

Weathering the Storm: Adverse Conditions, Adaptive Capacities and Resilience of Cacao Farmers in Disaster-Prone Areas

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ABSTRACT

Farmers' repeated exposure to disasters is disconcerting. I explored the essences of resilience of cacao farmers as they encountered adverse conditions in disaster prone areas of the CARAGA region, and how they mobilize their adaptive capacities to surmount these adverse conditions. I utilized qualitative descriptive study, interviewed fifteen cacao farmers which I selected through purposive sampling, and applied thematic analysis. I found that cacao farmers experience recurring adverse conditions caused by typhoons, strong winds, soil erosion, nutrient loss, pest infestations, and plant diseases that significantly affect farm productivity and crop survival. Cacao farmers demonstrated adaptive capacities by implementing practical strategies to sustain their farms and livelihoods. It was recognized that while nature cannot be controlled, but farms can be prepared through proper management and environmental stewardship. Resilience among cacao farmers is not a single reaction to disaster, but a long-term process grounded in patience, adaptation, environmental awareness, and sustained commitment to their livelihoods. Farmers may strengthen ecological coping strategies such as maintaining agroforestry systems, planting windbreaks, and avoiding "upaw" or bare farms to reduce soil erosion and protect crops from strong winds and heavy rainfall. Future studies may use regression, mediation analysis, and exploratory factor analysis may be pursued in developing instruments for disaster-related farming.

Keywords: Weathering the storm, adverse conditions, adaptive capacities, resilience of cacao farmers, disaster-prone areas

INTRODUCTION

In this section, I presented the problem and its setting, significance of my study, research questions, theory and theoretical lens, and my assumptions.

The Problem and its Scope

In the disaster-prone areas of the Caraga Region, I have observed that many cacao farmers rise each season knowing that the next typhoon may undo months of labor. This uncertainty, in my view, deeply shapes how they farm, prepare, endure, and rebuild amid recurring natural hazards. Located along the eastern seaboard of Mindanao facing the Pacific Ocean, the Caraga Region is frequently exposed to tropical cyclones, intense rainfall, flooding, and storm surges brought by weather systems entering the Philippine Area of Responsibility. According to Tandog and Condes-Tandog (2023), these stressors can reduce agricultural yields and influence farmers' decisions regarding land preparation, labor, and income diversification.

Across the world, I believe farmers in similarly exposed areas face overlapping vulnerabilities that heighten their risk of environmental shocks and livelihood instability. According to the Food and Agriculture Organization (FAO, 2024), small-scale farmers in flood-prone, landslide-affected, and typhoon-vulnerable regions face persistent challenges of food insecurity, fragile infrastructure, and limited institutional support. To me, these difficulties are systemic, revealing gaps in preparedness, recovery, and rural development. In Asia, smallholder farmers in climatically volatile areas, especially uplands and coastal zones, struggle with erratic rainfall, declining soil fertility, and disrupted farming cycles (Devendra, 2021; Ruben & Pender, 2020). I see these stressors as factors that reduce yields and influence decisions on land preparation, labor, and income

diversification as discussed by Tandog and Condes-Tandog (2023).

In the Philippines, I recognize that agriculture remains vital to rural livelihoods but is among the sectors most vulnerable to climate-related disasters. Typhoons, droughts, and floods accounted for nearly 60% of agricultural damage between 2010 and 2022 (Philippine Statistics Authority [PSA], 2022; National Disaster Risk Reduction and Management Council [NDRRMC], 2023). In my view, farmers in hazard-exposed and geographically isolated areas often experience greater difficulties during environmental disturbances due to limited infrastructure, access to information, and institutional support, which have been discussed in studies by Lasco et al. (2020) and the Asian Development Bank Climate Risk Profile Philippines (2021).

This vulnerability is evident in Mindanao, particularly in Caraga, where cacao farmers regularly confront typhoons, landslides, riverine flooding, and coastal storm surges associated with northeast monsoon rains and tropical cyclones (ASEAN Coordinating Centre for Humanitarian Assistance [AHA Centre], 2024; ThinkHazard, 2023; PAGASA, 2023). Historical hazard monitoring shows that eastern Mindanao provinces, including Surigao del Sur, Surigao del Norte, and Agusan del Sur, experience repeated flooding and rain-induced landslides due to prolonged rainfall events and saturated watersheds (Department of Science and Technology–Project NOAH, 2019; World Bank, 2021). I find that these hazards disrupt cacao production and intersect with constraints such as unstable markets, poor transportation, and limited support as discussed by Cramb et al. (2019) and Lasco et al. (2020).

