

**THE RESILIENCE OF COCONUT FARMERS IN SUSTAINING LIVELIHOOD IN
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University of Southeastern Philippines,**ABSTRACT**

Resilience among coconut farmers in sustaining their livelihood was the focus of this study conducted in Davao Occidental. Coconut farmers had been able to provide and earn a living through coconut farming despite living in areas where coconut contributed largely to their economy. However, coconut farmers still face several economic, environmental, and social challenges threatening the continuity of their livelihood. This study was anchored on Resilience Theory and the Sustainable Livelihood Framework and sought to identify latent dimensions that explained the resilience of coconut farmers. Furthermore, this research created an intervention framework grounded on its findings.

A quantitative research method with Exploratory Factor Analysis was used. Through the administration of a survey questionnaire, 150 registered coconut farmers in Davao Occidental were purposively gathered and served as respondents for this study. Results were gathered and assessed through the following tests: Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, Bartlett's Test of Sphericity, Total Variance Explained, Scree Plot Analysis, and Rotated Component Matrix.

Findings showed that KMO value of .837 indicated that data gathered was factorable. Moreover, the Bartlett's Test of Sphericity was significant ($p < .001$). Three factors were discovered that explained how coconut farmers sustained their livelihood: Physical Capital, Human Capital, and Financial Capital. Physical Capital described the concrete or farm infrastructure including transportation and accessibility to farm tools and equipment. Human Capital addressed knowledge, skills, training, and adaptive capacities in farm operation and possible risks. Financial Capital referred to savings, financial stability or regular income, access to loans, and financial recovery after unforeseen incidents. These three resilient dimensions uncovered in this study explained factors which allowed coconut farmers to cope up with challenges and adapt to various livelihood situations they may encounter.

The resilience framework and proposed intervention program were established based on results to enhance physical, human, and financial capitals of coconut farmers Davao Occidental. The study can conclude that all three factors are necessary to increase farmers' capacity to adapt to situations affecting their livelihood and improve their overall resilience. This study may also help policymakers, local government officials, Philippine Coconut Authority, and other stakeholders create sustainable and evidence-based programs and policies that may aid the development of coconut farmers in the long run.

Keywords:

resilience, coconut farmers, sustainable livelihood, physical capital, human capital, financial capital, exploratory factor analysis, Davao Occidental

INTRODUCTION

In tropical countries like Philippines, coconut (*Cocos nucifera* L.) is predominantly found. Coconut has a diverse ecological and economic functions that is why it is referred as the "tree of life". It is also considered as one of the most important agricultural commodities in the country which provides a vital source of livelihood for more than 3.5 million Filipino farmers. According to Philippine Coconut Authority (PCA 2022), almost one-third of the country's agricultural land area is coconut production area, which produce about 14.7 million metric tons annually and generate around PhP 91.4 billion in export earnings. Thus, the Philippines rank as the world's

second-largest coconut producer and leading exporter of coconut products. This indicates that coconut farming in the country plays a significant role in economy.

In the Philippines, Davao Region is the highest share contributor of coconut production, it produces about 1.9 million metric tons annually. Among the regions five provinces, Davao Occidental is one of the major contributors because of its favorable climatic conditions and extensive coastal terrain that are suitable for coconut production. According to Philippine Statistics Authority (PSA 2023), the agricultural land area of Davao Occidental is primarily used for coconut production, it occupies about 63,100 hectares, representing almost 68%. This indicates that coconut farming is the primary source of livelihood for most of the residents in the province.

Contrary to the economic significance of coconut farming, coconut farmers still belong to the poorest and one of the most vulnerable households in the agriculture sector. Current literature indicates that coconut farming is experiencing a wide spectrum of economic, environmental, and social problems (Aguilar et al., 2023; Bentayao et al., 2025; Gurbuz & Manaros, 2019; Herrera et al., n.d.; Jayasekhar et al., 2024). The issues mentioned are interconnected and threatening the productivity, profitability, and sustainability of coconut farming. As such, this study seeks to look into the resilience of coconut farmers in sustaining livelihood in Davao Occidental.

It is vital to study about resilience among coconut farmers in sustaining livelihood because the data that will be gathered from this study will serve as foundation in formulating and designing more inclusive data-driven intervention programs that will aid in enhancing the resilience of coconut farmers. Moreover, this will help the country commit with its support to the Sustainable Development Goals (SDGs) as this study will majorly contribute to SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 8 (Decent Work and Economic Growth), and SDG 12 (Responsible Consumption and Production).

OBJECTIVES

This study aims to examine the resilience of coconut farmers in sustaining livelihood in Davao Occidental.

Specifically, this study aims to answer the following questions:

- 1) What is the level of resilience of coconut farmers in sustaining livelihood?
- 2) What framework can be developed based on the findings of the study?
- 3) What interventions can be proposed to strengthen the resilience of coconut farmers in sustaining livelihood in Davao Occidental?

METHODOLOGY

This study employed a quantitative research design using Exploratory Factor Analysis (EFA). EFA is a multivariate statistical tool that will be used to identify the underlying factor structures among the observable variables. In social science research, EFA is widely recognized as a valuable tool for assessing construct validity, improving measurement instruments, and exploring relationships among variables. It also identifies cross-loading or inappropriate objects that can be removed to enhance the reliability of instrument. (Reio & Shuck, 2015), stated that the interpretability of factor is crucial to effective application of EFA. Additionally, EFA enables the researcher to have a systematically and empirically grounded assessment of the factors contributing to the resilience of coconut farmers in sustaining livelihood in Davao Occidental.

The study utilized primary data sources obtained from registered coconut farmers in Davao Occidental. Data were collected through structured survey questionnaire, which was administered to a sample of 150 registered coconut farmers residing in Davao Occidental whose primary source of livelihood is coconut farming.

The main instrument used in data gathering was structured survey questionnaire. The questionnaire is focused on factors affecting the resilience of coconut farmers in sustaining livelihood. The study employed five-point Likert scale to interpret the responses of coconut farmers in Davao Occidental, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree.

A purposive sampling method was used to collect data from coconut farmers of Davao Occidental. Purposive sampling was appropriate for this study since it only wanted coconut farmers who are currently involved in coconut farming. The researcher also wanted respondents who can give meaningful information based on their experience specifically to coconut farming for at least five (5) years in order to understand deeper the factors that lead to their resilience towards his/ her situation. In total, 150 coconut farmers who live in Davao Occidental were included in this study as respondents to the structured survey questionnaire.

RESULTS AND DISCUSSION

This chapter presents the analysis and interpretation of the data gathered from 150 registered coconut farmers in Davao Occidental. The collected data were statistically analyzed using Exploratory Factor Analysis (EFA) to determine the underlying dimensions influencing the resilience of coconut farmers in sustaining their livelihood. Findings were presented through Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity, Total Variance Explained, Scree Plot Analysis, Rotated Component Matrix, and Rotated Component Matrix with Grouped Attributes. This methodological procedure was conducted to determine factors that mostly contribute to the resilience of coconut farmers in maintaining livelihood.

