitted to the data analyst to identify various themes. These themes were identified in line with the responses and descriptions of the research participants. The researcher asked for the help and expertise of a data analyst specifically in the treatment, arrangement, and categorization of a large quantity of qualitative data. This was done for easy merging, managing, sorting, and data categorization. Finally, the researcher then undergoes the three stages of the interpretative analysis such as deconstruction, interpretation, and reconstruction. Below were the responses and answers of the participants that were gathered during the data collection:

Research Question No. 1: What are the experiences and challenges of the small-scale farmers during the course of climate change?

The researcher used the following questions to come up with substantial discussions on this particular research question. In your own observation and experience, what are the changes in climate for the past 10 years in your locality? What do you think is the biggest climate change-induced threat in your farming? What are the specific experienced that you've encountered in rice farming due to Climate Change? What are the direct effects of climate change on your crop production? How does the effect of climate change affect your living status? Five major themes materialized from the data collected on the experiences and challenges of the small-scale farmers during the course of climate change as shown in Table 2. These include among others Uncertainties of Weather, Man-Made Unsustainable Actions and Activities, Financial Challenges, Financially Unstable and unable to continue rice production, Poor and Difficult Economic & Living conditions.

Table 2

Themes and ideas on experiences and challenges of the small-scale farmers during the course of climate change

Essential Themes	Core Ideas
Uncertainties of Weather	Lack of water supply cannot provide good produce. Sudden rain can damage the seedlings. Too much heat may harm the crops. It decreased harvest. There is a big change in climate; there's sudden extreme heat and rain. The farmers are suffering heat stress, especially the older.
Man-Made Unsustainable Actions and Activities	A large hole on the atmosphere sip. [ozone layer] due to the smoke released by (coal, manufacturing,) plants. Cutting of trees in the forest causes lesser absorption of smoke from burning, and no replanting of trees to replace the cut trees. Extreme burning of rice hays after harvest which causes smoke trapped in the atmosphere. Lack of discipline of the farmers through the burning of plastics and other agricultural waste which leads to the production of carbon dioxide. There is no control over mining in the mountains.
Financial Challenges	No income. Loss of capital Hard-up in life Huge money will be spent to produce a rice crop The harvest was a little less these days than in the past when changes in the climate were still imperceptible. Thinking twice on growing palay because of fear of losses during Wet Season. The chemicals sprayed on the crops are useless sometimes because of a sudden change of climate.

Financially unstable and unable to continue rice production	The return of investment seems impossible because of various agricultural inputs that we used due to climate change. We cannot afford to send our children to college because our income is just enough to sustain the day. We resulted in going to lending companies or cooperatives that would allow us, farmers, to lend money. It is hard financially because it is hard to regain again our investments in farming. There is a possibility we would result in crop shifting, from Rice Field to Banana Plantation, due to smaller income in Rice Farming.
Poor and Difficult Economic & Living Condition	It makes us poorer. It makes life more difficult. [We] keep on investing but no return. No income. We cannot assure that our way of life will be better if we will just rely on Rice Farming. We should have other source of income. We, the Rice Farmers, will become poorer. We cannot have anything we need because our income is just so little. We are forced to sell our Rice Field because of our liabilities. We end up maintaining the land that was once ours.

Uncertainties of Weather - Several research participants agreed that they experienced uncertainties of weather in the past 10 years as rice farmers. STW (not his real name) said that

“Kung walay tubig dili ka provide ug sakto nga pagbunga.” (RCVJL-IDI-3-Q1)

(Lack of water supply cannot provide good produce.)

Meanwhile, this is also the sentiment of Carabao Holder (Pseudonym), which confirmed that the uncertainties of weather decreased harvest as indicated below.

“Decrease ang harvest” (RCVJL-IDI-6-Q1)

(It decreased harvest.)

Carabao holder (not his actual name) also added and echoed his side that there is a change in the climate as compared before.

“Dako kaau ang kabag-ohan sa klima, grabe nga init ug grabe nga ulan.” (RCVJL-IDI-6-Q1)

(There is a big change in climate; there’s sudden extreme heat and extreme rain.)

Finally, HY Rice Variety (a pseudonym) observed that these uncertainties of weather have detrimental effects on her crop production and the farmers as well especially the old ones.

“Dako na kayo ang kabag-ohan sa klima, grabe nga init ug grabe ang ulan.” (RCVJL-IDI-9-Q1)

(There is a big change in climate; there’s sudden extreme heat and rain.)

“Ma heat stress ang mga mag-uuma labi pa mga edaran ang mga mag-uuma.” (RCVJL-IDI-9-Q1)

(The farmers are suffering heat stress especially the older.)

Man-Made Unsustainable Actions and Activities - When the participants were asked what they think is the biggest climate change-induced threat in their farming as part of their experiences and challenges brought about

by this climate change, the majority of them said that man-made unsustainable actions and activities. IPM Ako (not his real name) made mention of man-made actions such as the burning of coals and fossil fuel.

“Dako na ug bangag ang atmosphere tungud sa smoke nga ginarelease sa mga planta.”
(RCVJL-FGD-1-Q1)

(A large hole on the atmosphere sip. [ozone layer] due to the smoke released by (coal, manufacturing,) plants).

This statement was echoed by RCM User (not his actual name) which he said that man-made actions like the cutting of trees in the forest are one of the biggest climate-change-induced threats in their farming.

“Pag pamutol sa mga kahoy sa mga kalasangan hinungdan wala nay mo absorb sa mga aso nga binuga gikan sa sunog ug aso ug walay replanting nahitabo isip puli sa giputol nga mga kahoy”. (RCVJL-FGD-2-Q1)

(Cutting of trees in the forest causes lesser absorption of smoke from burning, and no replanting of trees to replace the cut trees.)

Much related to rice farming was the response of *Mag-uumang Sikat* (pseudonym) when asked the same question.

“Grabe ang pag panunog ug uhot human sa pag ani hinungdan sa pag saka sa aso sa langit.”
(RCVJL-IDI-8-Q1)

(Extreme burning of rice hays after harvest which causes smoke trapped in the atmosphere.)

On the other hand, RC 18 (not his real name) answered was focused on the lack of discipline of the farmers.

“Pagka walay disiplina sa mga mag uuma pina agi sa pag sunog sa mga plastic ug uban pang mga agricultural waste hinungdan sa produce ug carbon dioxide.”
(RCVJL-IDI-1-Q1)

(Lack of discipline of the farmers through the burning of plastics and other agricultural waste which leads to the production of carbon dioxide.)

Lastly, Flood Free Farmer (not her exact name) made mention of no control over mining in the mountains as the biggest climate-changed induced threat of farming.

“Walay pag control sa mga mina sa kabukiran hinungdan

sa pagka upaw niini.” (RCVJL-FGD-6-Q1)

(There is no control over mining in the mountains.)

Financial Challenges - The results of the FGD and in-depth interview conducted by the researcher revealed that the majority of the participants agreed that they experienced financial challenges as part of the specific experiences encountered in rice farming due to the changing climate. Rice Grower 77, Mechanized Farmer, and Stem Borer (pseudonyms) shared the same sentiments that they experience no income, losses, and hardships.

“Walay Income.” (RCVJL-FGD-9-Q1)

(No Income.)

Loss of capital. (RCVJL-IDI-7-Q1)

“Lisud sa pangunabuhian”. (RCVJL-IDI-5-Q1)

(Hard up in life)

Meanwhile, Combine Harvester (not his real name) said that he spent a huge amount of capital on his rice production.

“Dako ka ug magawas nga kwarta para sa pag produce sa humay.” (RCVJL-FGD-3-Q1)

(Huge money will be spent to produce rice crops.)