While government and international reports provide hazard data and crop-loss assessments, I notice that most focus on production rather than farmers' adaptive experiences. The Department of Agriculture–Caraga (2023) recorded recurring losses from floods and landslides, while the ACAPS Briefing Note (2024) reported torrential rains destroying over 25,000 hectares of crops across Mindanao. From my perspective, a gap remains in studies that highlight farmers' voices and coping practices in disaster-prone settings. Research on the Philippine cacao industry has focused mainly on production and marketing (Gonzales, Janaban, & Martir, 2024; Magallon, Patalinghug, & Tangalin, 2022), overlooking the social and adaptive processes that sustain livelihoods. Despite various initiatives, I believe recurring disasters continue to weaken agricultural systems and rural communities (Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development [PCAARRD], 2022; Mindanao Development Authority, 2023). Since natural hazards cannot be prevented, I consider it essential to understand how farmers manage disruptions, cope with losses, and identify needed support. Hence, this study is conducted.

Significance of the Study

This study is significant as it directly contributes to the realization of the United Nations Sustainable Development Goals, particularly Goal 2 (Zero Hunger), which promotes sustainable agriculture and food security, and Goal 13 (Climate Action), which emphasizes strengthening resilience and adaptive capacity to climate-related hazards and natural disasters. By exploring the challenges, coping mechanisms, and insights of cacao farmers in disaster-prone areas of the Caraga Region, the study supports a deeper understanding of how vulnerable agricultural communities respond to recurring typhoons, floods, and landslides. Through documenting the experiences of farmers, the study highlights the importance of resilience, and adaptive farming practices in sustaining livelihoods amid environmental uncertainties.

Statement of the Problem

In this study, I explored the perceptions of cacao farmers on resilience in disaster prone areas. Specifically, I sought to answers the following questions:

Research Questions

1. What are the adverse conditions encountered by cacao farmers in disaster-prone areas?
2. What are the adaptive capacities undertaken by the cacao farmers in surmounting the adverse conditions?
3. What are the essences of resilience resulting from surmounting the adverse conditions?

Theoretical Lens

This study is anchored on Community Resilience Theory, which provides a framework for understanding how communities collectively adapt, recover, and thrive amid adverse conditions such as disasters, economic instability, and environmental stress. According to Norris et al. (2008), community resilience refers to a dynamic process that links a network of adaptive capacities, such as social capital, economic development, information and communication, and community competence, to the ability of a community to withstand and recover from disturbances.

Paradigm

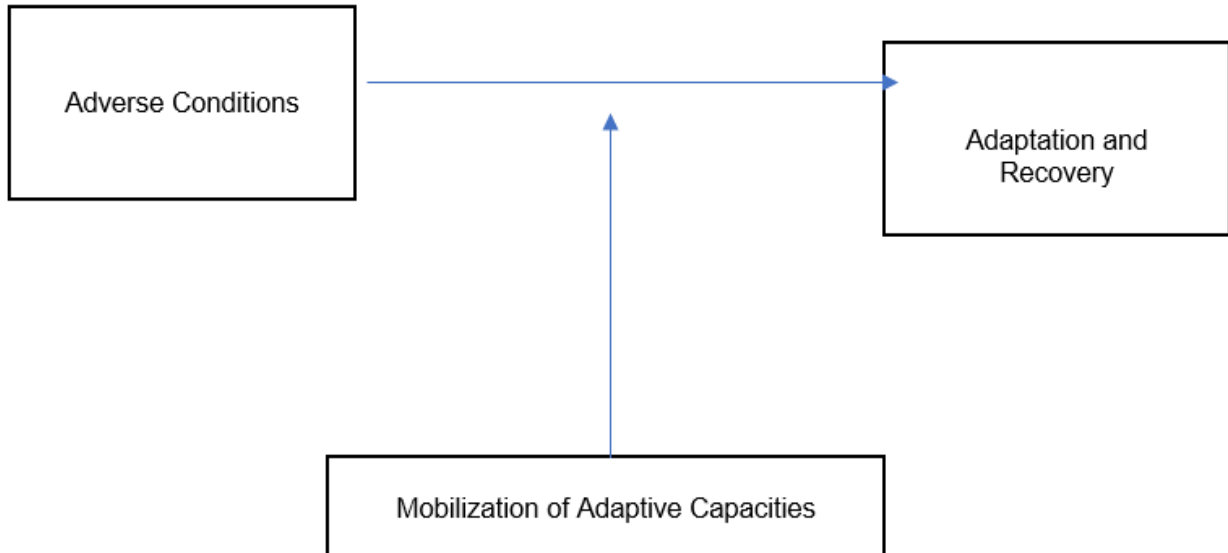


Figure 1. Adverse conditions, mobilization of adaptive capacities and adaptation & recovery of Cacao Farmers in Disaster-Prone Areas

Assumptions

I assumed that the experiences of cacao farmers in disaster-prone areas of the Caraga Region as my study participants align with the assertion of the theory. Apart from what is being explained in the theory, I assumed there may be emerging themes or divergent themes in the case. I assumed that in this study, cacao farmers who have participated in the study are qualified and have sufficient knowledge and experience in farming in disaster-prone areas and can accurately identify adverse conditions, adaptive capacities, and resilience. I also assumed that the cacao farmers will provide an honest and accurate responses to the interviews that the research will make.

