Harnessing Income Volatility for Market Sustainability among Fisher Communities in Surigao del Sur, Philippines

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ABSTRACT

Small-scale fisheries are vital to coastal livelihoods, food security, and local economies, yet fisherfolk continue to experience unstable income due to seasonal catch variation, climate-related disruptions, changing market prices, rising operational costs, and dependence on intermediaries. This study examined the relationship between income volatility and market sustainability among registered small-scale fisherfolk in the First District of Surigao del Sur, Philippines. Using a quantitative descriptive-correlational design, data were collected from 442 registered fisherfolk selected through stratified proportional random sampling from a population of 17,625. A researcher-made questionnaire, validated by experts and pilot-tested with excellent reliability, measured income volatility in terms of seasonality of fishing income, frequency of income fluctuations, variability of earnings, and exposure to climate-related and environmental risks. Market sustainability was measured in terms of access to stable and reliable markets, price stability and bargaining power, continuity of buyers and market channels, and stability to sustain fishing livelihood over time. Descriptive statistics, Pearson product-moment correlation, and regression analysis were used to analyze the data. Findings revealed that fisherfolk experienced income volatility while maintaining a moderate level of market sustainability. Income volatility was significantly and positively related to all dimensions of market sustainability, with variability of earnings showing the strongest association with price stability and bargaining power. Regression results further indicated that income volatility significantly predicted market sustainability. The study concludes that sustainable market participation requires integrated interventions that stabilize income, strengthen bargaining power, expand market linkages, improve post-harvest systems, and build climate-resilient livelihood capacities. The proposed Fisherfolk Income Resilience and Market Sustainability Framework may guide local government units, fisheries agencies, fisherfolk organizations, and development partners.

Keywords: income volatility, market sustainability, small-scale fisherfolk, livelihood resilience, fisheries value chain, climate resilience, market access

INTRODUCTION

Small-scale fisheries are essential to coastal economies, especially in developing archipelagic countries where fishing remains a primary livelihood and food security source for many households. In the Philippines and other Asia-Pacific contexts, fisherfolk contribute to local food systems, community employment, aquatic food supply, and household subsistence. However, the economic role of small-scale fisheries is frequently weakened by income instability. Fisherfolk income is rarely fixed because it depends on fishing days, catch volume, seasonal fish availability, prevailing weather conditions, fuel costs, buyer access, and fish prices. This condition exposes fishing households to recurring income gaps, especially during lean fishing seasons, adverse weather events, and periods of low catch.

Income volatility is a critical livelihood issue because it affects the capacity of fisherfolk to meet household needs, manage debt, maintain fishing operations, participate in markets, and invest in productive assets. Studies on small-scale fisheries indicate that climate variability, seasonal closures, ecological change, declining fish

stocks, and market disruptions increase the economic vulnerability of fishing households (Ayisi et al., 2024; Chakraborty et al., 2025; Riantini et al., 2024; Sunny et al., 2021). In coastal and island communities, the problem is intensified by limited livelihood diversification, weak access to formal credit, insufficient savings, and limited capacity to absorb income shocks (Gusha et al., 2026; Sethy et al., 2025; Putri et al., 2025).

Market sustainability is equally important because fisherfolk income does not depend only on the act of fishing but also on how fish products move through markets. Sustainable market participation requires reliable buyers, fair prices, bargaining capacity, post-harvest infrastructure, transport access, product quality, and continuity of market channels. Yet, small-scale fishers often operate from a weak position in the value chain. They may depend on buyers, traders, financiers, or middlemen for fuel, inputs, loans, and market access. Such dependence can reduce price control and force fisherfolk to accept unfavorable prices, particularly when fish products are perishable and storage facilities are unavailable (Penca et al., 2021; Ginting et al., 2024; Putri & Wulandari, 2020). Market vulnerability is also aggravated by poor cold-chain systems, limited transport, weak product consolidation, and insufficient institutional linkage (Belton et al., 2021; Bassett et al., 2022; Roul et al., 2024).

The relationship between income volatility and market sustainability is therefore central to understanding fisherfolk livelihood resilience. Unstable income may weaken market participation, while weak market systems may further intensify income instability. For instance, when catch is irregular, fisherfolk may fail to supply buyers consistently. When prices are unstable, fisherfolk may earn less even when they catch fish. When weather prevents fishing, both household income and market supply are disrupted. These conditions show that income volatility is not only a household financial problem but also a market-system concern.

In Surigao del Sur, where many coastal households depend on fishing, the intersection of environmental risk, income fluctuation, and market participation requires empirical investigation. This study therefore examined the level of income volatility and market sustainability among small-scale fisherfolk in the First District of Surigao del Sur. It also determined whether income volatility is significantly related to, and predictive of, market sustainability. The study contributes to the literature by linking fisherfolk income instability with market sustainability outcomes and by proposing a practical framework for income resilience and market strengthening.

Research Objectives

This study generally aimed to examine income volatility and market sustainability among small-scale fisherfolk in the First District of Surigao del Sur.

Specifically, it sought to:

1. Determine the level of income volatility among fisherfolk in terms of seasonality of fishing income, frequency of income fluctuations, variability of daily, weekly, and monthly earnings, and exposure to climate-related and environmental risks.

2. Assess the level of market sustainability among fisherfolk in terms of access to stable and reliable markets, price stability and bargaining power, continuity of buyers and market channels, and stability to sustain fishing livelihood over time.