On the other hand, Rice Duck Farmer (pseudonym) detailed her harvest experience and by having a comparison before and after.

“Mas kunhod ang abot karong panahona dili parehas sa mga milabay nga panahon nga dili pa kayo masinanati ang pag bag-o sa klima.” (RCVJL-IDI-4-Q1)

(The harvest was a little less these days than in the past when changes in the climate were still imperceptible)

Moreover, Banaybanay Rice (not her actual identity) emphasized further she experienced the ineffectiveness of the chemicals used in crop production.

“Usahay ma usik ang spray or ang mga chemicals nga gi spray

tungod sa sudden change klima mi ulan na banlas ang gi spray

mo usab napud ug spray sayang ang medisina.”

(RCVJL-FGD-8-Q1)

(The chemicals sprayed on the crops are useless sometimes because of sudden change of climate.)

Finally, Masagana 99 (pseudonym) shared that for his part, there is now hesitation whether to plant rice or not.

“Mag duha2 na ug basak ug humay kay mahadlok na nga ma

lugi kay tungod sa panahon labi na kung Wet Season kay grabe

ang ulan possible nga bahaon gyud ang humayan”.

(RCVJL-FGD-7-Q1)

(Thinking twice on growing palay because of fear of losses during Wet Season)

Financially Unstable and unable to continue rice production - Another direct impact of climate change in rice production of the small-scale farmers is that it made them financially unstable and unable to continue rice production as aired by some of the farmer participants. RC 18 and STW (not their actual names) made mention of the impossible attainment of the return of investment.

“Dili mi maka bawi sa gastos kay tungod daghan nga mga

agricultural inputs magamit namo tungod sa climate change.”

(RCVJL-IDI-1-Q1)

(The return of investment seems impossible because of various agricultural inputs that we used due to climate change.)

“Sakit sa balsa kay mag lisod mi ug bawi sa gi capital namo sa pag basak.” (RCVJL-IDI-3-Q1)

(It is hard financially because it is hard to regain again our investments in farming.)

RCM User, not his real name, meanwhile, echoed his experience that climate change resulted in him going to lending companies and or cooperatives that would allow them to lend money for rice crop production.

“Magka utang2 gyud mi sa mga lending o mga cooperatiba o uban pang gapa utang namo mga mag uuma.”

(RCVJL-FGD-2-Q1)

(We resulted in going to lending companies or cooperatives that would allow us, farmers, to lend money.)

The saddest part is when Hybrid Rice (not her actual name) expressed her discomfort when she said that the education of their children was affected because of this climate change.

“Dili makapa eskwela sa college ang among mga anak kay igo lang gyud sa pang-adlaw2 among income.”

(RCVJL-IDI-2-Q1)

(We cannot afford to send our children to college because our income is just enough to sustain the day.)

Lastly, Masagana 99 (pseudonym) floated the idea that as part of the direct effect brought by this changing climate is that there is a possibility that it would result in crop shifting, due to smaller income in rice farming.

“Mapugos mig crop shift sa among basak, gikan sa basakan mamahimong sagingan kay tungod gamay nalang gyud kaayo ang among incomon sa humay.” (RCVJL-FGD-7-Q1)

(There is a possibility we would result in crop shifting, from Rice Field to Banana Plantation, due to smaller income in Rice Farming.)

Poor and Difficult Economic & Living Condition - Climate change not just affected the rice crop production of the participants but also their living status as a whole. IPM Ako (not his real name) revealed during the focus group discussion that climate change makes them poorer; and Combine Harvester (not also his real name) agreed that climate change makes their life more difficult.

Samot mig kalisod. (RCVJL-FGD-1-Q1)

(It makes us poorer.)

“Samot kapait ang kinabuhi”. (RCVJL-FGD-3-Q1)

(It makes life more difficult.)

In like manner, Hybrid Rice 101 (not her real name) also confirmed that climate change resulted in no

income for them and they keep on investing but no return as aired by Rice Grower 77 (pseudonym).

“Walay income.” (RCVJL-IDI-2-Q1)

(No income.)

“Cgeg pagawas ug capital, walay bawi.” (RCVJL-FGD-9-Q1)

[We] keep on investing but no return.)

Meanwhile, Green Leaf Hopper (not her real name) confirmed that they cannot assure that their way of life will be better if they will just rely on rice farming and explore the possibility of having another source of income.

“Dili gyud mi mo asenso ug mag basak lang mi ug humay among panginabuhiam, dapat naa mi laing source of income”.
(RCVJL-FGD-5-Q1)

(We cannot assure that our way of life will be better if we will just rely on Rice Farming. We should have other source of income.)

Due to the changing climate, Flood Free Farmer (pseudonym) said that as rice farmers they will become poorer. This is the same experience of Green Leaf Hopper (not her real name) as she said that they experience difficulties because of little income.

“Samot mig ka pobre mga rice farmers.” (RCVJL-FGD-6-Q1)

(We, the Rice Farmers, will become poorer.)

“Dili mi makapa gusto sa among kinabuhi kay kulang kaayo ang among income.” (RCVJL-FGD-5-Q1)

(We cannot have anything we need because our income is just so little.)

Lastly, Rice Farmer (not his actual name) concluded that because of climate change, their living status is rigorously affected and he said that they are forced to sell their rice field because of their debt and might end up maintaining the land that was once theirs.

“Tungod sa mga utang mapugos nalang ug baligya sa ilang basakan ug nahimo nalang mig tig maintain nalang sa among kaugalingong basakan kay tungod nabaligya naman namo”.

(RCVJL-FGD-4-Q1)

(We are forced to sell our Rice Field because of our liabilities. We

end up maintaining the land that was once ours.)

Research Question No. 2: What coping mechanisms and mitigation measures that the farmers adapted?

There were five questions used by the researcher to know how the small-scale rice farmers in Banaybanay faced the effects of climate change. These are: *What are your strategies to mitigate the effect of climate change? How do you prepare your crop if in case there will be a climate risk forecast such as long drought and extreme heavy rainfall? What are your coping mechanisms in case of abrupt change in climate and extreme events especially in your crop production? What are the actions or mitigation measures have you done during the course of climate change? In your own experience against climate change, how do you empower yourself to become a resilient farmer?* As revealed, there are five themes which came out as shown in Table 3. The five themes are Crop-Livestock diversification, Water Impound, Crop Management, Strategizing Farming Techniques, and Individualized/Personalized Interventions.

Table 3

Essential themes and core ideas on the coping mechanisms and mitigation measures that the farmers adapted

Essential Themes	Core Ideas
Crop-Livestock diversification	We used crop-livestock diversification. We put ducks in the field for additional income in case we will have lesser produce. If possible, we will practice organic farming so that we can't contribute in destroying our nature. The Rice hays are thrown back to the field so that it will be used as a fertilizer. In this way, we can save in our consumption of Inorganic Fertilizers.
Water Impound	Impound water in the irrigation. We will use the Alternate Wetting and Drying (AWD) to conserve the irrigation water and to monitor the level of water in the field. Collect rainwater to sustain the needs in the irrigation water.
Crop Management	I planned to use high-quality Rice grains that can withstand any dilemma that would possibly hit us in farming. Change the pattern in planting. Plant early maturing Rice varieties so that it will not rot in the farm.
Strategizing Farming Techniques	I planned to do soil analysis so that I will know the lacking nutrients in the farm and the fertilizers will not be wasted. We will deepen the dikes to prevent flooding in the farm in case there is heavy rain. We will plant hybrid Rice seeds because it can still be giving higher produce even if affected with diseases and pests and lacks water. Plant drought tolerance varieties for a higher produce despite too much heat (El Nino). We will not burn the Rice hays in the farm. We will promote the planting of Leguminous crops to keep the soil in good condition.
Individualized/Personalized Interventions	Need to be wise. Make a way that can help your farm like making a water impound. Join seminars to be conducted in your municipalities From the traditional practices, we have to become modern or conventional farmers or progressive farmers through learning new technologies in farming. We need to be knowledgeable about Climate Change to empower the farmers. We have to think positive always. As a farmer, we should not surrender easily, we need to have strong determination.