METHODOLOGY

In this chapter, I presented research design, locale of the study, sample and sampling technique, data gathering technique, data gathering procedures, data analysis, and trustworthiness.

Research Design

I utilized a qualitative descriptive study design to explore the adverse conditions, adaptive capacities, and the essences of resilience of cacao farmers living in disaster-prone areas of the Caraga Region. A qualitative descriptive study is particularly appropriate for understanding how individuals and communities experience and respond to complex realities shaped by environmental stress, livelihood uncertainty, and social interdependence. In this study, cacao farmers are not viewed merely as victims of disasters but as active agents who continually adapt, make decisions, and develop strategies that allow them to sustain their livelihoods in the face of recurring hazards

Locale of the Study

I conducted this study in Brgy. Coletto, Bislig City, Surigao del Sur. Over the past decade, Caraga has endured several significant weather-related disasters, highlighting its high exposure to climate and hydro-meteorological hazards. Among the most destructive events was Super Typhoon Odette, which made landfall in December 2021 and caused widespread devastation across parts of Mindanao, including Caraga. The typhoon severely damaged infrastructure, agricultural areas, and coastal settlements throughout the region. Satellite-based assessments confirmed extensive infrastructure destruction and vegetation loss in Caraga's coastal and low-lying areas (Cruz et al., 2022).

Sample and Sampling Technique

This study involved fifteen cacao farmers who are currently farming in disaster-prone areas of CARAGA region. To enrich the data and capture multiple perspectives related to the case, I also interviewed one officer from the cacao farmers' association and one supervisor specializing in cacao production who provided technical assistance to farmers. Their inclusion offered valuable insights into organizational support, production challenges, capacity-building efforts, and the external assistance available to cacao farmers in disaster-prone areas. These additional perspectives helped broaden the understanding of the farmers' experiences by incorporating both community-based leadership and technical expertise relevant to cacao farming and resilience practices.

In this study, I employed a purposive sampling technique to gather data. It is a non-probability sampling approach in which participants were intentionally selected based on specific characteristics, roles, or experiences relevant to the research problem (Patton, 2023; Merriam & Tisdell, 2024). This method enabled me to focus on information-rich participants who could provide deep and meaningful insights into the experiences, challenges, and coping mechanisms of cacao farmers in disaster-prone areas. Moreover, purposive sampling provided flexibility in identifying individuals who possessed firsthand knowledge of cacao production, disaster response, and institutional support systems. As such, it was particularly valuable in qualitative case study research where depth, relevance, and contextual understanding were prioritized over statistical generalization (Campbell et al., 2023; Creswell & Poth, 2024).

Data Gathering Techniques

For the collection of data, I conducted in-depth interviews with the chosen participants. An in-depth interview is a qualitative research technique that involves a close, one-on-one interaction between the researcher and the participant, aimed at eliciting detailed accounts of their experiences, perspectives, and interpretations through open-ended questioning (Kvale & Brinkmann, 2023; Seidman, 2024). Throughout the interview process, I documented all participant responses to ensure the accuracy, credibility, and completeness of the information gathered. This approach is particularly appropriate for studies that seek to develop a rich and nuanced understanding of complex phenomena, explore individuals' lived realities, and examine situation-specific difficulties and coping mechanisms (Kvale & Brinkmann, 2023).

Data Analysis Technique

I used thematic analysis to examine the data. It is a method of qualitative research that identifies, organizes, and interprets patterns or themes within the dataset. I am convinced that thematic analysis is a widely used qualitative analytic method for identifying, analyzing, and reporting patterns (themes) within data through a systematic yet flexible process that includes familiarization, coding, theme development, review, definition, and reporting. The advantages of this approach include its flexibility across different research paradigms, its accessibility for novice researchers, and its capacity to produce rich, detailed, and nuanced interpretations of qualitative data (Braun & Clarke, 2023).

Trustworthiness of the Study

To ensure the rigor and integrity of this qualitative research, I adhered to the trustworthiness criteria proposed

by Lincoln and Guba (1985): credibility, transferability, dependability, and confirmability. Credibility was established through my prolonged engagement with the research context and participants, as well as through in-depth, semi-structured interviews that generated rich accounts of their experiences. I also conducted member checking by asking participants to review their interview summaries or selected findings to confirm that their perspectives were accurately represented. Transferability was supported by providing detailed descriptions of the research setting, participant backgrounds, and emergent themes, allowing others to assess the applicability of the findings to similar disaster-prone farming communities. Dependability was ensured through careful documentation of the research process, including a clear audit trail of decisions made during data collection, coding, and analysis, together with reflexive notes and versioned interview guides. Confirmability was reinforced by grounding interpretations in direct participant quotations and by using triangulation through field notes, recorded interviews, and participant feedback to minimize bias. By adhering to these principles, I aimed to produce findings that were rigorous, meaningful, and relevant to cacao farmers, researchers, and policy makers working in disaster-prone contexts.