3. Examine the significant relationship between income volatility and market sustainability among fisherfolk.

4. Identify which aspects of income volatility significantly predict market sustainability among fisherfolk.

5. Develop a framework that may strengthen income resilience and market sustainability among small-scale fisherfolk.

REVIEW OF RELATED LITERATURE

Income Volatility among Small-Scale Fisherfolk

Income volatility refers to the irregularity, unpredictability, and instability of income over time. Among small-scale fisherfolk, this condition is commonly experienced because fishing income depends on ecological, seasonal, climatic, operational, and market-related factors. Unlike salaried occupations, fishing does not provide fixed or guaranteed earnings. Income may increase during favorable fishing periods but decline during bad weather, low-catch days, lean seasons, or periods of market price instability. This makes fisherfolk households highly vulnerable to income shocks, debt dependency, reduced consumption, and difficulty in planning household expenditures.

Small-scale fishing households are particularly exposed to unstable income because they rely heavily on natural resources and daily catch. Arthur et al. (2022) emphasized that small-scale fisheries are closely linked with livelihood security, local food systems, and fish value chains, suggesting that instability in fish production affects both household welfare and market participation. Similarly, Sunny et al. (2021) found that small-scale fishers in coastal Bangladesh are vulnerable to climate variability and livelihood uncertainty. In the Philippine context, Enema and Quezon (2024) noted that small-scale coastal fisherfolk continue to experience low and unstable income due to declining fish stocks, limited livelihood diversification, and economic vulnerability.

Seasonality of Fishing Income

Seasonality of fishing income refers to changes in fisherfolk earnings brought about by peak and lean fishing periods, monsoon patterns, closed seasons, and seasonal fish availability. Fishing income tends to be higher during favorable seasons when fish are abundant and lower during lean periods when catch is reduced. Ayisi et al. (2024) found that closed fishing seasons affect fishers' operations, livelihood, and coping strategies because fishing activity is restricted or suspended. Chakraborty et al. (2025) similarly argued that fishing restrictions and seasonal disruptions push small-scale fishers to rely on borrowing, reduced household consumption, or temporary livelihood adjustments.

Seasonality has also been observed in Philippine coastal communities. De La Torre-De La Cruz et al. (2023) reported that fishing households in Maliwaliw Island experienced differences in income between peak and lean fishing months due to seasonal fish availability and weather-related limitations. Wang et al. (2025), in a study on coastal China, further showed that seasonal fishing moratoria affect the livelihood capital and behavioral responses of small-scale fishers. These findings suggest that seasonal fishing income remains a major factor in fisherfolk income volatility, particularly where households have limited income alternatives.

Frequency of Income Fluctuations

Frequency of income fluctuations refers to the repeated changes in fisherfolk income across fishing days, weeks, or seasons. Fisherfolk may earn adequately on some days but receive little or no income on others. These fluctuations are shaped by catch volume, weather conditions, market prices, fuel costs, and access to buyers. Riantini et al. (2024) found that fisherman households in Indonesia experience livelihood vulnerability due to climate change and related economic pressures. Putri et al. (2025) also highlighted that small-scale fisheries in Madura experience economic vulnerability linked to livelihood instability and sustainability challenges.

Repeated income fluctuations affect household financial planning because fisherfolk must adjust their spending according to uncertain income. Sethy et al. (2025) observed socio-economic disparities among fishing communities in coastal Odisha, where unstable livelihood conditions remain a persistent concern. Sultana et al. (2023) similarly found that coastal fishing communities in Bangladesh are vulnerable to climate-related and social-ecological risks. These studies indicate that income fluctuation among fisherfolk is not an isolated event but a recurring livelihood condition.

Variability of Daily, Weekly, and Monthly Earnings

Variability of earnings refers to the inconsistency of fisherfolk income within short-term and medium-term periods. Daily, weekly, and monthly earnings vary because catch volume, species caught, fish quality, buyer demand, and fish prices are not constant. Deb et al. (2022) showed that fish price volatility affects fish producers in Bangladesh, demonstrating how changing market prices influence income outcomes. Roul et al. (2024) also found that marketing channels and price ranges differ across commercially important finfish species in India, implying that market structure affects fisherfolk income.

White and Scheld (2024) noted that income diversification can reduce income risk among small-scale commercial fishers. Their findings suggest that fishers who depend on a single fishery may experience greater earnings instability than those with diversified fishing or livelihood strategies. Indrabudi et al. (2025) similarly reported that socio-economic dynamics in octopus fisheries affect livelihood sustainability among small-scale fishers in Indonesia. These studies support the view that earnings variability among fisherfolk is shaped by both ecological uncertainty and market structure.

Exposure to Climate-Related and Environmental Risks

Climate-related and environmental risks are major drivers of income volatility among fisherfolk. Typhoons, flooding, strong waves, storm surges, changing species distribution, habitat degradation, and declining fish stocks reduce safe fishing days and weaken fishing productivity. Pinsky et al. (2021) emphasized that climate-driven shifts in marine species ranges affect marine ecosystems and fishery-dependent communities. Macusi et al. (2024) found that fisherfolk in Surigao del Sur face climate-related risks that affect preparedness, coping capacity, and adaptation capacity.

Recent Asia-Pacific studies confirm the link between climate vulnerability and fishing livelihood insecurity. Debnath et al. (2024) found that coastal wetlands in India are vulnerable to climate change and require adaptation strategies. Nunn et al. (2025) highlighted the growing climate exposure of water-dependent communities in the Western Pacific. Khan et al. (2026) also developed a disaster vulnerability index for coastal Bangladesh, showing the relevance of disaster exposure in coastal livelihood systems. These studies suggest that climate-related risks do not only affect ecological systems but also fisherfolk income, market supply, and livelihood sustainability.

Market Sustainability among Fisherfolk

Market sustainability refers to the ability of fisherfolk to continuously participate in markets under fair, stable, and economically viable conditions. It includes access to buyers, price stability, bargaining power, continuity of market channels, and the capacity to sustain fishing livelihood over time. In small-scale fisheries, market sustainability is influenced by transport access, post-harvest facilities, cold storage, price information, buyer relationships, product quality, cooperative participation, and access to finance.