Dimensions of the Resilience of Coconut Farmers in Sustaining Livelihood

The following statistics will be presented, this includes KMO and Bartlett's Test, Total Variance Explained, Scree Plot, Rotated Component Matrix, and Rotated Component Matrix with Grouped Attributes.

KMO and Bartlett's Test. The data was then analyzed with Exploratory Factor Analysis (EFA) including Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. KMO and Bartlett's Test are measures utilized to validate whether EFA should be undertaken on the gathered data. KMO is utilized to determine the adequacy of sample size. Kaiser (1974) recommended that "KMO values greater than 0.90 are marvelous, values between 0.80 and 0.89 are meritorious, values between 0.70 and 0.79 are middling, values between 0.60 and 0.69 are mediocre, values between 0.50 and 0.59 are miserable, and values less than 0.50 are unacceptable" (p. 731).

As presented in Table 1, KMO was calculated at 0.837 (between 0.80 and 0.89), therefore suggesting that sample size was sufficient and correlations among variables were adequate enough to factor into reliable and useful factors. Bartlett's Test of Sphericity was then evaluated, showing an approximate chi-square value of 2459.345 with degrees of freedom at 435 and a significance value of 0.000 which is less than the significance level of .05. Since the sample's KMO value was greater than the recommended value of .60 and the Bartlett's Test is significant ($p < .05$), the data met assumptions for factor analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.837
Bartlett's Test of Sphericity	Approx. Chi-Square	2459.345
	df	435
	Sig.	0.000

Table 1. KMO and Bartlett's Test

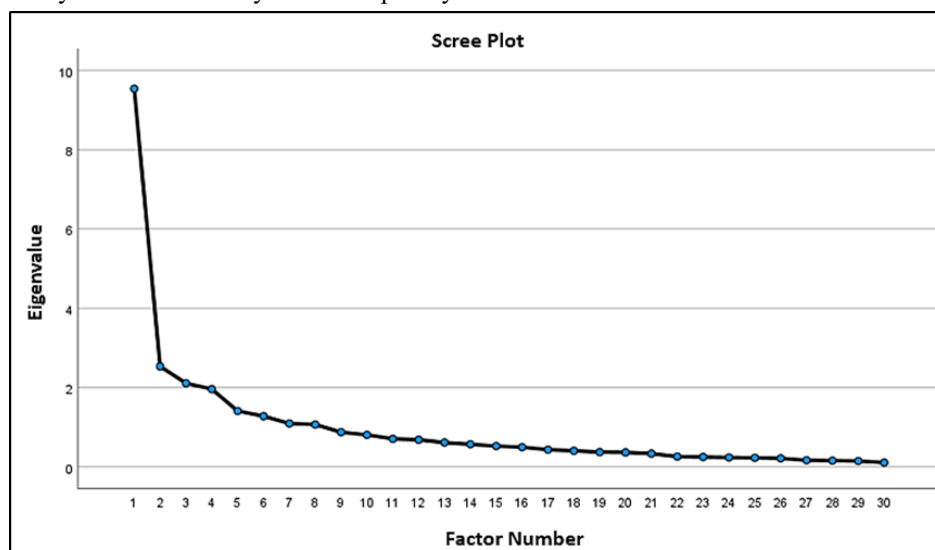
Total Variance Explained. The Exploratory Factor Analysis also measured how much of the variance was explained. Explained variance refers to how much of the dataset is explained by the extracted factors. Table 2 shows the Initial Eigenvalues, Extraction Sums of Squared Loadings, and Rotation Sums of Squared Loadings.

As shown in column titled Initial Eigenvalues, eight factors have eigenvalues greater than 1.0 meeting Kaiser's Criterion. Factor 1 had the highest Eigenvalue at 9.541 with 31.805% variance explained. It means that Factor 1 accounted for most of the common variance in the observed variables. The rest of the factors explained significant portions of variance. Factor 2 had 8.455%, Factor 3 had 7.041%, Factor 4 had 6.543%, Factor 5 had 4.702%, Factor 6 had 4.271%, Factor 7 had 3.653%, and Factor 8 had 3.562%. These eight factors explained 70.032% of the variance which is acceptable in social science studies. As shown in column titled Rotation Sums of Squared Loadings, the explained variance was rotated so each extracted factor explained similar amount of variance using Varimax rotation. Total variance explained stayed the same; however, rotated factor loadings were simplified for clarity. Results show that extracted factors were able to explain resilience of coconut farmers to sufficiently sustain livelihood in multidimensional ways.

Factor s	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.541	31.805	31.805	9.541	31.805	31.805	3.307	11.024	11.024
2	2.537	8.455	40.260	2.537	8.455	40.260	3.267	10.889	21.914
3	2.112	7.041	47.301	2.112	7.041	47.301	3.162	10.538	32.452
4	1.963	6.543	53.844	1.963	6.543	53.844	3.098	10.325	42.777
5	1.411	4.702	58.546	1.411	4.702	58.546	2.767	9.223	52.000
6	1.281	4.271	62.816	1.281	4.271	62.816	2.755	9.183	61.183
7	1.096	3.653	66.469	1.096	3.653	66.469	1.412	4.707	65.890
8	1.069	3.562	70.032	1.069	3.562	70.032	1.243	4.142	70.032

Table 2. Total Variance Explained

Scree Plot. Figure 2 shows the scree plot graphing the number of factors extracted against their eigenvalues. The scree plot helps determine how many factors should be retained in an analysis. The scree plot showed a rapid decrease in eigenvalues from Factor 1 through Factor 3, and then the decline of the curve started to level off at Factor 4. The point at which the curve starts to level off (shown as an “elbow” in the image above) represents the point at which factors account for significantly less variance. In other words, the first three factors extracted the majority of useful information, and subsequent factors accounted for minimal variance. The scree plot thus indicated that three factors should be retained. This provides further evidence that the results of the factor analysis are statistically and conceptually consistent.

**Figure 2. Graphical Explanation of Total Variance**

Factor Retention and Reliability Analysis. Exploratory Factor Analysis was conducted on the 30 survey items that formed part of the questionnaire. Even though extraction revealed that there were eight factors with eigenvalues greater than 1.0, after examining the scree plot along with theoretical interpretability and parsimony, only three factors were retained.

Varimax rotation was then used to extract a more interpretable factor structure. The three extracted factors explained 32.452% of the variance of the data. Of the 30 survey items, only 14 items were included in the final factor structure. Several items were removed due to low communalities or factor loadings, as well as cross-loadings.

The three factors that were retained were Physical Capital, Human Capital and Financial Capital.

Rotated Component Matrix with Group Attributes.

Physical Capital. Physical Capital emerged as the first dimension influencing the resilience of coconut farmers in sustaining livelihood. This dimension consisted of five items associated with farm infrastructure, transportation access, and the availability of farming tools and equipment. These components reflect the importance of tangible agricultural resources in ensuring productivity, operational continuity, and long-term livelihood sustainability among coconut farmers.

The following items were associated with this factor: “My farm infrastructure is adequate to support production” (0.719); “I have access to transportation for selling my products” (0.689); “My farm tools are in good working condition” (0.673); “I have access to tools and equipment needed for coconut farming” (0.661); and “I can easily repair or replace damaged farm equipment” (0.639).