RESULTS

The succeeding narratives present the results of this study. They illuminate the research questions regarding the adverse conditions, adaptive capacities, and resilience of cacao farmers living in disaster-prone areas. I consider this section as the foundation for the discussions that follow and for framing the implications of resilience within climate-vulnerable agricultural communities.

Adverse conditions encountered by cacao farmers

My understanding of cacao farming in disaster-prone communities began when I visited the farms of the participants and interviewed them about their experiences as cacao farmers. I initially expected to hear about common agricultural problems such as pests or low production. What I encountered instead was a deeper reality shaped by geography, climate exposure, and recurring disasters.

As we walked through the farms, one participant explained that damage to cacao trees is almost inevitable whenever storms pass through their area. The participant stated:

“Sa 1,000 ka punoan nako, dili gyud mahimo nga walay madamage.” (Out of my 1,000 trees, it is impossible that none will be damaged.) (PH1, LN7–LN8)

This statement reflects the farmers’ acceptance that crop damage is a recurring part of farming in their region. Moreover, one of the most frequently mentioned challenges relates to the loss of soil nutrients. Many farms are located on rolling and sloping terrain, which farmers repeatedly described as *bakilid*. Because of this landscape condition, heavy rainfall easily washes away soil nutrients and fertilizer.

One participant explained:

“Pag ulan, maawas ang nutrients, ang abono... kay ang among kakawan diri wala sa patag, nasa rolling.” (When it rains, the nutrients and fertilizer are washed away because our cacao farm here is not on flat land, it is on rolling terrain.) (PH1, LN5–LN6)

Another participant reinforced this concern by describing how topsoil erosion weakens plant growth, saying:

“Bakilid baya among uma... mabanlas ang yuta ug ang ibabaw nga topsoil nga mao unta ang naay sustansya para sa tanom.” (Our farm is sloping... the soil gets eroded, including the topsoil that should contain nutrients for the plants.) (PH3, LN35–LN36)

These accounts demonstrated that soil degradation is not simply a temporary condition but a recurring environmental challenge that reduces long-term farm productivity.

Apart from soil problems, the participants frequently face physical damage caused by typhoons and strong winds. Several participants recalled how powerful storms destroyed cacao trees and branches.

One participant described the aftermath of Typhoon Odette, saying:

“Sa bagyong Odette daghan nangatumba nga cacao kay kusog gyud ang hangin ug walay dagkong kahoy nga makasagang.” (During Typhoon Odette, many cacao trees were uprooted because the wind was very strong and there were no large trees to serve as barriers.) (PH2, LN30–LN31)

Another participant described how strong winds cause flowers and branches to fall before fruits can fully develop. The participant gave this description:

“Kung kusog ang hangin... mangabali ang mga sanga ug mangataktak ang bulak sa cacao.” (When the wind is strong, the branches break and the cacao flowers fall off.) (PH5, LN42–LN43)

These accounts illustrated how climate disturbances repeatedly interrupt the growth cycle of cacao plants and force farmers to rehabilitate their farms after every major storm.

Additionally, environmental conditions also contributed to pest and disease outbreaks. The participants repeatedly mentioned mugtok (cacao pod borer) as the most damaging pest affecting their production.

One participant described the scale of the damage:

“Ang number one namo gyud nga problema kining mugtok... imbes 20 ka bunga imong maharvest, ang mapili nimo ana pito o walo na lang.” (Our number one problem is the cacao pod borer... instead of harvesting 20 pods, you can only select seven or eight.) (PH1, LN21–LN22)

Other participants reported diseases such as cherelle wilt and pod rot, which usually occur during continuous rainfall. One of the participants shared:

“Sa sige ug ulan, ang gagmayng bunga sa cacao mangaitom ug bugtokon.” (When the rain continues, the small cacao fruits turn black and become rotten.) (PH2, LN33–LN34)

These conditions demonstrated how humidity and rainfall intensify biological threats to cacao production.

Beyond environmental pressures, farmers also described structural limitations. Some of them observed that farmers in their communities have limited access to technological knowledge or are hesitant to adopt improved agricultural practices.

One participant stated:

“Kulang og teknolohiya ang farmers... dili kaayo sila moadapt sa bag-ong pamaagi.” (Farmers lack technology... they do not easily adapt to new methods.) (PH1, LN26–LN27)

Another challenge involves the transportation of planting materials obtained from government agencies. One of the participants said:

“Pananglitan 10,000 ang paliton nga seedlings... usahay 1,000 ang madamage sa trucking pa lang.” (For example, if 10,000 seedlings are purchased, sometimes 1,000 are already damaged during transport.) (PH1, LN11–LN12)

Taken together, these narratives revealed that the adverse conditions faced by cacao farmers are not isolated problems. Rather, they reflect interconnected pressures brought about by environmental conditions, technological limitations, and infrastructural constraints.