Small-scale fisherfolk often operate within unequal market systems where traders, buyers, and intermediaries control price information and market access. Penca et al. (2021) argued that small-scale fisheries markets face weaknesses related to bargaining power, market structure, and product distribution. Belton et al. (2021) showed that aquatic food value chains in Asia and Africa were disrupted during the COVID-19 pandemic, demonstrating the vulnerability of fishery markets to external shocks. Bassett et al. (2022) likewise found that small-scale fishery supply chains are vulnerable to disruptions, emphasizing the need for resilient and inclusive market systems.

Access to Stable and Reliable Markets

Access to stable and reliable markets means that fisherfolk can consistently sell their catch through dependable buyers and market channels. However, access is often limited by transport difficulties, lack of cold storage, weak market information, and dependence on intermediaries. Siddiqua et al. (2022) found that market restrictions

affected the ability of small-scale fishers to sell their catch properly, resulting in lower prices and reduced sales. ACPC et al. (2021) similarly emphasized that financial and institutional barriers limit the market participation of small-scale fishers in the Philippines.

In fisheries value chains, reliable market access depends not only on the existence of buyers but also on logistics, post-harvest handling, and market coordination. Utami et al. (2023) found that stakeholder convergence and supply-chain vulnerability influence large pelagic fish supply chains in Indonesia. Zamroni et al. (2024) also showed that supply-chain patterns affect the movement and value of blue swimming crabs in Java, Indonesia. These studies indicate that stable market access requires coordinated supply chains and institutional support.

Price Stability and Bargaining Power

Price stability and bargaining power refer to fisherfolk's capacity to obtain fair prices and negotiate favorable terms for their catch. This dimension is critical because fish products are perishable, and fisherfolk often sell immediately to avoid spoilage. When fisherfolk lack storage, transport, or alternative buyers, they become price takers. Penca et al. (2021) noted that weak bargaining power is a common problem in small-scale fisheries markets. Putri and Wulandari (2020) found that the income of fishers is affected by market factors and selling arrangements, while Ginting et al. (2024) explained that middlemen and market power relations can limit fisherfolk control over prices.

Collective organization may improve fisherfolk bargaining power. Taniu et al. (2024) found that cooperative membership can influence welfare among capture fishery households in Indonesia. Enayati et al. (2024) also suggested that blockchain-enabled livelihood systems may improve transparency and reduce exploitation in rural fishing communities. These findings imply that market sustainability requires not only access to buyers but also fair pricing systems, transparent information, and collective bargaining mechanisms.

Continuity of Buyers and Market Channels

Continuity of buyers and market channels refers to the sustained relationship between fisherfolk and their buyers, traders, cooperatives, institutional markets, or consumers. Continuous buyer relationships can provide market certainty, but they may also create dependence if one buyer controls credit, fuel, or market access. González-Mon et al. (2023) argued that small-scale fisheries and trade networks are socially embedded, meaning that market relationships are shaped by trust, dependency, and social ties. Orach et al. (2024) further showed that diverse fisher-trader relations influence how small-scale fisheries respond to environmental and market change.

Market-channel continuity can be improved through diversified buyers and direct market access. Rimmer et al. (2021) found that seaweed aquaculture in Indonesia contributes to livelihoods and community wellbeing by linking production with broader value-chain opportunities. Paul et al. (2025) emphasized that stakeholder dynamics in live fish supply chains affect livelihood security and vulnerability. These findings show that buyer continuity becomes more sustainable when fisherfolk have multiple market channels rather than dependence on a single middleman.

Stability to Sustain Fishing Livelihood Over Time

Stability to sustain fishing livelihood over time refers to the long-term ability of fisherfolk to maintain fishing as a viable economic activity. This depends on livelihood resilience, adaptive capacity, access to productive assets, sustainable resource management, and market viability. Amadu et al. (2021) emphasized that livelihood resilience among small-scale fishers is shaped by buffer capacity and adaptive capacity. Hidayat et al. (2022) found that culture and community systems can enhance livelihood resilience in rural fisheries.

Long-term fishing livelihood stability also requires diversification. Salgueiro-Otero et al. (2022) argued that livelihood diversification is an important adaptive strategy for small-scale fishers facing climate change. Chen et al. (2025) found that livelihood capital affects coastal fishers' intentions to transform livelihood toward

tourism-related activities, while Tien Ho et al. (2026) identified factors explaining livelihood diversification among households engaged in aquaculture in Thailand. These studies suggest that sustaining fishing livelihood over time requires both fisheries-based and non-fisheries-based income strategies.

Relationship between Income Volatility and Market Sustainability

The relationship between income volatility and market sustainability is grounded in the idea that unstable income affects market participation, and weak market systems intensify income instability. When fisherfolk experience irregular catch and variable earnings, they may fail to supply buyers consistently, negotiate prices effectively, or invest in post-harvest handling. Conversely, poor market infrastructure, weak bargaining power, and buyer dependence can increase income instability even when fishers are able to catch fish.

Fish price volatility, supply-chain structure, and dependence on intermediaries are central to this relationship. Deb et al. (2022) showed that fish price volatility affects fisheries income outcomes, while Roul et al. (2024) demonstrated that marketing channels influence price ranges and income distribution. Penca et al. (2021) and Ginting et al. (2024) further showed that weak bargaining power and dependence on intermediaries reduce fisherfolk market benefits. These studies support the assumption that income volatility and market sustainability are mutually connected within the small-scale fisheries value chain.

Predictors of Market Sustainability

The income volatility indicators used in this study—seasonality, frequency of income fluctuations, variability of earnings, and climate-related or environmental exposure—are expected to predict market sustainability because they influence supply continuity, buyer relationships, price negotiation, and livelihood stability. Earnings variability may predict market sustainability because unstable income weakens fisherfolk's ability to plan production and negotiate with buyers. Frequency of income fluctuations may predict market sustainability because repeated income shocks affect household decisions and market consistency. Seasonality may predict market sustainability because peak and lean fishing periods influence product availability. Climate-related risks may predict market sustainability because weather disturbances and environmental shocks reduce fishing days and market supply.