As presented in Table 3, Item 12 obtained the highest factor loading of 0.719, while Item 15 recorded the lowest factor loading of 0.639. All retained items exceeded the acceptable factor loading threshold of 0.50, indicating strong relationships with the identified dimension.

Dimension	Item No.	Attributes	Factor Score
Physical Capital	12	My farm infrastructure is adequate to support production.	0.719
	13	I have access to transportation for selling my products.	0.689
	14	My farm tools are in good working condition.	0.673
	11	I have access to tools and equipment needed for coconut farming.	0.661
	15	I can easily repair or replace damaged farm equipment.	0.639

Table 3. Rotated Component Matrix with Grouped Attributes of Physical Capital

This finding is supported by the study of (F. X. Aguilar et al., 2022), which highlighted that limited access to water resources, infrastructure, and productive farm assets significantly constrains smallholder farmers' adaptive capacity to climate-related shocks, while improved access enhances resilience and livelihood stability; similarly, (Varela et al., 2022) emphasized that climate-resilient agriculture is strongly dependent on the availability of farm infrastructure, production technologies, and institutional support systems that reduce vulnerability to environmental risks; furthermore, (Abagat et al., 2017) found that inadequate rural infrastructure and limited financial and informational resources significantly weaken farmers' capacity to respond effectively to flooding and climate variability, underscoring the critical role of physical assets in strengthening agricultural resilience and sustainability in rural farming communities.

Human Capital. Human Capital formed the second dimension that influence resilience. Human Capital included five items regarding farm knowledge and skills, technical abilities, adaptability capacity, training and seminars attended. Human capital relates to farmers' abilities and capacities to manage farming operations, confront risk and adopt adaptive practices.

The following items are associated with these factors: ‘I attend training or seminars related to coconut farming.’ (0.753); ‘I know how to prepare for climate-related risks (e.g., drought, typhoon)’ (0.724); ‘I have the necessary knowledge to manage my coconut farm effectively.’ (0.673); ‘I have the skills to adjust my farming practices during emergencies’ (0.619); and ‘I can easily learn new farming techniques when needed.’ (0.612). As presented in Table 4, Item 4 has the highest factor loading (0.753) and item 3 has the lowest factor loading (0.612). Factor loadings above 0.60 show strong intercorrelations among items

Dimension	Item No.	Attributes	Factor Score
Human Capital	4	I attend training or seminars related to coconut farming.	0.753
	2	I know how to prepare for climate-related risks (e.g., drought, typhoon).	0.724
	1	I have the necessary knowledge to manage my coconut farm effectively.	0.673
	5	I have the skills to adjust my farming practices during emergencies.	0.619
	3	I can easily learn new farming techniques when needed.	0.612

Table 4. Rotated Component Matrix with Grouped Attributes of Human Capital

Human capital may also be one of the key determinants influencing adaptive capacity and resilience of coconut farmers, as access to information/knowledge, trainings, and skills correlated with stronger responses to address challenges faced by coconut farmers. Access to agricultural training/extension was found to have positive relationships with farmers' adaptive actions, decision-making processes, and productivity during periods of climate stress. Structured agricultural trainings have been found to significantly increase farmers' uptake of practices that improved their resilience to climate change and strengthened their livelihood sources in smallholder production systems (Dar et al., 2020). Furthermore, farmer field school programs and other participatory extension methods have been found to consistently improve participants' human capital through increases in technical knowledge, self-efficacy, and ability to think innovatively, contributing to greater resilience (Van Den Berg et al., 2020). The Organization for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization (FAO) have similarly identified that investments in human capital through training and continuous agricultural advisory services are critical for sustainable food production and rural resilience.

Financial Capital. Financial Capital was identified as the third dimension contributing to resilience. This dimension contained 4 items related to savings, steady sources of income, financial recoverability, and loans/credit assistance.

The following items are associated with these factors: 'I have savings that can support me during emergencies.' (0.800); 'I have a stable income from coconut farming.' (0.753); 'I can financially recover quickly after unexpected events' (0.733); and 'I have access to loans or credit for farm needs' (0.576).

Dimension	Item No.	Attributes	Factor Score
Financial Capital	22	I have savings that can support me during emergencies.	0.800
	21	I have a stable income from coconut farming.	0.753
	24	I can financially recover quickly after unexpected events.	0.733
	23	I have access to loans or credit for farm needs.	0.576

Table 5. Rotated Component Matrix with Grouped Attributes of Financial Capital

Strongly agree with this item as financial capital allows farmers to maintain livelihood security and increase their ability to bounce back. When coconut farmers have enough savings, access to credit facilities, and sources of income that are stable and secure, they can insure themselves against potential risks and improve their capacity to recover from economic downturns and environmental disasters. (Fronda, 2024). Evidence from studies examining the relationship between financial inclusion and farmer resilience aligns with this finding, suggesting that access to financial services enables farmers to better smooth consumption, invest in production, and manage agricultural risks (Masdo & Panday, n.d.). Research on microfinance and rural finance programs also supports the notion that access to formal and informal financial services contributes to stronger economic resilience and adaptive capacity among smallholder farmers in developing nations (Geron et al., 2016).

Additionally, recent evidence on farmer financial literacy and credit behavior reinforces the importance of improved financial access in enhancing farmers' ability to cope with and respond to shocks, particularly through savings and credit facilities which allow farmers to allocate more resources towards productivity-increasing inputs (Retnoningsih & Chung, 2025). Taken together, these studies suggest that access to financial capital is an important driver of farmer resilience.

According to Hair et al. (2014), factor loadings above 0.50 are considered significant, indicating that these items are strong indicators of the variable they are intended to measure. The results suggest that the three factors, human, financial, and physical capital are distinct and meaningful components of overall coconut farmers resilience in sustaining livelihood.

Framework Developed Based on the Findings

Results of the study determined that three interrelated dimensions best describe coconut farmers' resilience to sustain livelihood, namely Physical Capital, Human Capital, and Financial Capital. Physical capital addresses factors related to farm setup and livelihood assets such as infrastructure, transportation, and farming equipment. Human Capital includes knowledge and skills, adaptive capacities, and agricultural training that helped farmers respond to risks properly. Financial capital focuses on factors like having a regular income, savings, capacity to financially recover, and received financial help/capacity to borrow in maintaining a livelihood amidst uncertainty. Furthermore, dimensions were noted to function as subsystems that farmers go through in preparing for, enduring, adapting, and recovering from economic, environmental, and institutional risks that affect coconut farming. As such, the study's conceptual framework gave ample grounds to developing programs and policies that will strengthen the resilience of coconut farmers in sustaining livelihood particularly in Davao Occidental.