Adaptive Capacities of cacao farmers

Despite these adverse conditions, the farmers described various strategies they use to continue farming and protect their livelihoods.

One participant expressed a common sentiment among farmers:

“Wa man ta’y mahimo kay kinaiyahan man na... pangitaan na lang nato og paagi.” (We cannot do anything because that is nature... we just have to find ways to cope.) (PH1, LN56–LN57)

This statement reflected a practical mindset, acknowledging the unpredictability of nature while actively searching for solutions. Additionally, many farmers protect their cacao plantations by planting native trees and windbreaks along farm boundaries and riverbanks.

One participant explained:

“Namuhibuhi ko og mga native nga kahoy sa kilid-kilid sa sapa kay sila ang makasagang sa hangin.” (I planted native trees along the sides of the creek because they serve as barriers against the wind.) (PH1, LN58–LN60)

These trees reduce wind damage and help stabilize the soil. After storms, farmers rehabilitate damaged cacao trees by pruning broken branches and restoring soil nutrients.

A participant shared:

“Pamutlon ang mga nabali nga sanga ug mag-abono pagbalik para mobalik ang pamunga.” (The broken branches are cut, and fertilizer is applied again so the trees can bear fruit once more.) (PH2, LN68–LN69)

These actions demonstrated deliberate efforts to restore productivity after disasters. Further, farmers also apply preventive practices to reduce pest damage. One example is fruit bagging, which protects cacao pods from infestation.

As stated by one participant:

“Kung puston ang bunga, mga 80% mawala ang mugtok.” (If the fruits are bagged, about 80% of the cacao pod borer can be prevented.) (PH1, LN24–LN25)

Although effective, this practice often requires additional labor because of the large number of cacao trees in each plantation.

Moreover, the family members of the participants often assist in farm activities, as shared by the one of the participants:

“Nagtinabangay mi sa akong pamilya sa pag-atiman sa kakaw.” (My family and I help one another in taking care of the cacao farm.) (PH3, LN72–LN73)

Family cooperation reduces labor costs and strengthens farm management. Some farmers diversify their income through intercropping coconut trees with cacao. Diversification helps stabilize income when cacao harvest declines due to disasters. This was shared by one of the participants, saying:

“Nagtanom mi og coconut trees para naa gihapon lain source sa income.” (We planted coconut trees so that we would still have another source of income.) (PH5, LN80–LN81)

The Essence of Resilience

When farmers were asked about the lessons they learned from years of farming in disaster-prone areas, their responses revealed deeper reflections about resilience.

One participant summarized his experience in two simple words:

“Lahutay lang.” (Just endure.) (PH3, LN107)

The phrase captures the perseverance required to continue farming despite repeated losses. Further, another farmer reflected on the limits of human control over nature. As shared by one participant:

“Dili nato makontrol ang kinaiyahan, pero pwede nato andamon ang atong uma.” (We cannot control nature, but we can prepare our farm.)(PH5, LN117–LN118)

Farmers also developed a deeper understanding of environmental management. A participant pointed out:

“Ang cacao makatabang sa soil erosion kay ang iyang gamot mohawid sa yuta.” Cacao helps prevent soil erosion because its roots hold the soil together.)(PH1, LN111–LN112)

This highlights how farmers connect agricultural practices with environmental stability. Repeated exposure to disasters also strengthened farmers’ preparedness. One of them noted:

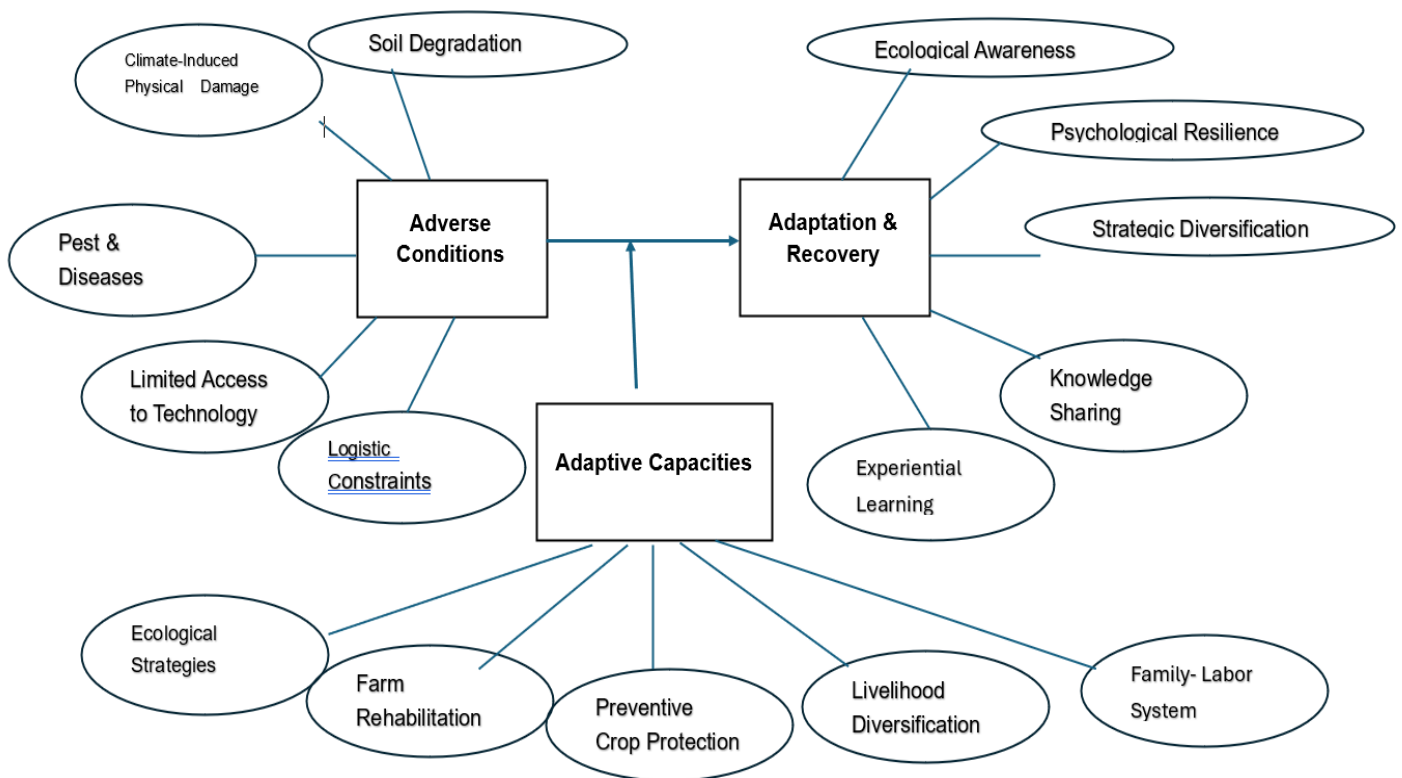
“Na immune na pod mis bagyo diri.” (We have already become used to typhoons here.)(PH3, LN113)

The phrase suggests that experience has transformed fear into familiarity and readiness.

The narratives of cacao farmers revealed that resilience in disaster-prone agricultural communities develops through continuous adaptation. The farmers face soil erosion, typhoon damage, pest infestations, and structural limitations. Yet they respond through ecological protection strategies, rehabilitation practices, preventive crop management, family cooperation, and livelihood diversification.

These experiences showed that resilience is not a single response to disaster but a long-term process shaped by environmental awareness, practical adaptation, social cooperation, and experiential learning. In the hills of the Caraga Region, where storms repeatedly pass and the wind rarely rests, cacao farmers quietly continue their work. Through patience, preparation, and perseverance, they sustain their farms and livelihoods despite the uncertainties that surround them.

Modified Paradigm



SUMMARY OF FINDINGS

- 1. Environmental hazards, biological threats, and structural limitations create adverse conditions for cacao farmers.** Cacao farmers experience recurring challenges caused by typhoons, strong winds, soil erosion, nutrient loss, pest infestations, and plant diseases that significantly affect farm productivity and

crop survival. These environmental pressures are intensified by farms located on sloping terrain, where rainfall easily washes away topsoil and fertilizer. In addition, limited access to technological knowledge, reluctance to adopt improved practices, and transportation losses of seedlings further constrain their farming capacity. These findings reveal that the adverse conditions encountered by cacao farmers are interconnected pressures arising from climate exposure, land conditions, biological threats, and weak support systems.

2. **Ecological strategies, farm rehabilitation, and livelihood diversification strengthen the adaptive capacities of cacao farmers.** Despite adverse conditions, cacao farmers demonstrate adaptive capacities by implementing practical strategies to sustain their farms and livelihoods. They protect plantations by planting native trees and windbreaks, rehabilitate damaged cacao trees through pruning and fertilization, and apply preventive pest management practices such as fruit bagging. Farmers also rely on family cooperation to reduce labor costs and improve farm management, while diversifying income sources through intercropping coconut and cacao. These responses show that farmers use their adaptive capacities with recurring risks through resourcefulness, collective effort, and continuous adjustment to changing environmental conditions.
3. **Ecological awareness, perseverance, and experiential learning define the resilience of cacao farmers.** Years of farming in disaster-prone communities have shaped cacao farmers' understanding of resilience as endurance, readiness, and the ability to learn from repeated hardships. Farmers recognize that while nature cannot be controlled, farms can be prepared through proper management and environmental stewardship. Their repeated exposure to typhoons and losses has transformed fear into familiarity, allowing them to respond with greater confidence and preparedness. These findings indicate that resilience among cacao farmers is not a single reaction to disaster, but a long-term process grounded in patience, adaptation, environmental awareness, and sustained commitment to their livelihoods.