Existing literature supports these predictive links. White and Scheld (2024) showed that diversification behavior affects income risk among fishers. Wang et al. (2025) demonstrated that seasonal fishing moratoria influence fisher livelihood capital and behavior. Macusi et al. (2024) found that climate-related preparedness and adaptation capacity are crucial among fishers in Surigao del Sur. Belton et al. (2021), Bassett et al. (2022), and Zamroni et al. (2024) also demonstrated that supply-chain disruptions and market structures influence fishery livelihood outcomes. These studies provide a strong basis for examining income volatility as a predictor of market sustainability.

THEORETICAL FRAMEWORK

This study is anchored on four interrelated theoretical perspectives: the Sustainable Livelihoods Framework, Resilience Theory, Value Chain Theory, and Market Systems Theory. These theories collectively explain how fisherfolk income volatility emerges, how it affects household and market systems, and how market sustainability may be strengthened.

Sustainable Livelihoods Framework

The Sustainable Livelihoods Framework explains how households use available assets and capabilities to pursue livelihood strategies under conditions of vulnerability. It emphasizes five forms of livelihood capital: human, social, natural, physical, and financial capital. In the context of small-scale fisheries, natural capital includes marine resources and fishing grounds; physical capital includes boats, gear, cold storage, and transport; financial

capital includes savings, credit, and income; human capital includes fishing skills and technical knowledge; and social capital includes fisherfolk associations, buyer relationships, and community support.

This framework is relevant because fisherfolk income volatility is shaped by vulnerabilities such as seasonality, climate risks, fluctuating catch, and unstable markets. When fisherfolk have limited savings, weak market access, inadequate facilities, and few livelihood alternatives, their ability to cope with income shocks is reduced. The Sustainable Livelihoods Framework therefore supports the study's focus on income volatility and market sustainability as livelihood issues that depend on household assets, institutional support, and adaptive strategies.

Resilience Theory

Resilience Theory explains the capacity of individuals, households, and communities to absorb shocks, adapt to disturbances, and recover from disruptions. In small-scale fisheries, resilience refers to the ability of fisherfolk to continue their livelihood despite climate-related hazards, low catch, market disruptions, and income instability. Resilience is not only about surviving shocks but also about improving adaptive capacity through diversification, social networks, learning, and institutional support.

This theory supports the study because fisherfolk are exposed to repeated shocks such as bad weather, declining fish stocks, fluctuating prices, and seasonal fishing limitations. Climate-related and environmental risks affect both fishing activity and market participation. Resilience Theory provides a basis for understanding why fisherfolk need climate adaptation, safety-at-sea support, savings mechanisms, alternative livelihood, and market linkages to sustain livelihood over time. It also supports the proposed framework's emphasis on climate-resilient livelihood and income stabilization.

Value Chain Theory

Value Chain Theory explains how products move from production to consumption and how value is created, distributed, and captured by different actors. In fisheries, the value chain includes fishers, buyers, traders, processors, transporters, retailers, institutional buyers, and consumers. The theory is relevant because fisherfolk income depends not only on catch volume but also on their position in the fishery value chain.

Small-scale fisherfolk often occupy the weakest position in the value chain because they sell perishable products, lack storage facilities, depend on middlemen, and have limited price information. As a result, they may receive only a small share of the final market value. Value Chain Theory supports the study's focus on market sustainability, particularly price stability, bargaining power, continuity of buyers, and access to reliable markets. It also justifies interventions such as cooperative marketing, direct buyer linkages, cold storage, fish processing, and value-adding activities.

Market Systems Theory

Market Systems Theory views markets as systems composed of core transactions, supporting functions, rules, institutions, and relationships. It emphasizes that market performance depends not only on buyers and sellers but also on infrastructure, information, finance, regulations, services, and institutional coordination. In the context of small-scale fisheries, fisherfolk market participation is affected by transport systems, credit access, post-harvest facilities, buyer relationships, price information, and local government support.

This theory is relevant because market sustainability among fisherfolk cannot be achieved through market access alone. Fisherfolk need supportive systems that improve fair pricing, reduce dependence on middlemen, provide financial access, strengthen product handling, and connect them to stable buyers. Market Systems Theory therefore supports the study's assumption that income volatility and market sustainability are connected through broader market structures and institutional support.

Synthesis of Theoretical Bases

Taken together, the four theories provide a comprehensive foundation for the study. The Sustainable Livelihoods Framework explains how fisherfolk livelihoods depend on assets, capabilities, and vulnerability contexts. Resilience Theory explains how fisherfolk respond to shocks and adapt to unstable income and climate risks. Value Chain Theory explains how fisherfolk income and bargaining power are shaped by their position in the fishery market chain. Market Systems Theory explains why market sustainability requires coordinated support functions such as finance, infrastructure, information, institutions, and buyer linkages.

These theories support the central argument of the study: income volatility among fisherfolk is not merely an individual household problem but a livelihood, climate, and market-system issue. Therefore, improving market sustainability requires integrated interventions that strengthen financial resilience, climate adaptation, value-chain participation, and institutional coordination.

METHODOLOGY

Research Design

The study employed a quantitative descriptive-correlational research design. The descriptive component assessed the level of income volatility and market sustainability among fisherfolk. Income volatility was examined through seasonality of fishing income, frequency of income fluctuations, variability of earnings, and exposure to climate-related and environmental risks. Market sustainability was examined through access to stable and reliable markets, price stability and bargaining power, continuity of buyers and market channels, and stability to sustain fishing livelihood over time.