Crop-Livestock diversification - The small farmers in the Municipality of Banaybanay used various strategies to lessen and reduce the effects of climate change more specifically on their rice production. A number

of them said that they are using crop-livestock diversification as revealed in the focus group discussion and in-depth interview. Mechanized Farmer (not her exact name) made mention of putting ducks in the field for additional income just in case they will have lesser produce due to climate change. This is part of the crop-livestock diversification strategy.

“Mag crop-livestock diversification nalang mi, mag butang mi ug pato sa among basakan aron dugang income in kaso mo konhud among abot.” (RCVJL-IDI-7-Q2)

(We used crop-livestock diversification. We put ducks in the field for additional income in case we will have lesser produce.)

Another farmer, just in the case of Combine Harvester (not his real name) also practices organic farming so that they cannot contribute to destroying nature.

“Kung mahimo mag practice mi ug organic farming aron dili mi maka contribute ug kadaot sa kinaiyahan.” (RCVJL-FGD-3-Q2)

(If possible, we will practice organic farming so that we can't contribute to destroying our nature.)

Finally, another farmer in the name of Rice Duck Farmer (pseudonym) practices rice hay decomposition in the rice field.

“Ang mga uhot ibalik ug labay sa basakan kay aron dungag abono kon malata aron maka tipid sa inorganic fertilizers.” (RCVJL-IDI-4-Q2)

(The Rice hays are thrown back to the field so that they will be used as a fertilizer. In this way, we can save in our consumption of Inorganic Fertilizers.)

Water Impound - When asked if what is their preparation in case of the forecasted long drought and extremely heavy rainfall as part of their coping mechanisms and mitigation measures, most of them responded that they used water impounding related activities. Banaybanay Rice (pseudonym) said that she impounded water for irrigation purposes.

“Magpundo ug tubig sa irrigation (Water Impounding)”.
(RCVJL-FGD-8-Q2)

(Impound water in the irrigation).

On the other hand, another farmer, Flood Free Farmer (not her actual name) said that they will use a technology introduced by the agricultural extension workers in conserving limited irrigation water.

“Gamiton namo ang Alternate Wetting and Drying (AWD) aron ma conserve namo ang irrigation water ug ma monitor unsa ka daghanon na ang tubig naa sa among basakan.” (RCVJL-FGD-6-Q2)

(We will use the Alternate Wetting and Drying (AWD) to conserve the irrigation water and to monitor the level of water in the field.)

Meanwhile, in case of heavy rainfall, they try to utilize the excess irrigation water into something beneficial by collecting the rainwater to sustain the needs in the irrigation water as discussed by RC 18 (pseudonym).

“Mag kolekto ug tubig sa ulan aron I augment ug naay kakulangan sa Irrigation water.” (RCVJL-IDI-1-Q2)

(Collect rainwater to sustain the needs in the irrigation water.)

Crop Management - In case of abrupt change in climate and extreme events that could affect their crop production, the small rice farmers in the Municipality of Banaybanay voiced out in unison and answered that they adapted crop management as part of their coping mechanisms and mitigating measures. Masagana 99 (actual name is hidden) made mentioned during the FGD of his plan of using high-quality rice variety.

“Plano nako nga mag gamit gyud ug mga dekalidad na binhi sa palay nga mo lahutay sa bisan unsang delima mo abot sap ag-uma”. (RCVJL-FGD-7-Q2)

(I planned to use high-quality Rice grains that can withstand any dilemma that would possibly hit us in farming.)

In the same manner, another said in the person of Rice Farmer (not his actual name) said they will plant early maturing rice varieties.

“Mag tanom ug mga early maturing rice varieties aron dili ma abtan sa bisan unsang kadaot maabot sa farm.” (RCVJL-FGD-4-Q2)

(Plant early maturing Rice varieties so that they will not rot on the farm.)

Lastly, Stem Borer (pseudonym) made mentioned the change in planting pattern or the schedule of planting and harvesting as part of their coping mechanisms and mitigating measures in their crop production.

“Usbon ang pattern sa tanom, itunong nga linao ang panahon ug klima”. (RCVJL-IDI-5-Q2)

(Change the pattern in planting.)

Strategizing Farming Techniques - During climate change, the small-scale rice farmers in the Municipality of Banaybanay tried to employ strategizing farming techniques as revealed in the FGD and In-depth interviews as their actions or mitigating measures. Mechanized Farmer (not her actual name) said that she is planning to conduct soil analysis.

“Plano nako magpa soil analysis aron makahibalo nako ug unsay kulang nga nutrients sa akong basakan ug aron dili usik ang abono nga malabay nako kay basig sobra ra o kulang ang nalabay na abono.” (RCVJL-IDI-7-Q2)

(I planned to do soil analysis so that I will know the lacking nutrients in the farm and the fertilizers will not be wasted.)

IPM Ako (not her real name) also declared of deepening their dikes.

“Pa lawman na namo ang mga pilapil (dikes) namo aron dili dayon mabahaan ang among basakan ug in kaso adunay dako nga ulan mo abot.” (RCVJL-FGD-1-Q2)

(We will deepen the dikes to prevent flooding in the farm in case there is heavy rain.)

In like manner, STW (pseudonym) emphasized the use of hybrid rice varieties.

“Mag tanom mi ug hybrid rice seeds kay maka hatag gihapon ug abot ang maong hybrid rice variety nga gi tanom maski atakihon ug mga sakit ug insekto ug kulang sa tubig.” (RCVJL-IDI-3-Q2)

(We will plant hybrid Rice seeds because they can still be giving higher produce even if affected by diseases and pests and lacks water.)

Meanwhile, Rice Farmer (not his actual name) underscored the importance of planting drought-tolerant rice varieties.

“Mo tanom ug mga drought tolerance varieites aron maka hatag gihapon ug ani bisan sa ka taas nga higayon sa init (El Niño).” (RCVJL-FGD-4-Q2)

(Plant drought tolerance varieties for higher produce despite too much heat (El Niño))

Rice Grower 77 (not her actual name) on the other hand mentioned that they will use the rice hays in their newly harvested crops.

“Dili na sunogon ang mga uhot nga nabilin sa basakan.”

(RCVJL-FGD-9-Q2)

(We will not burn the Rice hays on the farm.)

Finally, Stem Borer (not his real name) tried to take good care of the soil by planting a leguminous crop in it.

“Mag promote nga mag tanom ug leguminous crops aron mabalik ang pagka tambok sa yuta.” (RCVJL-IDI-5-Q2)

(We will promote the planting of Leguminous crops to keep the soil in good condition.)

Individualized/Personalized Interventions - Part of the coping mechanism and mitigation measures adopted by the small farmers of Banaybanay is their individualized/personalized interventions for them to become an empowered and resilient farmers. HY Rice Variety (not her real name) highlighted by using his knowledge and the available resources to be able to be a resilient farmer.

“Kailangan madiskarte.” (RCVJL-IDI-9-Q2)

(Need to be wise)

The same is true also to RC 18 (not his real name) as he made mentioned being knowledgeable to be empowered.

“Dapat naa gyud sakto mi nga kaalam ug unsa ang Climate Change aron ma empowered pud mi mga farmers.” (RCVJL-IDI-1-Q2)

(We need to be knowledgeable about Climate Change to empower the farmers.)