DISCUSSIONS

In this chapter, I discussed the findings of my study and presented the implications for practice and future directions.

Environmental hazards, biological threats, and structural limitations create adverse conditions for cacao farmers.

The finding revealed that cacao farmers in disaster-prone areas of the Caraga Region face interconnected environmental, biological, technological, and institutional adverse conditions that affect productivity and livelihood stability. A major challenge is soil nutrient depletion and land degradation, especially in sloping areas. Farmers explained that heavy rainfall washes away nutrients and topsoil, reducing fertility and weakening cacao plants. This finding aligns with Borrelli et al. (2020), who showed that soil erosion in humid tropical systems reduces productivity through the loss of nutrient-rich topsoil and organic matter. Similarly, my findings affirm the idea of Panagos et al. (2021), emphasizing that erosion risk is significantly higher in sloped agricultural landscapes exposed to intense rainfall, where repeated soil loss progressively reduces long-term fertility and agricultural productivity.

Another adverse condition is climate-induced physical damage to cacao farms. Farmers reported typhoons, strong winds, and heavy rainfall causing fallen trees, broken branches, and flower drop, with Typhoon Odette frequently mentioned. This finding aligns with Lahive et al. (2021), who indicated that cacao is highly sensitive to climatic stressors that disrupt plant development and reduce yield stability. Likewise, my study also supports the idea of Schroth et al. (2023) highlighting that increasing climate variability intensifies plantation damage and necessitates repeated rehabilitation efforts.

Pest and disease incidence is another major concern, particularly cacao pod borer, cherelle wilt, and pod rot. Farmers identified pod borer as their "number one problem" due to severe yield loss. This finding aligns with Cilas and Bastide (2020), who explain that cacao production is strongly constrained by pest and disease pressures that are intensified by humid and wet conditions. Similarly, my study also supports the idea of Adu-Acheampong et al. (2022), noting that climate change influences pest dynamics and pathogen development, increasing the frequency and severity of cacao diseases, particularly under prolonged rainfall conditions that favor pod rot and

other fungal infections.

The fourth adverse condition is limited access to technology and adaptive practices. Participants noted insufficient knowledge, limited training, resistance to practices such as pod bagging, and weak preventive strategies. This finding aligns with Arslan et al. (2020), who emphasize that farmers' adaptive capacity is strongly influenced by access to extension services, knowledge systems, and innovation support. Likewise, my study supports the idea of Wainaina et al. (2021), highlighting persistent adoption gaps in climate-smart agricultural practices due to limited training, weak technical guidance, and labor constraints that hinder implementation of improved farm management strategies.

Finally, institutional and logistical constraints hinder recovery. Farmers reported damaged seedlings during transport, dependence on government planting materials, poor road access during rains, and repeated replanting after storms. This finding is supported by existing literature, particularly FAO (2021), which stresses that weak rural infrastructure and disrupted supply systems significantly reduce smallholder farmers' recovery capacity after climate-related shocks. Similarly, my study supports the idea of Thornton et al. (2020), underscoring that strong institutional support, reliable logistics, and infrastructure development are essential components of agricultural resilience in the face of increasing climate variability.

Overall, the adverse conditions are multidimensional and interconnected.

Ecological strategies, farm rehabilitation, and livelihood diversification strengthen the adaptive capacities of cacao farmers.

The finding showed that cacao farmers in disaster-prone areas of the Caraga Region mobilized their adaptive capacities through ecological strategies, rehabilitation practices, preventive crop protection, family labor systems, and livelihood diversification. One evident strategy is ecological buffering through farm-based protection. Farmers plant native trees, coconut trees, and windbreaks to shield cacao farms from strong winds and heavy rainfall. This finding is in line with López-Ridaura et al. (2021), who showed that agroforestry-based systems enhance farm resilience by improving ecosystem stability and regulating microclimatic conditions. Similarly, the present study resonates with Schroth et al. (2023), who emphasized that integrating trees into cacao systems strengthens soil protection and reduces vulnerability to extreme weather events in tropical landscapes.

Another adaptive capacity is post-disaster rehabilitation and farm management. After typhoons, farmers prune damaged branches, apply fertilizers, cultivate soil, and manage diseased plants to restore productivity. This finding aligns with Arslan et al. (2020), who report that smallholder farmers commonly rely on adaptive farm management practices such as replanting, pruning, and soil rehabilitation in response to climate-related disturbances.

Farmers also apply preventive crop protection strategies, especially pod bagging and early harvesting before heavy rainfall. This finding is in line with Cilas and Bastide (2020), who highlight that integrated pest management practices are essential in reducing cacao yield losses under humid tropical conditions. Similarly, my study supports the idea of Adu-Acheampong et al. (2022), emphasizing that preventive crop protection strategies improve yield stability by minimizing pest and disease damage, while IPCC (2022) noted that anticipatory adaptation measures reduce exposure to climate-related risks.