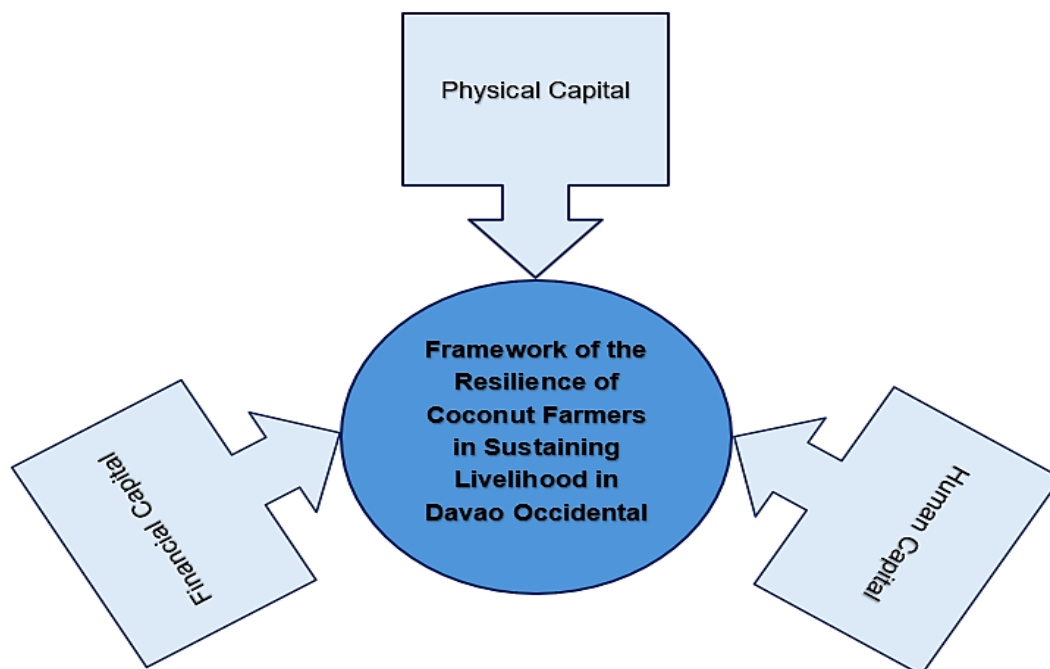


Figure 3. Study Framework Revealing the Extracted Three Dimensions

PROPOSED INTERVENTION PROGRAM

This proposed integrated intervention program aims at enhancing sustaining livelihood resilience in Davao Occidental based on the three-dimensional aspects revealed by the study. The program's main objective is to prepare and develop coconut farmers through education, skills training and creating learning communities that are resilient in terms of preparedness, adaptability and response and recovery leadership whenever faced with situations that can potentially impact the productivity, profitability and sustainability of coconut production.

Intervention Program Title: STRENGTHENING THE RESILIENCE AND SUSTAINABLE LIVELIHOOD OF COCONUT FARMERS IN DAVAO OCCIDENTAL

I. Program Description

This intervention specifically targeted to strengthen the resilience of coconut farmers in sustaining livelihood in Davao Occidental through addressing the three (3) key dimensions concluded in this study which are Physical Capital, Human Capital, and Financial Capital. These variables were proven to help farmers sustain coconut production and farm productivity as well as provide economic adequacy.

The program seeks to enhance access to farm infrastructure, transportation, tools, and equipment; improve farmers' knowledge and technical competencies in coconut farming; and strengthen financial security through savings promotion, income stabilization, and improved access to credit facilities. Through these interventions, coconut farmers will be better equipped to sustain their livelihoods and improve their overall well-being.

II. Rationale

Livelihood resilience refers to the ability of individuals and households to maintain and improve their livelihood despite challenges and uncertainties. According to the Sustainable Livelihood Framework developed by the Department for International Development (DFID, 1999), access to livelihood assets significantly influences the sustainability of rural livelihoods. Among these assets, physical, human, and financial capital play crucial roles in enhancing sustainable livelihood outcomes, adaptive capacity and sustained socioeconomic well-being (Azhari et al., 2025; Su et al., 2021).

Physical capital is concerned with having farm facilities or infrastructures, transportation facilities, tools and equipment needed to run farm operations effectively and efficiently. (Su et al., 2021) stated productive assets and good infrastructure support farmers livelihood activities by increasing their ability to work productively and earn income, positively affecting their sustainable livelihoods. Therefore, farmers who have enough farm facilities and access to agricultural equipment tend to help them keep their production efficient, continue their farming business, and increase farm performance.

Human capital pertains to the individuals' knowledge, skills, training, and competencies needed to perform their livelihood-related activities successfully. According to FAO (2017), farmers who are provided with learning opportunities and agricultural trainings would improve their technical knowledge and skills that translate into increased productivity and better decision-making skills in farm management. Ferrer et al. (2023) also reported that farmers' knowledge and understanding along with training and information access affect climate-smart agriculture technologies adoption decision-making and farm management.

Financial capital refers to the financial resources available to individuals and households, including savings, income, loans, credit facilities, and other economic assets that can be used to support livelihood activities. According to the Sustainable Livelihood Framework financial capital is an essential livelihood asset that households can invest in livelihood activities. Examples of financial capital may include funds that are used to purchase farm inputs, cope with livelihood shocks, improve livelihood resilience, and aid long-term livelihood sustainability (Czekaj et al., 2020; Wulandari et al., 2025). Financial capital can help farm households invest in agricultural productive activities and purchase farm inputs that will help them mitigate livelihood shocks when they occur. As such, farmers with access to financial capitals can sustain farm livelihoods and adapt to changes when faced with unpredictable financial situations.

The findings of this study revealed that physical capital, human capital, and financial capital significantly influence the resilience of coconut farmers in sustaining livelihood. Consequently, an intervention program focusing on these dimensions is necessary to strengthen farmers productive capacity, enhance technical competencies, and improve financial stability.

III. Objectives

Considering the challenges faced by coconut farmers in Davao Occidental, it is essential to implement a comprehensive intervention program that strengthens the key livelihood assets necessary for sustainable agricultural development. The findings of the study revealed that Physical Capital, Human Capital, and Financial Capital significantly influence the resilience of coconut farmers in sustaining livelihood. Limitations in farm infrastructure, technical knowledge, and financial resources can reduce productivity, constrain adaptive capacity, and increase vulnerability to economic and environmental shocks. Thus, this intervention program will provide solutions to aid farmers improve their productive resources, equip them with knowledge and skills, and increase their financial stability. Investment in these assets will allow coconut farmers to sustain agricultural production, improve household well-being, and achieve long-term economic resilience.

Specifically, this intervention aims to:

- 1. Improve the adequacy of farm infrastructure to support coconut production and related farming activities.** Farm operations should be as efficient as possible, which requires adequate infrastructure. This objective seeks to enhance farm buildings, storage facilities, irrigation facilities and other supporting structures that can help make coconut farming convenient and less constrained.