The correlational component determined the strength and direction of the relationship between income volatility and market sustainability. Regression analysis was also employed to identify which dimensions of income volatility significantly predicted market sustainability. This design was appropriate because the study aimed to describe existing conditions and examine statistical relationships among livelihood and market variables.

Research Locale and Respondents

The study was conducted among registered small-scale fisherfolk in the First District of Surigao del Sur, Philippines. From a total population of 17,625 registered fisherfolk, 442 respondents were selected through stratified proportional random sampling. This sampling method ensured that fisherfolk from the municipalities and city included in the study were represented proportionately according to their fisherfolk population.

Research Instrument

A researcher-made questionnaire was used to collect quantitative data. The instrument used a five-point Likert scale, ranging from Strongly Disagree to Strongly Agree, to measure the respondents' perceptions of income volatility and market sustainability. The income volatility scale included indicators on seasonality, frequency of income fluctuations, variability of earnings, and climate-related or environmental risks. The market sustainability scale included indicators on market access, price stability and bargaining power, buyer continuity, and livelihood sustainability.

The instrument underwent face and content validation by a panel of experts composed of a fisheries specialist, a research methodology professor, and a coastal resource management practitioner. A pilot test was conducted with 30 non-respondent fisherfolk, and the instrument obtained a Cronbach's alpha of 0.8596, indicating excellent reliability.

Data Gathering Procedure

The researcher secured the necessary approval from relevant institutions, Municipal Agriculture Offices, and barangay officials before data collection. The validated questionnaires were personally administered to the selected respondents and retrieved after completion. Responses were checked for completeness, coded, tabulated, and subjected to statistical analysis. Ethical principles were observed throughout the process, including informed consent, voluntary participation, confidentiality, and anonymity.

Statistical Treatment

Descriptive statistics, including weighted means and adjective ratings, were used to determine the levels of income volatility and market sustainability. Pearson product-moment correlation was used to determine the relationship between income volatility and market sustainability. Regression analysis was used to identify the income volatility dimensions that significantly predicted market sustainability.

RESULTS AND DISCUSSION

Level of Income Volatility among Fisherfolk

Table 1 presents the level of income volatility among fisherfolk in terms of seasonality of fishing income, frequency of income fluctuations, variability of earnings, and exposure to climate-related and environmental risks.

Table 1. Level of Income Volatility among Fisherfolk

Indicators	Mean	Adjective Rating
Seasonality of Fishing Income	3.502	Agree
Frequency of Income Fluctuations	3.577	Agree
Variability of Earnings	3.567	Agree
Exposure to Climate-Related and Environmental Risks	3.594	Agree
Grand Mean	**3.560**	**Agree**

The results show that fisherfolk experience income volatility as a recurring condition in their livelihood. The overall rating indicates that respondents agree that fishing income is unstable and influenced by seasonal, environmental, operational, and market-related factors. This supports the view that small-scale fishing households are highly vulnerable to irregular catch, weather disruptions, seasonal fishing patterns, and market uncertainty (Sunny et al., 2021; Riantini et al., 2024; Gusha et al., 2026).

Exposure to climate-related and environmental risks obtained the highest mean. This indicates that weather disturbances, rough seas, flooding, habitat degradation, and declining fish availability are perceived as the strongest contributors to income instability. Climate-related risks affect fisherfolk by reducing safe fishing days, damaging fishing assets, increasing operating costs, and lowering catch success. These results are consistent with studies showing that climate variability and environmental degradation threaten fishing livelihoods, especially in coastal communities with limited adaptive capacity (Pinsky et al., 2021; Macusi et al., 2024; Debnath et al., 2024; Nunn et al., 2025; Khan et al., 2026).

Frequency of income fluctuations and variability of earnings were also rated Agree, showing that fisherfolk regularly experience changing income patterns. Their daily, weekly, and monthly earnings depend on catch volume, market prices, buyer availability, fuel cost, and environmental conditions. Fish price volatility and market channel differences have been shown to affect fisherfolk income outcomes in Bangladesh and India (Deb

et al., 2022; Roul et al., 2024). Similarly, dependence on one fishery or one source of livelihood tends to increase earnings instability, while diversification can reduce financial vulnerability (White & Scheld, 2024; Tien Ho et al., 2026).

Seasonality of fishing income obtained the lowest mean but remained within the Agree interpretation. This suggests that although fisherfolk may anticipate peak and lean fishing periods, seasonality continues to affect household income. Closed seasons, monsoon periods, and seasonal fish availability reduce fishing activities and force fisher households to adjust expenses, borrow, or seek alternative income (Ayisi et al., 2024; Chakraborty et al., 2025; De La Torre-De La Cruz et al., 2023; Wang et al., 2025). Overall, the findings confirm that income volatility is a multidimensional challenge that affects fisherfolk livelihood stability.

Level of Market Sustainability among Fisherfolk

Table 2 presents the level of market sustainability among fisherfolk in terms of access to stable and reliable markets, price stability and bargaining power, continuity of buyers and market channels, and stability to sustain fishing livelihood over time.

Table 2. Level of Market Sustainability among Fisherfolk

Indicators	Mean	Adjective Rating
Access to Stable and Reliable Markets	3.719	Agree
Price Stability and Bargaining Power	3.624	Agree
Continuity of Buyers and Market Channels	3.734	Agree
Stability to Sustain Fishing Livelihood Over Time	3.772	Agree
Grand Mean	**3.712**	**Agree**

The results indicate that fisherfolk generally perceive their market sustainability as present, although not fully secure. They report access to markets, continuity of buyers, and the ability to sustain fishing livelihood over time. This suggests that fishing remains an important economic activity and that fisherfolk continue to participate in local fishery markets despite volatility and structural constraints.