Undoubtedly, the delivery of agricultural extension services which paved the way for the transfer of effective technologies and knowledge sharing is part of the coping mechanisms and mitigation measures of the small-scale farmers in Banaybanay as mentioned by Mechanized Farmer and Flood Free Farmer (not their actual names).

Mechanized Farmer said:

“Apil ug mga seminars nga ipahigayon sa inyung munisipyo.” (RCVJL-IDI-7-Q2)

(Join seminars to be conducted in your municipalities)

While Flood Free Farmer mentioned:

“Gikan sa traditional practices mahimo nami dapat nga modern or conventional farmers o progresibo nga farmer pina agi sa pag tuon sa mga bag-ong teknolohiya karon sa farming.” (RCVJL-FGD-6-Q2)

(From the traditional practices, we have to become modern or conventional farmers or progressive farmers through learning new technologies in farming.)

Finally, being innovative and resilient is also part of the individualized and personalized intervention adapted by the small-scale farmers of Banaybanay. This was made mentioned by Banaybanay Rice and Hybrid Rice 101 during the focus group discussions and in-depth interviews.

Banaybanay Rice said:

“Maghimu ka ug paagi nga makatabang sa imung pag uma like paghimu ug pundohanan ug tubig” (RCVJL-FGD-8-Q2)

(Make a way that can help your farm like making a water impound.)

Hybrid Rice 101 said:

“Kinahanglan mag huna-huna ug positiibo pirmi, isip usa ka farmer dili ka dayon dapat dali mo surrender, dapat naay strong determination”. (RCVJL-IDI-2-Q2)

(We have to think positive always. As a farmer, we should not surrender easily, we need to have strong determination.)

Research Question No. 3: How can their level of awareness and insights help them to cope up the problem of climate change?

The level of awareness and insights that help the small-scale farmers of Banaybanay to cope up the problem of climate change was determined using five questions. These are: *Despite the effects of climate change, what are your learnings regarding on yourself and to your farming endeavor? How does climate change improve your ability as a rice farmer? Base on the prevalence of extreme events, how does your knowledge saved you or may lessen the effect of it? How does the phenomenon integrate your learnings and adaptations to your farming culture and techniques? How do you see the government interventions on mitigating climate change?* Five essential themes emerged as shown in Table 4 below. These are Awareness of Environmental Concerns and Causes, Initiative and Innovations in Crop Management, Consideration of Alternative Ways in Farming, Empowerment of Farmers, and Role of Government’s Intervention to Local Farmers.

Table 4

Essential themes and core ideas on the insights that help them to cope with the problem of climate change

Essential Themes	Core Ideas
Awareness of Environmental Concerns and Causes	We have to take care of our nature because if not for it, we will not be given with a bountiful harvest. We will utilize nature in a good way so that our children will still benefit from it. Monitor the farm regularly.
Initiative and Innovations in Crop Management	It gives you different ideas and ways to do during unexpected change of climate. You have to be a versatile farmer by having ways and techniques in coping up with Climate Change. It teaches me how to make alternative ways. Participate in Info-Drive on how to cope-up with Climate Change. Join groups that fight against Climate Change. Farmers should double their hard work. Be alert always and vigilant with the news in your surroundings. Farmers should know how to save. Farmers should be educated on the importance of taking care of our nature so that we will be given with a good weather always.
Consideration of Alternative Ways in Farming	It helps in solving through alternative ways. Use machineries like water pump. I plan to use reservoir for water impound. Widened the main canal so that irrigation water will not be stocked.
Empowerment of Farmers	We should not stop in finding ways of fighting against Climate Change. Farmers should be given enough support since they are the most affected. Farmers should be given high regards because we are the ones planting and producing rice. We, farmers, should not stop in finding ways to solve our problems We should empower ourselves. We should feel that we are given enough attention by the government. I viewed that the farmers in the Philippines must be highly mechanize so that we can compete in the neighboring countries that producing Rice because they are also mechanize.
Role of Government's Intervention to Local Farmers	Seminar Information dissemination. Municipal Agriculture Office conducted orientation on Climate Change. We will adopt the Waste Management program of the government. Obey the rules and ordinance of the municipality in prohibiting burning of hays. LGU gives help through giving free seedlings, fertilizers and chemicals. Conduct trainings related to climate change. Give farm machineries and equipment to lessen the cost of labor.

Awareness of Environmental Concerns and Causes - The awareness of environmental concerns and causes stood up when the research participants asked about their learning regarding themselves and their farming endeavors despite the effects of climate change. IPM Ako (pseudonym) highlighted to take good care of the nature as he said:

“Kinahanglan ampingan nato ang kinaiyahan kay kung dili tungod niini dili ta mabuhi ug maka hatag ug nindot nga ani.”
(RCVJL-FGD-1-Q3)

(We have to take care of our nature because if not for it, we

will not be given with a bountiful harvest.)

In the same manner, utilizing the resources responsibly is the realization of Carabao Holder (not his actual name).

“Pahimuslan nato ang nature pinaagi sa mayo dili pahimuslan sa dautan nga pamaagi aron ang atong mga anak maka benepisyo pa gihapon niini.” (RCVJL-IDI-6-Q3)

(We will utilize nature in a good way so that our children will still benefit from it.)

Meanwhile, the importance of monitoring was underscored by *Mag-uumang Sikat* (not his real name) when asked about his learning.

“Mag monitor kanunay sa farm regularly”.
(RCVJL-IDI-8-Q3)

(Monitor the farm regularly.)

Initiative and Innovations in Crop Management - Climate change led to the improvement of the ability of the small-scale rice farmers in the Municipality of Banaybanay through their initiative and innovations in crop management. When asked how climate change improves the ability of rice farmers Masagana 99 (Pseudonym) made mentioned finding additional ways and exploring various ideas.

“It gives you different ideas ug diskarte nga imung himuon during sa unexpected change of the climate”. (RCVJL-FGD-7-Q3)

(It gives you different ideas and ways to do during unexpected change of climate.)

In addition, RCM User (not his actual name), underscored the versatility ability of the farmer.

“Dapat versatile farmer kay dghan nka ug ways and techniques sa pagpanalipud nimu sa climate change.” (RCVJL-FGD-2-Q3)

(You have to be a versatile farmer by having ways and techniques in coping up with Climate Change)

Banaybanay Rice (not her real name) shared that climate change helps her discover alternative ways.

It teaches me how to make alternative ways.
(RCVJL-FGD-8-Q3)

Meanwhile, Mechanized Farmer and Flood Free Farmer (not their real names) ability was reinforced by their active participation in climate change adaptation and mitigations initiatives.

“Dapat mo apil sa mga info-drive unsaon pag sagubang sa Climate change.” (RCVJL-IDI-7-Q3)

(Participate in Info-Drive on how to cope-up with Climate Change)

“Mag apil sa mga grupo mga naga kampanya batok sa climate change” (RCVJL-FGD-6-Q3)

(Join groups that fight against Climate Change)

Further, Rice Farmer, HY Rice Variety, and Rice Grower 77 (not their actual names) reiterated the importance of hard work, vigilance, and savings as part of their improved abilities due to this climate change.

“Dapat mag doble kugi na gyud ta mga farmers.”
(RCVJL-FGD-4-Q3)

(Farmers should double their hard work.)

“Maging alerto na kanunay sa palibot ug mga balita kanunay.” (RCVJL-IDI-9-Q3)

(Be alert always and vigilant with the news in your surroundings.)

Dapat kabalo na gyud ta mga farmers mo daginot.”
(RCVJL-FGD-9-Q3)

(Farmers should know how to save.)