2. **Enhance farmers' access to transportation facilities for the efficient movement and marketing of agricultural products.** Functional farm equipment allows farmers to work faster and more efficiently. This objective will help farmers acquire working tools and equipment they can use to prepare their land for planting, harvest their crops, maintain their farms and more.
3. **Improve the condition, functionality, and availability of farm tools and equipment used in coconut farming.** Farmers need tools and equipment that work well so they can work smarter. This goal intends to provide farmers access to dependable farm equipment and quality tools they can use to cultivate their land, harvest their crops and maintain their farms.
4. **Increase farmers' access to essential farming tools and machinery needed to improve farm productivity.** Availability of appropriate modern agricultural machinery reduces drudgery and helps attain increased productivity with less labor force. The objective is to ensure availability of machines and equipment that help farmers manage farms efficiently leading to higher production.
5. **Strengthen farmers' capacity to maintain, repair, and replace damaged farm equipment to ensure continuous farm operations.** Regular maintenance and repair of agricultural equipment are critical. This objective works toward improving farmers knowledge and skills around equipment maintenance, while facilitating ways for them to mobilize resources for repair and replacement.
6. **Increase farmers' participation in training programs, seminars, and other capacity-building activities related to coconut farming.** There is a need to keep learning if we want to improve agricultural practices as well as learn how to deal with new challenges. This objective encourages participation in educational and training efforts to further develop farmers skills and technical knowledge.
7. **Enhance farmers' knowledge and technical skills necessary for effective coconut farm management and production.** Having technical knowledge will greatly help farmers maximize productivity. This objective aims to upgrade the farmers knowledge on modern agriculture and coconut production technology.
8. **Improve farmers' competencies in planning, decision-making, and farm management practices.** Good farm management skill includes proper planning and decision making. This objective is set to empower farmers with managerial skills that will allow them to efficiently manage their farms.
9. **Strengthen farmers' ability to learn, adopt, and apply improved farming techniques and technologies.** New technologies can create possibilities for increasing productivity and decreasing risks in production. This objective directs its attention to improving farmers' willingness to accept new methods and their ability to put improved technologies into practice.
10. **Enhance farmers' awareness and preparedness in managing production-related challenges that may affect farm productivity.** Farm production can be disrupted by many factors such as pests, disease, weather, and market forces. This objective addresses the readiness and resilience of the farmer by increasing awareness of these risks and the best mitigation practices.
11. **Promote savings practices among coconut farmers to improve financial preparedness and security.** Having savings can provide financial cushion during times of need. The objective is to promote regular savings from coconut farmers that can be used to aid their household and farm during crisis.
12. **Improve the stability and sustainability of income generated from coconut farming activities.** Consistent income is important for the viability of agricultural production and to household welfare. This objective aims to increase stability of opportunities for income generation.
13. **Strengthen farmers' capacity to recover financially from unexpected events and economic difficulties.** Financial resilience enables farmers to withstand economic shocks and continue productive activities. This objective aims to improve farmers' ability to manage risks and recover from unforeseen circumstances affecting their livelihoods.
14. **Increase farmers' access to loans, credit facilities, and financial assistance programs for farm development and livelihood improvement.** Financial services can provide opportunities for farmers to invest in their operations and improve their livelihoods. This objective aims to help farmers access formal and informal loans, credit, and financial assistance to support their farm development and livelihood growth.

15. Enhance farmers financial management skills to support informed decision-making and long-term financial sustainability. Financial management is crucial in helping farmers improve their livelihood. This objective aims to help farmers better manage budgets, financial planning, resource allocation, and investments.

IV. Strategic Approach

The intervention program shall take on a Livelihood Asset Enhancement Approach based on the Sustainable Livelihood Framework. SLF approach acknowledges that livelihood assets must be improved for households in rural areas to have better life. The SLF approach shall particularly target the Physical Capital, Human Capital and Financial Capital aspects of coconut farmers in Davao Occidental because these livelihood assets are found to affect livelihood sustainability and resilience according to this study. Capacity building, provision of resources, linkage to institutions, and financial improvement programs will allow coconut farmers to overcome constraints in accessing livelihood assets needed for production and adaptive capacity.

Livelihood interventions should also be farmer-participatory and community-based. Planning, implementing, monitoring, and maintaining interventions should be conducted with the farmers and key stakeholders like LGU, agricultural agencies and cooperatives, etc. Lastly, since the improvement of livelihood is multi-faceted, improvement of productive assets, technical skills, and financial stability should be addressed simultaneously.

1. Physical Capital Enhancement Strategy

Enhancing physical capital involves ensuring easy access to agricultural infrastructure and facilities, farm equipment, and machinery which farmers can use to improve their coconut production. Investment in physical capital may be limited due to the poor quantity of resources that are available to farmers. The program will mobilize resources to help in the development of more infrastructure and increase access to farm tools and machinery through sharing programs. Collaboration will be done with government and agriculture-based organizations to ensure availability of farm resources. Programs to train farmers on how to maintain the equipment and use them effectively will be implemented. When physical capital is increased, farmers will have better access to do their farm operations more efficiently minimizing their costs therefore; increasing productivity.

2. Human Capital Development Strategy

The primary focus of Human Capital Development Strategy is investing in farmers' knowledge, skills, competencies, and adaptive capacity. Activities related to continuous training and capacity building like technical trainings, agricultural extension and demonstration farms, seminars, and skills building focused on improved agricultural practices and adopting new ideas will be part of the strategy. The intervention will promote lifelong learning by providing farmers access to updated information and knowledge on coconut production and farm management, adapting to climate and modern agricultural practices, pest management strategies, and other technologies that can aid them in their daily operations. When farmers are given the opportunity to learn and grow through trainings they will have increased capacity on how to identify proper solutions to increase their productivity and manage farm-related issues. Empowering farmers and investing in their human capital will allow them to adapt to present and future conditions.

3. Financial Capital Strengthening Strategy

Increased access to financial savings, credit options, government financial support programs and training on financial literacy will be addressed through the Financial Capital Strengthening Strategy. Financial barriers have the potential to limit agricultural growth and the recovery process following an economic disruption. This program will reinforce interventions that aim to strengthen farmers' ability to responsibly spend and save with future financial goals in mind. Workshops on financial literacy, as well as building relationships with financial institutions, government support programs, and campaigns to increase savings rates will be introduced to farmers. These components will allow farmers to have an increased ability to obtain the financial resources necessary to invest in their farms and livelihoods. Other skills that will be addressed through this program include bettering farmers' ability to handle risk, diversifying their income, and preparing for unexpected events that have the ability to disrupt production.

V. Methods. The following strategies will be integrated into the intervention in order to best meet the desired outcome which are capacity building and empowerment strategies. Educational capacity building trainings and seminars will be provided to farmers to help improve their knowledge, skills, and competencies on coconut production, farm management, sustainable agriculture, and livelihood development. Coaching and technical farm advice will be conducted by partnering with agriculture

experts and agriculture extension workers who can provide hands-on advice and mentorship to farmers. Resource empowerment will be achieved by providing farm equipment and tools to farmers as well as ensuring that infrastructure programs are set in place to help farmers have better access to productive assets, transportation, and post-harvest support. Financial empowerment workshops on financial responsibility, budgeting, savings, and thoughtful spending will be provided to farmers. Linking farmers to existing financial institutions, credit associations, and government resources will help empower farmers to receive the financial resources they need to better their farm and livelihood. Monitoring and evaluation will be conducted to check the progress of the intervention and the impact it creates.