Stability to sustain fishing livelihood over time obtained the highest mean. This reflects fisherfolk resilience and continued dependence on fishing as a livelihood source. However, livelihood sustainability depends on access to financial, physical, human, natural, and social capital. Studies show that livelihood resilience among fishers is strengthened through adaptive capacity, diversification, social capital, and institutional support (Amadu et al., 2021; Hidayat et al., 2022; Malherbe et al., 2020; Mitu et al., 2021). In this study, fisherfolk may perceive fishing as sustainable because it remains their primary livelihood, but sustainability requires support systems that address environmental and market vulnerabilities.

Continuity of buyers and market channels and access to stable and reliable markets were also rated Agree. This suggests the presence of buyer relationships and market outlets. Nevertheless, access to markets does not automatically guarantee fair income. Market sustainability depends on transport systems, post-harvest facilities, buyer diversity, price transparency, and product quality. Studies on aquatic food value chains show that market disruptions, weak logistics, and supply-chain vulnerability can affect small-scale fisheries and reduce livelihood benefits (Belton et al., 2021; Bassett et al., 2022; Utami et al., 2023; Zamroni et al., 2024).

Price stability and bargaining power obtained the lowest mean. This indicates that fisherfolk remain vulnerable to buyer-controlled prices, weak negotiation power, and dependence on traders or middlemen. Small-scale fishers often lack standardized pricing mechanisms, market information, and formal credit access, leaving them with limited control over selling arrangements (Penca et al., 2021; Putri & Wulandari, 2020; Ginting et al., 2024).

Cooperative membership, collective selling, and transparent market systems can improve fisherfolk bargaining power and welfare (Taniu et al., 2024; Enayati et al., 2024).

Relationship between Income Volatility and Market Sustainability

Table 3 shows that all income volatility indicators were positively and significantly related to all market sustainability indicators. This means that seasonality, frequent income fluctuations, earnings variability, and climate-related risks are closely connected with fisherfolk's market access, price stability, bargaining power, buyer continuity, and long-term livelihood sustainability. The result confirms that income volatility is not only a household financial issue but also a market-system concern.

Seasonality of fishing income was significantly related to all market sustainability dimensions. This implies that peak and lean fishing periods affect fisherfolk's ability to supply markets, maintain buyers, and earn stable income. Although market access may still be available across seasons, fisherfolk cannot fully benefit from it when catch is low or fishing is restricted. This supports findings that closed seasons and seasonal moratoria affect fisher operations, livelihood capital, and coping strategies (Ayisi et al., 2024; Chakraborty et al., 2025; Wang et al., 2025).

Frequency of income fluctuations was also significantly related to market sustainability. Repeated income changes make it difficult for fisherfolk to maintain regular market participation and stable buyer relationships. When income frequently rises and falls, fisherfolk may become more dependent on short-term borrowing, buyer-financiers, or middlemen. This aligns with studies showing that fisher households are vulnerable to livelihood instability caused by climate, declining fish stocks, and limited livelihood diversification (Riantini et al., 2024; Enema & Quezon, 2024; Putri et al., 2025).

Variability of earnings showed the strongest relationship with price stability and bargaining power. This means that unpredictable daily, weekly, and monthly earnings weaken fisherfolk's ability to negotiate fair prices. When income is uncertain, fisherfolk may be forced to sell immediately, especially when fish are perishable and household needs are urgent. This supports studies on fish price volatility, weak bargaining power, and dependence on intermediaries in small-scale fisheries (Deb et al., 2022; Penca et al., 2021; Roul et al., 2024; Ginting et al., 2024).

Table 3. Significant Relationship between Income Volatility and Market Sustainability among Fisherfolk

Income Volatility Indicator	Market Sustainability Indicator	Computed r	p-value	Decision	CONCLUSION
Seasonality of Fishing Income	Access to Stable and Reliable Markets	0.690	0.000	Reject Ho	Highly Significant
	Price Stability and Bargaining Power	0.775	0.000	Reject Ho	Highly Significant
	Continuity of Buyers and Market Channels	0.703	0.000	Reject Ho	Highly Significant
	Stability to Sustain Fishing Livelihood Over Time	0.723	0.000	Reject Ho	Highly Significant
Frequency of Income Fluctuations	Access to Stable and Reliable Markets	0.706	0.000	Reject Ho	Highly Significant
	Price Stability and Bargaining Power	0.777	0.000	Reject Ho	Highly Significant

	Continuity of Buyers and Market Channels	0.723	0.000	Reject Ho	Highly Significant
	Stability to Sustain Fishing Livelihood Over Time	0.729	0.000	Reject Ho	Highly Significant
Variability of Earnings	Access to Stable and Reliable Markets	0.729	0.000	Reject Ho	Highly Significant
	Price Stability and Bargaining Power	0.803	0.000	Reject Ho	Highly Significant
	Continuity of Buyers and Market Channels	0.696	0.000	Reject Ho	Highly Significant
	Stability to Sustain Fishing Livelihood Over Time	0.735	0.000	Reject Ho	Highly Significant
Exposure to Climate-Related and Environmental Risks	Access to Stable and Reliable Markets	0.723	0.000	Reject Ho	Highly Significant
	Price Stability and Bargaining Power	0.778	0.000	Reject Ho	Highly Significant
	Continuity of Buyers and Market Channels	0.701	0.000	Reject Ho	Highly Significant
	Stability to Sustain Fishing Livelihood Over Time	0.720	0.000	Reject Ho	Highly Significant

Exposure to climate-related and environmental risks was significantly related to all market sustainability dimensions. Bad weather, strong waves, typhoons, habitat degradation, and declining fish stocks reduce fishing days, disrupt supply, and weaken buyer continuity. This confirms that climate risks affect not only livelihood but also market participation (Pinsky et al., 2021; Macusi et al., 2024; Sunny et al., 2021; Debnath et al., 2024; Nunn et al., 2025).