Finally, Stem Borer (Pseudonym) emphasized the importance of education on taking good care of nature.

“Dapat edukado ta mga farmers kung unsa ka importante ang pag amping sa atong kinaiyahan aron tagaan tag maayong panahon kanunay” (RCVJL-IDI-5-Q3)

Farmers should be educated on the importance of taking care of our nature so that we will be given with a good weather always.

Consideration of Alternative Ways in Farming - The knowledge of the research participants is very important in the reduction of the negative impact of climate change and resulted in the farmer’s consideration of alternative ways in farming as revealed in the responses of the research participants. IPM Ako said that it is very useful in finding alternative ways in rice production.

“Nka tabang pag sulbad alternative ways.” (RCVJL-FGD-1-Q3)

(It helps in solving through alternative ways.)

Meanwhile, RC 18 specified that the knowledge in the operation of farm machinery particularly on the use

of water pumps helps them amid the changing climate.

“Mag gamit ug makinnarya sama sa water pumps.” (RCVJL-IDI-1-Q3)

(Use machineries like water pump)

In the same manner, Stem Borer (not his real name) brought out the idea of his knowledge in using the reservoir.

*“Plano nako mag himo ug reservoir aron mamahimong
punduhanan ug tubig”. (RCVJL-IDI-5-Q3)*

(I plan to use the reservoir for water impound)

Lastly, another consideration of alternative ways in farming is the knowledge shared by Flood Free Farmer (pseudonym) and pertains to the knowledge in irrigation water management.

*“Padak-an ang mga main canal aron dili mapundo ang
irrigation water.” (RCVJL-FGD-6-Q3)*

*(Widened the main canal so that irrigation water will not
be stocked.)*

Empowerment of Farmers - Climate change, though it has a negative effect on the rice production of the farmers, this phenomenon help integrate farmers learning and adaptations and helped in the empowerment of farmers. This is the case of Mechanized Farmer and Masagana 99 (not their real names) that cited the importance of finding appropriate ways to combat or solve the changing climate.

*“Dapat dili ta mo undang pag pangita ug mga pamaagi
sapag sagubang sa climate change.” (RCVJL-IDI-7-Q3)*

*(We should not stop in finding ways of fighting against
Climate Change.)*

*Dapat kita mga farmers dili ta mo undang sap ag pangita
ug mga pamaagi para sulbaron ang maong problema”
(RCVJL-FGD-7-Q3)*

*(We, farmers, should not stop in finding ways to solve our
problems.)*

Consequently, three research participants in the persons of Combine Harvester, Banaybanay Rice, and HY Rice Variety (not their real names) agreed that attention, support, and assistance to the farmers are the keys to help integrate their learning and adaptations measures.

*“Dapat tagaan ug saktong ayuda ming mga farmers nga
maoy apektado kayo.” (RCVJL-FGD-8-Q3)*

(Farmers should be given enough support since they are the most affected.)

“Tagaan mig pag tagad mga mag-uuma kay tungod dili namo dili ta maka kaon tanan ug bugas kung dili tungod sa among gi produce.” (RCVJL-FGD-8-Q3)

(Farmers should be given high regards because we are the ones planting and producing rice.)

“Dapat bation namo mga farmers nga gi tagaan mi ug saktong pag tagad sa atong gobyerno.” (RCVJL-IDI-9-Q3)

(We should feel that we are given enough attention by the government.)

Furthermore, Carabao Holder (pseudonym) aired his side on this concern and suggested that farmers should be highly mechanized as part of increasing the competitive advantage of the rice farmers.

“Nakita nako nga kita nga mga farmers sa Pilipinas dapat highly mechanize nata aron maka compete ta sa mga silingang nasud nga naga produce ug bugas kay mechanize napud sila.” (RCVJL-IDI-6-Q3)

(I viewed that the farmers in the Philippines must be highly mechanize so that we can compete in the neighboring countries that producing Rice because they are also mechanize)

Finally, *Mag-uumang Sikat* (not his actual name) directly said that farmers should empower themselves.

“Dapat I empower nato atong mga kaugalingon.” (RCVJL-IDI-8-Q3)

(We should empower ourselves.)

Role of Government’s Intervention to Local Farmers - The role of the government’s intervention to local farmers in the Municipality of Banaybanay in mitigating the impact of climate change is very evident in the lives of these small-scale farmers. Education and information dissemination is on the top list as mentioned by RCM User, Rice Duck Farmer, Hybrid Rice 101, and Masagana 99 (not their real names).

Seminar. (RCVJL-FGD-2-Q3)

Information dissemination. (RCVJL-IDI-4-Q3)

“Nag conduct ang opisina sa Mun. Agri Office ug mga orientation sa climate change”

(RCVJL-IDI-2-Q3)

(Municipal Agriculture Office conducted orientation on Climate Change)

“Conduct ug mga trainings related to climate change.” (RCVJL-FGD-7-Q3)

(Conduct trainings related to climate change)

Masagana 99 and Combine Harvester (not their actual names) added that the government should provide farm inputs and farm machineries.

“Nag hatag ug mga ayuda ang LGU sama sa libreng similya, abono ug mga kemikals.”

(RCVJL-FGD-7-Q3)

(LGU gives help through giving free seedlings, fertilizers and chemicals)

“Mag hatag ug mga Farm Machineries ug equipment aron mo gamay ang cost of labor”

(RCVJL-FGD-3-Q3)

(Give farm machineries and equipments to lessen the cost of labor)

Lastly, the role of the government to provide programs and policies must also be adopted by the farmers to mitigate the impact of climate change as emphasized by Flood Free Farmer and IPM Ako (both are pseudonyms).

“I adopt nato ang Waste Management Program sa gobyerno.” (RCVJL-FGD-6-Q3)

(We will adopt the Waste Management program of the government.)

“Pag sunod sa balaod o ordinansa sa munisipyo sa pag bawal pag sunog sa uhot.”

(RCVJL-FGD-1-Q3)

(Obey the rules and ordinance of the municipality in prohibiting burning of hays.)

5. Results and discussions

This section presents the discussions of the results of this phenomenological study, its implications for practice and future researchers, and conclusions supported by the themes that emerged during the analysis of data. This study stated clearly its purpose which is to provide a clear understanding, analysis, and documentation of the farming experiences and the transformative benefits acquired by the farmers of Davao Oriental specifically in the Municipality of Banaybanay. It focused on the perceptions of farmers and their experiences on how they have adapted to the negative effects brought about by climatic variability. Moreover, this study also identified the effects, challenges, and needs of farmers and corresponding interventions that the national and local governments extend to the farmers who were severely affected by climate change.

This phenomenological qualitative study is ideal in explaining the climate change-related experiences of small-scale farmers and in the attempts of the researcher to understand climate change-related farmers' perception, perspective, and understanding. Hence, 18 research participants (9 each for In-Depth Interviews and FGD) were asked to contribute their perceptions, ideas, knowledge, perspectives, and experiences in this climate change phenomenon. All these participants are living and farming in the Municipality of Banaybanay, Davao Oriental.

In addition, the study presents the importance of rice farmers in producing food for our table and how their experiences and struggles in this climate change phenomenon will provide ideas and relevant information to the government and policymakers on the appropriate interventions that are very vital in the survival of our

modern-day heroes, the farmers, for without them, there will be no more food for our consumption. Moreover, this study is anchored on the model conceptualized by Stern in 2006 that highlighted the possible climate change-related impacts in the social and economic lives of small-scale rice farmers as well as their livelihood options in countries like Philippines. The Municipality of Banaybanay is a second-class municipality where most of the inhabitants are largely dependent on agriculture including the research participants. Lastly, this study is also supported by the claims of Weber (2010) that environmental changes are generally recognized by individuals through their first-hand experience of the phenomenon. In this case are the experiences of the small-scale rice farmers on the changes of precipitation, temperature, drought, and other extreme events.