VI. Approach. The intervention program shall be implemented through a Participatory and Collaborative Approach. Under this approach, coconut farmers and stakeholders are actively engaged in the implementation of the project. Development interventions are beneficial and livelihood improving only if the beneficiaries have a hand on the activities presented to them. As such, interventions must involve the community in identifying problems, setting priorities, planning solutions and reviewing results. Doing so allow the intended interventions to be relevant to the people's needs and increases the ability of people to develop their livelihoods because the interventions are people-driven and not top-down. Specifically, coconut farmers shall be given the opportunity to provide their input and expertise in the planning and execution of various activities. This ensures that interventions are focused on improving their livelihood and are based on actual needs. Local government units (LGUs), agricultural agencies, cooperatives, financial institutions and other partners shall provide the needed technical and financial assistance, extension services and institutional support to ensure project implementation. The convergence of partners shall be strengthened to ensure regular coordination and easy access to interventions and services.

Moreover, the participatory and collaborative approach allow for transparency and responsibility of coconut farmers and partner institutions. Farmers shall be included in the monitoring and evaluation activities to ensure that the project is on track. They can freely provide recommendations and suggestions to improve the activity. Meaningful consultation, dialogue, and partnership-building with stakeholders and partners will ensure that project benefits are sustained even after the project periods. This approach empowers the coconut farmers as equal partners in the development of their livelihood and helps build strong institutions that work together for the betterment of coconut-based livelihood in Davao Occidental.

VII. Key Messages. The messages associated with the intervention program will focus on the overall theme of helping coconut farmers strengthen their livelihood assets in order to engage in sustainable coconut farming that will contribute to more resilient rural communities. These messages will include ideas that by increasing farmers access to improved farm infrastructure, tools and equipment they can be more productive in their farming efforts and improve their livelihoods long into the future. It will promote the concepts that through education, continuing skill development and learning improved practices farmers can better adapt to the changing agricultural and environmental situations they face. Financial literacy and understanding along with savings and responsible use of financial services can also help prepare farmers to better handle unexpected situations.

The key messages to be incorporated in the intervention are as follows:

- Strong coconut farm resources means strong and productive coconut farming households.
- Knowledge, skills and capacity building allow farmers to be more productive and better able to respond to change.
- Preparedness in financial resources and responsible resource management lead to stronger livelihoods and long-term sustainability.
- Tools, infrastructure, and support services that meet farmers' needs allow for greater efficiency and economic opportunity.
- Partnership, collaboration, and collective participation create an environment for sustainable development.
- Resilient coconut farmers help create resilient households, communities and local economy.
- Investment in physical, human, and financial capital creates opportunities for better quality of life.

VIII. Project Implementation Stage. The intervention program shall be implemented in four phases within a year. It is to maximize the accomplishment of activities included in the project specifically designed to strengthen the physical, human, and financial capital of coconut farmers in Davao Occidental. Every phase will also allow reviewing the accomplishments of the former phase for improvement and sustainability.

Phase 1: Planning and Development (First Quarter). The first phase shall involve project planning and preparation. This will ensure that all basic groundwork is laid out prior to implementation. Here, baseline survey and needs assessment will be undertaken to determine the existing situation, major problems and immediate needs of coconut farmers. This shall be used to formulate appropriate interventions and targets of the project. Intended beneficiaries and partner institutions like local government units, agricultural agencies, cooperative, and financial institutions shall also be identified. Detailed plans for implementation, monitoring indicators, proposed budget, and resource requirements shall be drawn up and finalized.

Phase 2: Launch and Initial Rollout (Second Quarter). The second phase will primarily involve launching of the intervention program, as well as the initial implementation of project activities. Launching activities will be implemented in order to formally introduce the program to program beneficiaries and stakeholders. Advocacy activities will be conducted in order to create awareness and generate participation in the program. Training programs on capacity building, seminars, and skill enhancement workshops will be carried out. Distributable agricultural inputs shall also be given to qualified beneficiaries. This includes basic farm tools and equipment that help increase farm productivity as well as efficiency in daily operations. Financial literacy and farmers' savings education shall also be conducted.

Phase 3: Mid-Project Assessment and Strengthening (Third Quarter). The third phase will concentrate on tracking implementation status and measuring impact of current interventions. Monitoring visits, field validations, and progress reviews will be carried out to measure project performance to see if goals are being met. Data collected at this stage will help determine gaps in implementation, developing problems, and opportunities for improvement. Timely correction and supplemental support interventions will be implemented to resolve concerns. Technical coaching, farm advisor services and extension services will continue to be implemented during this stage

Phase 4: Expansion, Evaluation, and Sustainability Planning (Fourth Quarter). The final phase shall aim to scale-up benefits of the project including impact assessment and sustaining gains after project completion. Selected activities may be scaled up to include more beneficiaries or communities, if warranted by monitoring and evaluation activities. Refresher training and other capacity-building activities may be provided to sustain knowledge and strengthen farmers' capacities. Additionally, continuing efforts to increase access to financial services and credit shall be considered to build financial resilience. Lastly, a project evaluation shall be done to measure project performance. Sustainability planning shall also be done to help sustain the livelihood of coconut farmers in Davao Occidental.

IX. Action Plan. This is where the actual implementation is laid down on how the intervention goals and objectives will be achieved in cascading form making it easier to measure by stating the activities that are specific, measurable, and time-bound activities.

The first key result area will cover interventions on providing support to increase accessibility to physical farm resources and facilities. These resources include farm tools and equipment that aid in farm operations as well as transportation facilities and farm infrastructure needed to make coconut farming more efficient. Activities covered under this KRA are the evaluation of coconut farmers farm assets and operations, help determine the farm equipment they need, and coordinate with LGUs and partner agencies to help facilitate farm tools and equipment distribution. Provide support to address needs in farm infrastructure like farm access, storage, as well as post-harvest support facilities to alleviate production problems and help farmers gain easier access to markets. Conduct relevant training on the proper use, maintenance, and repair of farm equipment. Coconut farmers should be able to face less difficulty and work more efficiently in their farms as a result of these interventions.

The second Key Result Area addresses efforts to increase farmers' knowledge, skills, and technical capability in coconut farming and farm management. Under this KRA, capacity-building interventions such as trainings, seminars and workshops on enhanced coconut production techniques and technology, good agricultural practices, pest and disease control, climate change adaptation, farm

planning and farm-level decision making will be conducted. Technical coaching and farm advice will also be provided to farmers through farm demonstration, mentorship sessions, and regular extension visits by agricultural technicians. These interventions are geared towards improving farmers' capacity to adopt improved farming technologies and enhance their adaptive capacity. Increasing human capital will allow coconut farmers to become more educated and skilled in farm management.

Finally, KRA number three aims to improve coconut farmers financial stability and capacity to properly manage their financial resources. This includes delivering financial literacy and savings programs to our farmers, as well as improving their knowledge on topics such as creating budgets, mobilizing savings, managing debt, and planning finances. We will also work to ensure farmers have proper access to credit facilities, loans, financial programs, and livelihood resources by working with financial institutions, cooperatives, and government agencies that can help connect farmers to these available resources. We can help our farmers obtain financial resources that can aid them in the areas of farm investments, emergencies, and growing their livelihood. We can also help them better prepare by diversifying their income and learning how to properly save to help lessen the vulnerability of farmers should any sort of economic component devastate their income. By achieving this, coconut farmers will be able to enjoy financial stability and will know how to best manage the resources they have to help them sustain their livelihood in the long run.