The findings imply that market sustainability cannot be improved by market access alone. Fisherfolk need income stabilization, climate adaptation, fair pricing systems, cooperative marketing, post-harvest support, direct buyer linkages, financial access, and livelihood diversification. These results support the proposed Fisherfolk Income Resilience and Market Sustainability Framework as an integrated response to income volatility and weak market sustainability.

Predictors of Market Sustainability

Table 4 presents the regression analysis determining whether dimensions of income volatility significantly predict market sustainability among fisherfolk.

Table 4. Aspects of Income Volatility Predicting Market Sustainability among Fisherfolk

Predictors	Coefficient	t-value	p-value	Decision
Seasonality of Fishing Income	0.1993	0.140	0.000	Significant
Frequency of Income Fluctuations	0.21619	0.080	0.000	Significant
Variability of Earnings	0.2257	0.250	0.000	Significant

Exposure to Climate-Related and Environmental Risks	0.1599	0.970	0.000	Significant
Model Summary: S = 0.3996; R-Sq = 74.4%; R-Sq(adj) = 74.2%				
Analysis of Variance				

Source	**SS**	**MS**	**F**	**p-value**
Regression	202.769	50.692	317.41	0.000
Residual Error	69.791	0.160	—	—
Total	272.559	—	—	—

The regression results indicate that income volatility significantly predicts market sustainability among fisherfolk. The model explains a substantial proportion of the variance in market sustainability, indicating that seasonality, income fluctuations, earnings variability, and climate-related or environmental risks jointly influence market participation, buyer continuity, bargaining conditions, and livelihood sustainability.

Variability of earnings emerged as the strongest predictor. This means that unstable daily, weekly, or monthly income has the strongest influence on market sustainability. When earnings are unpredictable, fisherfolk may struggle to plan production, maintain market supply, invest in post-harvest handling, repay obligations, and negotiate better prices. This is consistent with studies showing that catch variability, price fluctuation, market structure, and buyer access shape fisherfolk income outcomes (Deb et al., 2022; Roul et al., 2024; White & Scheld, 2024; Indrabudi et al., 2025).

Frequency of income fluctuations was also a significant predictor. Repeated income changes affect household financial planning and consistent market participation. Small-scale fishing households exposed to irregular income may become dependent on short-term borrowing, middlemen, or informal coping strategies, weakening their long-term market position (Riantini et al., 2024; Enema & Quezon, 2024; Sethy et al., 2025; Putri et al., 2025).

Seasonality of fishing income also predicted market sustainability. Seasonal fishing conditions affect catch availability, supply continuity, and buyer relationships. Closed seasons, monsoon conditions, and seasonal fish abundance can produce income gaps and reduce market consistency (Ayisi et al., 2024; Chakraborty et al., 2025; De La Torre-De La Cruz et al., 2023; Wang et al., 2025).

Exposure to climate-related and environmental risks had the lowest coefficient but remained significant. This suggests that climate risks influence market sustainability directly and indirectly through reduced fishing days, lower catch, damaged assets, higher operating costs, and disrupted supply. This finding supports the need to integrate climate resilience into fisheries market-development programs (Pinsky et al., 2021; Macusi et al., 2024; FAO, 2025; Nunn et al., 2025; Khan et al., 2026).

Proposed Framework Output

Based on the findings, the study proposes the Fisherfolk Income Resilience and Market Sustainability Framework. The framework is intended to guide local government units, fisheries agencies, fisherfolk organizations, cooperatives, financial institutions, and development partners in developing integrated interventions for small-scale fisherfolk.

The framework is anchored on the empirical finding that income volatility significantly influences market sustainability. It addresses key weaknesses identified in the study, including climate-related and environmental risks, unstable earnings, seasonal fluctuations, weak bargaining power, limited post-harvest support, buyer dependence, and limited livelihood diversification.

The framework has six components:

1. Income Stabilization and Financial Preparedness. This component focuses on savings mobilization, emergency funds, financial literacy, household budgeting, and seasonal income planning. It helps fisherfolk manage irregular income and prepare for low-catch periods.
2. Climate-Resilient Livelihood Support. This component includes early warning systems, safety-at-sea training, fisherfolk insurance, climate adaptation training, and sustainable coastal resource management. It responds to the strong effect of environmental risks on income and market participation.
3. Fair Pricing and Bargaining Power Enhancement. This component promotes cooperative marketing, collective selling, direct buyer linkages, price monitoring, market information access, and formal credit support. It aims to reduce dependence on middlemen and improve fisherfolk price negotiation.
4. Post-Harvest Infrastructure and Value-Adding Support. This component includes cold storage, ice supply, fish landing facilities, transport support, fish drying, smoking, packaging, and processing equipment. It helps fisherfolk reduce spoilage, avoid forced selling, and improve product value.
5. Livelihood Diversification and Enterprise Development. This component supports aquaculture, seaweed farming, fish processing, food vending, small trading, backyard gardening, and other coastal enterprises. It reduces dependence on fishing alone and provides income buffers during lean periods.
6. Institutional Coordination and Monitoring. This component encourages the coordination of LGUs, BFAR, DA, DTI, DOLE, DSWD, TESDA, CDA, cooperatives, fisherfolk associations, NGOs, and private buyers. It includes monitoring, evaluation, and feedback mechanisms to ensure program responsiveness and sustainability.

The framework assumes that fisherfolk market sustainability can be strengthened when income volatility is managed through coordinated livelihood, market, financial, infrastructure, and climate-resilience interventions.

SUMMARY OF FINDINGS

The study found that fisherfolk experienced income volatility in their fishing livelihood. Their income was affected by seasonal fishing patterns, frequent changes in income, variability of daily, weekly, and monthly earnings, and exposure to climate-related and environmental risks. Among these indicators, exposure to climate-related and environmental risks emerged as the most pressing concern, showing that bad weather, rough seas, flooding, habitat degradation, and declining fish availability strongly affect fishing activity and household income. Although seasonality of fishing income was the least emphasized indicator, it still remained a relevant source of income instability because fisherfolk continue to experience income differences between peak and lean fishing periods.