Experiences and Challenges of Small Scale Farmers. The results of the study have revealed numerous experiences and challenges of the small-scale rice farmers brought about by climate change which mostly are negative and disadvantageous to their lives. Through their sharing, major themes have emerged. These are uncertainties of weather, man-made unsustainable actions and activities, financial challenges, financially unstable and unable to continue rice production, poor and difficult economic & living condition.

The study further revealed that in the past 10 years there are uncertainties of the weather as experienced by the majority of the research participants. There are instances of lack of the supply of irrigation water which resulted in the decrease of production and decrease and or no income. There are also instances of extreme heat and extreme precipitation. The experienced uncertainties of weather also have detrimental effects not just on the rice production but also heat stress especially of the older ones.

This observation of uncertainties of weather and its adverse effect is very similar to the observations presented in the study by U.S. Global Change Research Program (2014) that drought and flood frequency and severity may change, posing challenges for farmers. Generally, this climatic variability resulted in the extreme difficulties of growing crops for food production. Likewise, extreme climatic conditions which include severe drought, frequent flooding, and temperature rise damages the crop production which in return affected the livelihoods of the households dependent on it.

In the long run, it threatens global food availability as mentioned by the United States Environmental Protection Agency. This is also in line with the studies of Shikuku et al. (2017), Menike & Arachchi, (2016), Alam et al. (2017), and Abid et al. (2016) that the sector of agriculture and the system of producing food for our table is the most affected sector of this climatic change. According to these several studies, the increased level of temperature resulted in the reduction of crop yields. In the case of the production of rice, the changes in temperature and quantity of rainfall affected the quality of soil and the proliferation of pests and diseases.

In addition, the observations and experiences of the small-scale farmers that this phenomenon could be attributed to man-made unsustainable actions and activities such as coal and fossil fuel burning, cutting of trees, uncontrolled mining activities, burning of agricultural wastes are among the climate-changed induced threat that the farmers experienced. These man-made activities were identified by the European Commission (2020) as one of the reasons for this climate change. Human beings are gradually changing the climate and the temperature of the earth, according to the European Commission, by burning fossil fuels, destroying forests, and rearing animals.

This is also in line with NASA's (2020) findings that human actions on the planet are modifying the normal greenhouse. For the past 100 years, the combustion of fossil fuels (coal and oil) increases the concentration of carbon dioxide in the air. Other human-related activities that contributed to the increased concentrations of carbon dioxide to a lesser extent include land clearing for crop and livestock production, industrial production, and other related activities.

Consequently, this just supports the reports of the IPCC (2014), which found that human activities have warmed our planet by more than 95% in the last 50 years. In addition, many researchers also discovered that human-induced greenhouse gases such as carbon dioxide, methane, and nitrous oxide are likely to be held

responsible for the recorded increase of the temperature of the earth for the past 5 decades. Similarly, this supports the findings of Odame et al. (2018), who found that the large number of research participants accounting for 67 percent believe that taking away of plant life in the environment has exacerbated changes in the climatic environment in the specified location, as well as Herring (2020), who found that the cutting of trees in the forest and damaging it, and crop and livestock production-related activities contributed to the increasing emission of greenhouse gas, particularly carbon dioxide.

Finally, according to a linked study by the European Commission in 2015 on the grounds of climate change, the removal of trees could result in the discharge of carbon dioxide in the air which contributes to the greenhouse effects. Furthermore, this study indicated small-scale farmers' concerns with climate change, since the majority of them faced financial difficulties such as capital loss, hardships, lower harvests, and fear of losses. As climatic extremes grow, production risks will rise in these areas.

This results is congruent to the findings of the studies of The World Bank (2013), Wingard & Anne-Sophie Brändlin (2013), and Parks (2021) that climate change is a danger multiplier that makes poverty more chronic, worsens bad health conditions, aggravate the current low level of food sufficiency, shortage, and environmental deprivation. Aside from financial challenges, small-scale farmers of Banaybanay also experienced financial instability and might unable to continue their rice production because of these climatic changes in the locality as revealed in the results of this study.

This backs up the conclusions of the study conducted by Alam et al. in 2017 that climate change has a detrimental impact on agriculture production, income, and its distribution, income equality, agricultural services, farmer well-being, and the subsidy-related policies of the government. In addition, it was determined that income distribution is highly unequal. Climate change is a contributory factor to the deepening of this economic divide, as marginalized crops and livestock growers and producers are more vulnerable to the negative consequences of climate change.

Lastly, climate change not just affected the rice crop production of the participants but also affected their living status as a whole which leads to poor and difficult economic and living conditions. Small-scale farmers in Banaybanay echoed their sentiments that climate change makes their lives difficult. It resulted in no income for them and they keep on investing but no return, they also cannot assure that their way of life will be better if they will just rely on rice farming and explore the possibility of having another source of income, and as a rice farmer they will become poorer, they experience difficulties because of little income their living status is severely affected others said that they are forced to sell their rice field because of their debt and might end up maintaining the land that was once theirs.

This study's specific outcome matched the findings of Olusegun et al. (2013), who revealed that climate change negatively impacted the production of rice. It shows that as the temperature rises and precipitation decreases, net revenue and land rent per hectare deteriorate. Similarly, this supports the findings of ADB (2014) and FAO (2021) that a high level of temperature can lessen the production of crops. This high level of temperature also helps encourage the presence of weeds and increase of the number of pests, hence the production of crops is highly affected of which aside from this condition other factors contributed to this scenario such as loss of land, delayed seasons, and the difficulties of the type of crops to grow and the period of its planting.

Coping Mechanisms and Mitigation Measures that farmers Adapted. With regards to the farmer's climate change coping mechanisms and mitigation measures, this phenomenological qualitative study also revealed several coping mechanisms and mitigation measures used by the small-scale rice farmers in dealing with the effects of climate change. Data gathering and analysis revealed at least five themes and these are crop-livestock diversification, water impound, crop management, strategizing farming techniques, and individualized/personalized interventions.

The use of crop-livestock diversification as mentioned by Mechanized Farmer (not her actual name) as one of the coping mechanisms and mitigation measures used by the small-scale rice farmers conform with the study of Onyeneke (2021) that crop and livelihood diversification is one of the frequent adaptation activities used by rice farmers in Nigeria. In the same manner, organic farming practices as shared by Combine Harvester (not his real name) is very similar to the conclusions of the study conducted by Onyeneke (2021), Hussain et al. (2020), and Shrestha (2016) mentioning that the use of organic fertilizers and natural pesticides are among the adaptations made to deal with climate change.

Another coping mechanism by the small-scale farmers in Banaybanay is to impound water for irrigation purposes and utilization of excess irrigation water as mentioned by Banaybanay Rice and RC 18 (pseudonyms). These coping mechanisms were also discussed and presented by the findings of several researchers such as Hussain et al. (2017), Onyeneke (2018) and Shresth (2016) construction of local drainages and bunds in agricultural systems can also help mitigate climate hazards. These measures help farmers adapt to climate change by reducing flood and soil erosion incidence in the farm production areas.

Meanwhile, crop management is also observed to be one of the climate change's coping mechanisms and mitigating measures of the small-scale farmers in Banaybanay, Davao Oriental. These include among others the use of high-quality rice varieties, early maturing rice varieties, and changing of planting calendar. These crop management strategies used by the research participants were very parallel to the conclusions of the study conducted by Hussain et al., (2017) that said that rice varieties that mature early, for example, are better suited to dealing with delayed start and early cessation of rain. In the same manner, Onyeneke (2021) made mention of the use of better rice varieties as frequent adaptation activities in Nigeria while Sugihardjo (2017) identified the use of new varieties of rice as among the adaptations made to deal with climate change in Indonesia.