Key Result Area (KRA)	Objectives	Intervention Activity	Responsible Agencies	Time Frame	Expected Outputs	Success Indicators	Estimated Budget
Physical Capital Enhancement	To improve access to farm tools, equipment, and infrastructure support	-Conduct assessment of farm infrastructure and equipment needs	-Project Team, LGU Agriculture Office, Farmers' Associations	Q1	-Baseline needs assessment report	-Completed assessment and identified beneficiaries	-P50,000.00
		-Procurement and distribution of farm tools and equipment	-LGU, Partner Agencies, Project Team	Q2	-Tools and equipment distributed	-Number of farmers receiving farm inputs	-P500,000.00
		-Provide training on proper use and maintenance of farm equipment	-Agricultural Technicians, Extension Workers	Q2-Q3	-Farmers trained in equipment handling	-Increased proper utilization of tools	-P80,000.00
Human Capital Development	To Enhance farmers knowledge and technical skills in coconut farming	-Conduct training programs and seminars on coconut production	-Agricultural Experts, Extension Workers	Q2	-Training sessions conducted	-Number of farmers trained	-P120,000.00
		-Provide technical coaching and farm advisory services	-Extension Workers, Project Staff	Q2-Q4	-Continuous technical assistance	-Improved farming practices observed	-P100,000.00
		-Conduct refresher and advanced training sessions	-Project Team, Partner Agencies	Q4	-Advanced training completed	-Increased adoption of improved techniques	-P80,000.00
Financial Capital Strengthening	To strengthen financial literacy and access to financial services	-Conduct financial literacy and savings education programs	-Financial Institutions, Cooperatives, LGU	Q2	-Financial literacy sessions conducted	-Improved financial knowledge of farmers	-P60,000.00
		-Facilitate access to loans, credit, and financial assistance	-Financial Institutions, Cooperatives	Q2-Q4	-Farmers linked to financial services	-Number of farmers accessing credit facilities	-P40,000.00

		programs					
		-Conduct orientation on government livelihood support programs	-Government Agencies, Project Team	Q3	-Information dissemination conducted	-Increased participation in support programs	-₱35,000.00

Table 6. Intervention Program Matrix

The Intervention Program Matrix presented on Table 6 focuses on interventions that strengthens the resilience of coconut farmers in sustaining livelihood. These interventions focus on Physical Capital Enhancement, Human Capital Development, and Financial Capital Strengthening. The table consists of program objectives, intervention activities, responsible agencies, time frame, expected program outputs, success indicator and budgetary requirement.

The interventions implemented in this program will address problems regarding lack of accessibility to farm tools and equipment, technical knowledge and skills, and financial services and literacy. These three factors will help coconut farmers better equip themselves to improve their capacity to cope with change, increase productivity and sustain their livelihood. Success indicators were also developed for this program.

Key Result Area (KRA)	Estimated Budget
Physical Capital Enhancement	₱630,000.00
Human Capital Development	₱300,000.00
Financial Capital Strengthening	₱135,000.00
Total	₱1,065,000.00

Table 7. Budgetary Requirement Summary for the Proposed Intervention Program

The estimated budget required to implement the proposed program intervention to strengthen the resilience of coconut farmers in sustaining livelihood is shown in Table 7. The total budget needed is ₱1,065,000.00 which will be allocated to the three key results areas: Physical Capital Enhancement, Human Capital Development, and Financial Capital Strengthening.

The biggest portion allotted (₱630,000.00) was for Physical Capital Enhancement which includes assistance in farm infrastructure development, farm tools and equipment, as well as training on the proper use proper use and maintenance of farm equipment. Human Capital Development got ₱300,000.00 which is intended for capacity-building programs such as technical training, coaching, and mentoring to enhance farmers knowledge in coconut production. Financial Capital Strengthening received ₱135,000.00, which focused on financial and livelihood literacy programs that will aim to enhance farmer's financial access to capital and credit, as well as make them aware of government livelihood programs.

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CONCLUSION

Based on the findings of the study, it can be concluded that there are three factors that affect the resilience of coconut farmers sustaining livelihood in Davao Occidental. These include physical capital, human capital, and financial capital. Physical capital denotes that having farm infrastructure to support production, access to

transportation, and access to tools and equipment needed sustaining livelihood. As for human capital, it is stated that knowledge, trainings, skills, and the ability to adapt will help farmers deal with problems in farming. Lastly, financial capital showed that having regular income, savings, ability to borrow money, and capacity to recover losses contribute to their ability to maintain their livelihood even in times of uncertainty. Also, the study shows that resilience is built not only through personal drive but also through available resources, institutions, and opportunities that allow farmers to have a better capacity to adapt. Lastly, the three different dimensions discovered from the study supported the SLF and resilience theory.

In conclusion, the SLF and the theory of resilience can be used to improve the lives of coconut farmers in Davao Occidental in the long run by developing and strengthening the factors above.