The study further revealed household and family-based adaptive capacities. Farmers rely on family labor and sometimes hire additional workers for tasks such as pod bagging and rehabilitation. This finding aligns with Eriksen et al. (2021), who stated that social networks and household labor-sharing systems significantly strengthen adaptive capacity among rural farming communities. Likewise, my study supports the study of Douchamps et al. (2021), emphasizing that cooperative labor arrangements enhance recovery efficiency and reduce vulnerability after climate shocks.

Finally, farmers adapted through livelihood diversification, particularly intercropping coconut with cacao. This finding affirms the idea of Waha et al. (2018), who explained that livelihood diversification reduces climate-related income risks by spreading economic dependence across multiple sources. Similarly, my study is in line

with FAO (2021), who highlighted that diversified farming systems strengthen household resilience by buffering shocks and stabilizing livelihoods.

Overall, cacao farmers in Caraga do not rely on a single adaptive capacities but employ an integrated set of adaptive strategies

Ecological awareness, perseverance, and experiential learning define the resilience of cacao farmers.

The experiences of cacao farmers revealed key essences on resilience and long-term adaptation. One major insight is ecological awareness and environmental stewardship. Farmers emphasized maintaining tree cover, avoiding “upaw” farms, and preserving native trees for protection. This finding aligns with the findings of Montagnini and Metzler (2018), showing that agroforestry systems enhance slope stabilization, soil retention, and erosion control in tropical landscapes. Similarly, my study supports the idea of Mbow et al. (2019), emphasizing improved resilience through biodiversity and microclimate regulation.

Another key insight is perseverance and psychological resilience. Farmers emphasized patience (“lahutay”) and endurance after disasters. This finding aligns with Cinner et al. (2018), who explained that resilience reflects the capacity to absorb disturbances while maintaining function. Likewise, my study supports the idea of Ungar (2021) and Southwick et al. (2019), emphasizing that resilience emerges from the interaction of individual coping capacity and environmental conditions.

The third insight is strategic diversification and adaptive planning. Farmers practiced intercropping and farm diversification to reduce risk. This finding aligns with Folke et al. (2021), who highlight adaptive management as essential for navigating uncertainty. Similarly, my study supports the idea of Birtal et al. (2021), showing that diversification strengthens income stability under climate risk.

Another insight is collective action and knowledge sharing. Farmers highlighted cooperation and shared learning. This finding aligns with Reed et al. (2020), Ensor and Harvey (2015), and Eriksen et al. (2021), who emphasized that social learning strengthens adaptive capacity through collaboration and shared experience.

Finally, farmers demonstrated experiential learning and adaptive maturity. They described learning from repeated typhoons and improving preparedness over time. This finding aligns with Berkes and Ross (2018) and Biggs et al. (2021), who explain that resilience develops through iterative learning from disturbances.

Overall, resilience is developed over time through ecological awareness, perseverance, diversification, collective action, and experiential learning.

IMPLICATIONS FOR PRACTICE

With the findings of this study, I discovered the situations of cacao farmers in disaster-prone areas in encountering interconnected environmental, biological, technological, and institutional challenges that affect productivity and livelihood stability. To overcome these, I believe that farmers may strengthen ecological coping strategies such as maintaining agroforestry systems, planting windbreaks, and avoiding “upaw” or bare farms to reduce soil erosion and protect crops from strong winds and heavy rainfall. With the help of LGU leaders, they may also enhance adaptive farm management through timely pruning, soil rehabilitation, fertilizer application, and disease control after disaster events to restore productivity. In addition, farmers may adopt preventive and climate-smart practices such as pod bagging, early harvesting before heavy rainfall, and crop diversification like intercropping cacao with coconut to reduce risks and stabilize income. Strengthening access to training, extension services, and appropriate technologies may further improve adaptive capacity, while reinforcing family labor systems and farmer cooperation through associations can enhance knowledge sharing and collective farm recovery efforts. These integrated strategies enable farmers not only to cope with recurring climate-related hazards but also to gradually build long-term resilience and sustain their livelihoods.

FUTURE DIRECTIONS

Future studies may include multiple linear regression analysis involving disaster-related farming challenges such

as excessive rainfall, pest infestation, and lack of farm inputs as determinant variables, and coping mechanisms such as intercropping, use of windbreak trees, and pruning practices as criterion variables. Mediation analysis may also be conducted using coping mechanisms as mediating variables on the relationship between disaster-related challenges and cacao farmers' farm productivity and resilience outcomes. Lastly, Exploratory Factor Analysis may be pursued in developing instruments for disaster-related farming challenges, coping strategies, and farm resilience variables, utilizing the emerging sub-themes as indicators for the variables.

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