Consequently, Arora (2019) said that implementing a climate-smart agriculture system that aligns with the FAO's Sustainable Food and Agriculture goals is another way to cope up and to address the adverse effects of climate change and this includes developing resilient crop varieties that can withstand temperature and precipitation shocks. Lastly, this is in agreement with the studies of Onyeneke (2021) and Mahdu (2019) that modifying the cropping calendar and or shifting the period when to plant and when to harvest are some of the frequent climate change adaptation activities.

This research also revealed that the small-scale rice farmers of Banaybanay employed several strategies in their rice production farming activities to deal with climate change and mitigate its adverse effects. For instance, IPM Ako (not her real name) also declared deepening their dikes. This is very similar to the results of the study conducted by Mahdu (2019) that farmers in Guyana maintain good drainage in and around their farms to mitigate the negative effects of this climatic variability.

In addition, individualized/personalized interventions were also revealed. STW and Rice Farmer (not their actual names) underscored and emphasized the importance of the use of hybrid rice varieties and using rice varieties that can withstand extreme drought as their way of reducing the adverse effects of climate change in their rice production. These practices are in agreement with the results of the studies conducted by Mahdu (2019), Onyeneke (2021), and Sugihardjo (2017) that the cultivation and planting of different rice varieties such as early maturing and better rice varieties are farmers' most prevalent adaptation measures to climate change.

Meanwhile, as mentioned by Flood Free Farmer (not her actual name), being innovative and adapting to new and modern technologies in rice farming could help cope with the negative results of climatic changes. This was detailed in the research conducted by Arora (2019) such as the changes in crop varieties, planting times, and crop growing system (i.e. practice of mixed cropping systems) to be considered to generate higher crop stability in intense occurrences. Other innovations and new and modern technologies in rice farming were presented by Unique-Kulima (2017). He said that the proper application of organic and chemical fertilizers both in timing and quantity can enhance the fertility of the soil and improve crops production which reduces the susceptibility of the farmers and growers to climatic changes.

Insights that Help Them Cope with the Problem of Climate Change. Regarding the insights on the effects of climate change learned by the small-scale rice farmers in the Municipality of Banaybanay, five major themes came out namely: awareness of environmental concerns and causes, initiative and innovations in crop management, consideration of alternative ways in farming, empowerment of farmers, and role of government's intervention to local farmers.

The results of the study highlighted the importance of the awareness of environmental concerns and causes as made mentioned by IPM Ako (pseudonym) and Carabao Holder (not his actual name). The need for the awareness of environmental concerns and their causes was also the same findings in the study conducted by Maung et al. (2016) and Pulhin et al., (2016). The various researchers offer several essential initiatives to increase the capacity of the farmers over a while to mitigate and adapt to climate change events. These include increasing the level of climate change consciousness among schoolchildren, farmers, and government officials in the locality.

Meanwhile, Stern (2007) emphasized the need for investment in education as a form of adaptation. He suggests investing in human capital as one of the effective ways to promote adaptation. In particular investment in individuals' well-being and knowledge, according to Stern, increases the usefulness of the information campaign to the affected individuals and areas. This also resulted in effective and much better options for the integration of this identified climate-related risk in planning and improvement processes. Lastly, having exact data and information of these climate-related risks and the possession and practice of weather conditions forecasting are the interventions needed by the majority of the countries.

In the same manner, initiatives and innovations in crop management were also one of the insights of the small-scale farmers brought about by this climate change. Masagana 99 (pseudonym) made mentioned improving his ability in finding additional ways and exploring various ideas. Meanwhile, RCM User (not his actual name), underscored the versatility ability of the farmer. In the same manner, Mechanized Farmer and Flood Free Farmer (not their real names) ability was reinforced by their active participation in climate change adaptation and mitigations initiatives. Consequently, Rice Farmer, HY Rice Variety, and Rice Grower 77 (not their actual names) reiterated the importance of hard work, vigilance, and savings as part of their improved abilities due to this climate change. Stem Borer (pseudonym) emphasized the importance of education on taking good care of nature. These initiatives and innovations in crop management as insights of the small-scale farmers were also the observations of Akthar and his fellow researchers (2019) and made mentioned of innovation and promotion of appropriate usage of mechanized farming and agricultural inputs, to improve the livelihood of farmers and farmers autonomously changed their rice production practices and techniques which will adaptive to the climate change-related events.

Another insight of the small-scale rice farmers is the consideration of alternative ways of farming. These include finding alternative ways in rice production, knowledge in the operation of farm machinery particularly on the use of water pumps, knowledge in using the reservoir, and knowledge in irrigation water management. This is in parallel with the findings of Ali (2011), Hussain et al. (2020), and Shrestha (2016) who found that the management of irrigation water has proven to be one of the successful adaptation measures that can lessen the negative effects of climate change on rice farming while building more reservoirs, canals, and community ponds around houses and rice fields to harvest and store rainwater and runoff are some of the knowledge that farmers can apply. These researchers also found out that the promotion of the use of mechanized agricultural technologies was also part of the climate change mitigation mechanism.

Empowerment of the farmers is also considered as one of the insights of the small-scale farmers brought about by this climate change. Mechanized Farmer and Masagana 99 (not their real names) cited the importance of finding appropriate ways to combat or solve the changing climate. Further, Combine Harvester, Banaybanay Rice, and HY Rice Variety (not their real names) agreed that attention, support, and assistance to the farmers are the keys to helping integrate their learning and adaptations measures. In like manner, Carabao Holder

(pseudonym) aired his side and suggested that farmers should be highly mechanized as part of increasing the competitive advantage of the rice farmers. While Mag-uumang Sikat (not his actual name) directly said that farmers should empower themselves.

This aligns with the recommendations of the study conducted by Ali (2021) in Bangladesh which said that rice farmers should improve their personal's capacities, capabilities, and knowledge in agricultural production and this can be done by employing appropriate crop production technologies and activities in the locality. Finally, this is also very similar to the study of Akhtar et al. (2019) which concluded and emphasized the importance of farmers' empowerment to enhance their adaptive capacity. The respondents who have limited adaptive capacity tried to improve their irrigation facilities, planted trees in their rice production areas, and use frequently suitable water and soil conservation technologies.

Alternatively, the role of the programs and projects of the government in mitigating the impact of climate change is very evident in the lives of these small-scale rice farmers as one of the insights revealed in the conduct of this study. These include among others education and information dissemination, provision of farm inputs and farm machineries, and the adoption of the farmers of the programs and policies introduced by the government. These insights are in agreement with the promotion of the Department of Agriculture approach in pushing the climate-resilient Agrifishery sector.

The Climate-Resilient Agriculture (CRA) approach of the Department was able to help promote the resilience of the country particularly in the areas of livelihood generation and the sector of the environment. Through this approach, agrifishery production was boosted along with the provision of sustainable income. In the same manner, the program was able to equip the families and agricultural production system in adapting to this climate change and reducing greenhouse gas production while improving the sequestration of carbon. This was launched in the year 2014 through the implementation of the Adaptation and Mitigation Initiative in Agriculture (AMIA) program of the DA-SWCCO.

5.1 Implications for Practice

There were five essential themes on the experiences and challenges of small-scale rice farmers related to climate change. These were uncertainties of weather, man-made unsustainable actions, and activities, financial challenges, financially unstable and unable to continue rice production, and poor and difficult economic & living conditions. These results implied that climate change is true, real, and currently happening in our world. The effects of climate change are detrimental particularly in agriculture. This further implies that human actions and activities as claimed by many researchers contributed to this climate change.