REFERENCES

- 1) Abagat, R. H., Roxas, E., Talubo, J. P., & Abucay, E. (2017). Adaptation and adaptive capacity to flooding of farming households: Insights from Mabitac, Laguna, Philippines. *Climate, Disaster and Development Journal*, 56–64. <https://doi.org/10.18783/cddj.v002.i02.a06>
- 2) Aguilar, E. A., Montesur, J., & Lacsina, J. C. (2023). Capacitating Strategies to Promote Climate Resilient Coconut-based Farming Systems (CR-CBFS) in Vulnerable Coconut Communities of the Philippines. *IOP Conference Series: Earth and Environmental Science*, 1235(1), 012002. <https://doi.org/10.1088/1755-1315/1235/1/012002>
- 3) Aguilar, F. X., Hendrawan, D., Cai, Z., Roshetko, J. M., & Stallmann, J. (2022). Smallholder farmer resilience to water scarcity. *Environment, Development and Sustainability*, 24(2), 2543–2576. <https://doi.org/10.1007/s10668-021-01545-3>
- 4) Azhari, R., Amanah, S., Fatchiya, A., & Kinseng, R. A. (2025). The Influence of Agricultural Extension Services and Livelihood Capitals on Farmers' Climate Resilience in West Java, Indonesia: A Structural Equation Modeling Approach. *Jurnal Pengelolaan Sumberdaya Alam Dan Lingkungan (Journal of Natural Resources and Environmental Management)*, 15(5), 904. <https://doi.org/10.29244/jpsl.15.5.904>
- 5) Barrett, C. B., & Constan, M. A. (2014). Toward a theory of resilience for international development applications. *Proceedings of the National Academy of Sciences*, 111(40), 14625–14630. <https://doi.org/10.1073/pnas.1320880111>
- 6) Bentayao, C. M., Verzosa, R. C., Vilela, E. M., & Nemenzo-Calica, P. (2025). Knowledge, Attitudes, and Agricultural Practices of Coconut Farmers on the Impacts of Climate Change on Coconut Productivity and Sustainability in Barangay Capasnan, Manay, Davao Oriental, Philippines. *Journal of Tropical Crop Science*, 12(01), 158–171. <https://doi.org/10.29244/jtcs.12.01.158-171>
- 7) Carmen, E., Fazey, I., Ross, H., Bedinger, M., Smith, F. M., Prager, K., McClymont, K., & Morrison, D. (2022). Building community resilience in a context of climate change: The role of social capital. *Ambio*, 51(6), 1371–1387. <https://doi.org/10.1007/s13280-021-01678-9>
- 8) Czekaj, M., Adamsone-Fiskovica, A., Tyran, E., & Kilis, E. (2020). Small farms' resilience strategies to face economic, social, and environmental disturbances in selected regions in Poland and Latvia. *Global Food Security*, 26, 100416. <https://doi.org/10.1016/j.gfs.2020.100416>
- 9) Department for International Development. (1999). Sustainable livelihoods guidance sheets. DFID.
- 10) Ferrer, A. J. G., Thanh, L. H., Chuong, P. H., Kiet, N. T., Trang, V. T., Duc, T. C., Hopanda, J. C., Carmelita, B. M., & Bernardo, E. B. (2023). Farming household adoption of climate-smart agricultural technologies: Evidence from North-Central Vietnam. *Asia-Pacific Journal of Regional Science*, 7(2), 641–663. <https://doi.org/10.1007/s41685-023-00296-5>
- 11) Folke, C. (2016). Resilience (Republished). *Ecology and Society*, 21(4), art44. <https://doi.org/10.5751/ES-09088-210444>
- 12) Food and Agriculture Organization. (2017). Agricultural development and rural livelihoods. FAO.
- 13) Gurbuz, I. B., & Manaros, M. (2019). IMPACT OF COCONUT PRODUCTION ON THE ENVIRONMENT AND THE PROBLEMS FACED BY COCONUT PRODUCERS IN LANA DEL NORTE PROVINCE, PHILIPPINES. 19(3).
- 14) Herrera, A., Brul, B., Cadavid, R., & Chavarría, E. (n.d.). Building Resilience of Coconut Smallholder Farmers in the Philippines: Final Evaluation Report of the FarmerLink Program.
- 15) Holling, C. S. (n.d.). RESILIENCE AND STABILITY OF ECOLOGICAL SYSTEMS.
- 16) Jayasekhar, S., Thamban, C., Chandran, K. P., Thomas, L., & Thomas, R. J. (2024). Analysis of Farmer Producer Organisations in the Coconut Sector: Current Scenario, Limitations, and Policy Outlook. *Journal of Plantation Crops*, 1–9. <https://doi.org/10.25081/jpc.2024.v52.i1.9170>

- 17) Mahmood, S., Nunes, M. R., Kane, D. A., & Lin, Y. (2023). Soil health explains the yield-stabilizing effects of soil organic matter under drought. *Soil & Environmental Health*, 1(4), 100048. <https://doi.org/10.1016/j.sch.2023.100048>
- 18) Meuwissen, M. P. M., Feindt, P. H., Spiegel, A., Termeer, C. J. A. M., Mathijs, E., Mey, Y. D., Finger, R., Balmann, A., Wauters, E., Urquhart, J., Vignani, M., Zawalińska, K., Herrera, H., Nicholas-Davies, P., Hansson, H., Paas, W., Slijper, T., Coopmans, I., Vroege, W., ... Reidsma, P. (2019). A framework to assess the resilience of farming systems. *Agricultural Systems*, 176, 102656. <https://doi.org/10.1016/j.agsy.2019.102656>
- 19) Oakeshott, J. A. (2018). Sustainable smallholder farming clusters in the Philippines. *Acta Horticulturae*, (1205), 109–116. <https://doi.org/10.17660/ActaHortic.2018.1205.12>
- 20) Philippine Coconut Authority. (2022). The Philippine coconut industry annual report 2022. PCA.
- 21) Philippine Statistics Authority. (2023). Agricultural land use and coconut production in Davao Occidental [Data set or report]. PSA. <https://psa.gov.ph>
- 22) Prem Pradeep Motgi. (2026). ARCHITECTING CLOUD-NATIVE LLM INFERENCE: PREDICTIVE SCALING AND TIERED MEMORY MANAGEMENT IN OPEN-SOURCE SERVING FRAMEWORKS. *International Journal Of Engineering Technology Research & Management (IJETRM)*, 10(06), 54–67. <https://doi.org/10.5281/zenodo.20535292>
- 23) Reio, T. G., & Shuck, B. (2015). Exploratory Factor Analysis: Implications for Theory, Research, and Practice. *Advances in Developing Human Resources*, 17(1), 12–25. <https://doi.org/10.1177/1523422314559804>
- 24) Su, F., Song, N., Ma, N., Sultanaliyev, A., Ma, J., Xue, B., & Fahad, S. (2021). An Assessment of Poverty Alleviation Measures and Sustainable Livelihood Capability of Farm Households in Rural China: A Sustainable Livelihood Approach. *Agriculture*, 11(12), 1230. <https://doi.org/10.3390/agriculture11121230>
- 25) Tambo, J. A., & Wünscher, T. (2017). Enhancing resilience to climate shocks through farmer innovation: Evidence from northern Ghana. *Regional Environmental Change*, 17(5), 1505–1514. <https://doi.org/10.1007/s10113-017-1113-9>
- 26) University of the Philippines Los Banos, Colting-Pulumbarit, C., Lasco, R., Rebancos, C., & Coladilla, J. (2018). Sustainable Livelihoods-Based Assessment of Adaptive Capacity to Climate Change: The Case of Organic and Conventional Vegetable Farmers in La Trinidad, Benguet, Philippines. *Journal of Environmental Science and Management*, 21(2), 57–69. https://doi.org/10.47125/jesam/2018_2/08
- 27) Varela, R. P., Apdohan, A. G., & Balanay, R. M. (2022). Climate resilient agriculture and enhancing food production: Field experience from Agusan del Norte, Caraga Region, Philippines. *Frontiers in Sustainable Food Systems*, 6, 974789. <https://doi.org/10.3389/fsufs.2022.974789>
- 28) Wulandari, E., Saidah, Z., Ernah, Syukur, Carsono, N., Kawashima, S., & Kang, S. W. (2025). Understanding farmers' behavior toward risk management practices and financial access: Evidence from chili farms in West Java, Indonesia. *Open Agriculture*, 10(1), 20250430. <https://doi.org/10.1515/opag-2025-0430>
- 29) Prem Pradeep Motgi. (2026). HETEROGENEOUS EDGE TO CLOUD INFRASTRUCTURE BLUEPRINTS FOR PHYSICAL AI AND AUTONOMOUS SYSTEMS. *International Journal Of Engineering Technology Research & Management (IJETRM)*, 10(06), 110–120. <https://doi.org/10.5281/zenodo.20536069>