The findings showed that fisherfolk generally perceived their market sustainability as present, particularly in terms of access to markets, continuity of buyers, and the ability to sustain fishing livelihood over time. Fishing remained an important source of household income and community livelihood. However, the study also found that market sustainability was not fully secured because fisherfolk still experienced weak price stability and limited bargaining power. This means that many fisherfolk continued to depend on buyers, traders, or middlemen who influence pricing, credit, and market access.

The study found a significant positive relationship between income volatility and market sustainability. This means that changes in fisherfolk income conditions were meaningfully connected with their market access, price stability, buyer continuity, and ability to sustain fishing livelihood over time. The strongest relationship was observed between variability of earnings and price stability and bargaining power, indicating that unpredictable income is closely linked with weak price negotiation and market dependence. The findings suggest that income volatility is not only a household financial concern but also a market-system issue.

The findings revealed that all aspects of income volatility significantly predicted market sustainability among fisherfolk. These include seasonality of fishing income, frequency of income fluctuations, variability of earnings, and exposure to climate-related and environmental risks. Among these, variability of earnings emerged as the

strongest predictor, showing that unstable daily, weekly, and monthly income has the greatest influence on market sustainability. This implies that when fisherfolk earnings are unpredictable, their ability to maintain buyers, negotiate fair prices, invest in post-harvest handling, and sustain market participation is weakened.

Based on the findings, the study proposed the Fisherfolk Income Resilience and Market Sustainability Framework. The framework was developed to address the key weaknesses identified in the study, particularly income instability, climate-related risks, earnings variability, weak bargaining power, dependence on intermediaries, limited market support, and the need for livelihood diversification. The framework emphasizes income stabilization, climate-resilient livelihood support, fair pricing, cooperative marketing, direct buyer linkages, post-harvest infrastructure, financial access, and institutional coordination as practical strategies to strengthen fisherfolk livelihood resilience and market sustainability...

CONCLUSIONS

Income volatility is a persistent livelihood condition among fisherfolk. Their income is not fixed or predictable because it depends on catch availability, weather conditions, fishing seasons, environmental risks, and market-related factors. The study concludes that fisherfolk livelihood remains highly vulnerable, especially when bad weather, rough seas, and declining fish availability reduce fishing days and household earnings.

Market sustainability exists among fisherfolk, but it remains fragile. Fisherfolk are able to participate in markets, but their benefits are limited by weak bargaining power, buyer dependence, unstable pricing, and limited control over selling arrangements. The study concludes that market participation alone does not guarantee sustainable livelihood unless fisherfolk can negotiate fair prices and reduce dependence on intermediaries.

Income volatility and market sustainability are strongly interconnected. The study concludes that unstable income affects fisherfolk's ability to access markets, maintain buyer relationships, negotiate prices, and sustain fishing livelihood. Income volatility should therefore be treated not only as a household financial issue but also as a market-system concern that directly influences fisherfolk's market participation and bargaining position.

The study concludes that market sustainability among fisherfolk is significantly influenced by income volatility. In particular, unstable daily, weekly, and monthly earnings have the strongest effect on fisherfolk's ability to sustain market participation. When earnings are unpredictable, fisherfolk find it more difficult to plan production, maintain buyer continuity, invest in post-harvest handling, and negotiate better market terms.

The proposed framework is a necessary research output because it directly responds to the weaknesses identified in the findings. The study concludes that strengthening fisherfolk livelihood requires an integrated approach that combines income stabilization, climate resilience, fair pricing, cooperative marketing, direct buyer linkages, post-harvest support, livelihood diversification, financial access, and institutional coordination.

The study concludes that income volatility is a major factor affecting the market sustainability of small-scale fisherfolk. Although fisherfolk continue to participate in markets and sustain fishing as a livelihood, their market position remains vulnerable because of unstable income, climate-related disruptions, weak bargaining power, and dependence on buyers or middlemen. Thus, improving market sustainability requires more than market access; it requires coordinated support systems that stabilize income, strengthen bargaining power, improve post-harvest capacity, diversify livelihood sources, and build climate-resilient fishing communities.

RECOMMENDATIONS

Small-scale fisherfolk should participate actively in livelihood diversification, financial literacy, savings mobilization, cooperative marketing, and climate-preparedness programs. These actions can reduce dependence on fishing alone and improve household resilience during lean seasons and environmental disruptions.

Fisherfolk organizations and cooperatives should strengthen collective selling, direct buyer linkages, savings groups, price monitoring, and market information sharing. Organized fisherfolk groups can improve bargaining power and reduce dependence on buyer-financiers and middlemen.

Local government units should adopt and implement the proposed Fisherfolk Income Resilience and Market Sustainability Framework through their agriculture, planning, disaster risk reduction, livelihood, and economic enterprise offices. LGUs should prioritize cold storage, ice facilities, fish landing support, livelihood training, buyer linkage, price monitoring, and climate adaptation programs.

BFAR, DA, DTI, DOLE, DSWD, TESDA, CDA, and other national agencies should collaborate to provide technical assistance, livelihood support, skills training, cooperative development, social protection, post-harvest equipment, and market facilitation. Their programs should be coordinated at the local level to avoid fragmented support.

Microfinance institutions, rural banks, and cooperatives should design fisherfolk-friendly financial products with flexible repayment terms, savings options, microinsurance, emergency loans, and production credit aligned with seasonal fishing income.

Future researchers may expand this study by including qualitative inquiry, longitudinal income tracking, comparative analysis across coastal municipalities, and evaluation of intervention models such as cooperative marketing, direct buyer linkages, microfinance, and post-harvest infrastructure.

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