In addition, the result also implies that the small-scale farmers are experiencing the adverse effect brought about by the changing climate both in their production and to their economic and living conditions. Nevertheless, despite these challenges and difficulties, small-scale farmers were still able to continue to produce rice and food for our table and were worthy of support both from the government sector and the consuming public. Hence, as an agriculturist, it is very important to develop effective technologies that would help our small-scale rice farmers adapt to the changes.

Moreover, the results of the study further implied that the Department of Agriculture, the LGUs, the private sectors, and Non-Government Organizations will continue to work together to help our small-scale farmers improve their production. The various stakeholders also are encouraged to step up in whatever support it can give so that the target of achieving a food-secured and resilient nation will come into reality. In the same manner, this also implied that convergence efforts also from the national down to the local level must also be established and adequately supported. Lastly, data and information gathered in this study are good evidence that climate change is true, real, currently experienced, and felt on the ground by our rice farmers.

With regards to how these small-scale farmers face the effects of climate change through their coping

mechanisms and mitigation measures, at least five essential themes emerged. These are crop-livestock diversification, water impound, crop management, strategizing farming techniques, and individualized/personalized interventions.

These results imply that the small-scale farmers have their personal ways of coping and adapting to the changes of climate and that these should be reinforced with the needed financial and other support such as technologies and knowledge transfer. The Local Government Unit through its Municipal Agriculture Office will try to intensify its programs and projects implementations that can complement the need of the small-scale farmers and achieve its mandate of providing excellent basic agricultural services. The LGU might provide additional incentives, farm production inputs, and even insurance to the affected farmers and might reduce the potential risks and damage.

This also implies that the Municipal Agricultural Extension Workers and the agriculturists assigned to provide the needed technical and extension support to these small-scale farmers will also try to enhance and improve their respective knowledge which could result in the effective delivery of agricultural extension services. These extension workers also might conduct and facilitate research and development and technology transfers.

In terms of the insights of the small scale farmers, awareness of environmental concerns and causes, initiative and innovations in crop management, consideration of alternative ways in farming, empowerment of farmers, and role of government's intervention to local farmers were the five essential themes that were emerged out of this study. This implies that being knowledgeable in the environmental-related issues and concerns is very helpful in coping up with this climate change. In addition, this implies further that innovations and initiatives in the management of the crop are also advantageous to the farmer that is why DA and other NGOs are promoting the application of local knowledge and effective knowledge management.

Moreover, the results of this study also imply that farmers should be taught proven, effective and alternative technologies to lessen and mitigate the adverse effect of climate change and this can be done by doing and advancing research and development in line with agriculture production. In the same way, this also implies that the Government will provide the needed enabling environment and mechanisms where these technologies will reach the ground and be accepted by the potential farmer-beneficiaries. Consequently, this also implied that farmers are encouraged to continue their production despite the presence of climate change and the government will also continue to support them. Finally, this implied that the role of the government is very helpful in achieving a food secured and climate change resilient country hence, funding support should be regularly allocated.

5.2 Implications for Future Research

The study is only bounded by the experiences of the small-scale rice farmers in the Municipality of Banaybanay, Davao Oriental. Hence, the researcher proposes and recommended the following for future researches: First, the researcher recommends conducting this study to another group of research participants to validate its findings. This is because 18 research participants as one of the limitations are not enough to generalize the findings of this study. Second, the researcher recommends increasing the scope of this research and could cover the entire rice-producing municipalities of Davao Oriental to validate its findings and gather more information on the experiences and struggles of the small-scale rice farmers on this climate change. Third, the researcher also recommends conducting this study to different farmers producing varied crops other than rice so that there will be a comparison as to the experiences and struggles of farmers and can generate insights that will be very useful in the coming future. Fourth, this study could be served as baseline information, hence the researcher recommends conducting this study for three or five years in the same participants to determine if there will be changes in their insights and experiences. Finally, though different research, the researcher recommends conducting the study on the impact of the agricultural extension services as crucial support in the production of rice farmers amidst this climate change to draw out findings and results to improve the extension services

delivery of the Local Government Unit and the Department of Agriculture.

5.3 Concluding Remarks

I can say, based on the findings and results of this study that the rice that we consume is a product of the sweat and hard labor of our small-scale farmers who were further made difficult by the changing climate. Hence, it is very imperative that whatever support we can give to this sector is much needed and highly appreciated. In addition, the hardships and negative experiences of this farmer made me think thrice not just twice that these farmers deserved our full support and assistance the reason why I pledged my 101% support to help them in whatever capacity I have as an agriculturist and a planning officer of our Municipality. For instance, as an agriculturist, I will help facilitate the effective implementation of various food security measures and programs like the implementation of climate-smart agriculture technologies and other agricultural-related Projects, Programs, and Activities (PPAs).

Moreover, I will also help develop and forge strong partnerships and collaboration with various government agencies, Non-Government Organizations, private institutions, business organizations, and even the academe to conduct various Information and Education Campaign (IEC) on climate change to raise the level of awareness of the community as well as to request assistance in the form of training & capacity building, farm production inputs and other related PPAs.

Consequently, as an agriculturist, I will draft various project proposals that will benefit these farmers and will be submitted to the above-mentioned entities. In the same manner, as a planning officer, I will encourage our Sangguniang Bayan (SB) Chairperson Committee on Agriculture and our Local Chief Executive to draft and approve legislation (ordinances) such as providing cash assistance to small scale farmers in case of severe drought and or floods due to climate change, creation of sustainable agriculture program to fund the various agricultural programs of the Municipality. The local agriculture fund will also be created wherein a certain percentage of the LGU share in Internal Revenue Allotment (IRA) or National Tax Allocation (NTA) or LGU Income will be allocated for the development of the agriculture sector. By doing this, the fund for the implementation of various programs is ensured and will surely enjoy by the farmers. The plight of the farmers in producing enough food despite the adverse effect of climate change is also very personal to me as a government worker, son of a farmer, and a policy-maker.

Furthermore, small-scale rice farmers' income is greatly affected by this climate change. Hence, to augment their income various policies, strategies, projects, programs, and activities might be considered for implementation. These include the enactment of local policies to lessen and reduce the adverse effect of climate change at the local level, the institutionalization of a local insurance program for rice farmers, procurement and distribution of drought-tolerant and high-yielding rice varieties, promotion and implementation of crop-livestock diversification, providing cash incentives, and provision of rice mechanization among others.

In the same way, I have come to realize that our small-scale farmers have their own coping mechanisms and they have adapted few climate change mitigation measures. I came to realize also that small-scale farmers needed assistance from both the production side and on the appropriate and effective technologies. Hence, as an agricultural extension worker, this will help me recalibrate, improve and enhance my strategies and approaches to better transfer the relevant knowledge and technologies to them given that climate change has brought to their hardships and difficulties.

As a planning officer, I can also suggest relevant plans, programs, policies, and or ordinances from the results of this study and with my first-hand experience through my day-to-day interactions with these small-scale farmers. Moreover, the detrimental results of this climate change as revealed in this study affected not just the livelihood and production of small-scale rice farmers but also it has a worldwide impact on food sufficiency and human existence. Hence, I am encouraged to advance my studies in the field of agriculture and public administration bearing this cause in mind.

Finally, improving the adaptive capacities and resiliency of these small-scale farmers require holistic and science-based approaches which involved not just one sector of the society or one agency of the government but it also involved several stakeholders; hence, careful program planning and program implementation which includes education and information campaign is very important.

6. References

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