ASIA PACIFIC HIGHER EDUCATION RESEARCH JOURNAL
Volume 12, Issue No. 1

PHILIPPINE HIGHER EDUCATION RESEARCH CONSORTIUM

Traditional Knowledge as a Mediator of Climate Awareness and Agricultural Resilience: Insights from Northern Negros, Philippines

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Abstract

The article assesses the climate change awareness and resilience of farming communities in Northern Negros, Philippines. It employs a descriptive-quantitative approach, guided by the Awareness-to-Action Model and Resilience Theory. From a total population size of 30,653, stratified sampling was used, and 394 respondents were selected to provide the results. Key findings reveal the level of climate change awareness among respondents. Additionally, traditional knowledge has been essential in adaptation, such as indigenous pest management, drought management through conventional irrigation, and water conservation. In conclusion, traditional knowledge is vital for climate adaptation but is most effective when supported by technology, institutions, and education within a framework of community resilience..

Keywords:
climate change awareness, traditional knowledge, northern Negros, agricultural resilience

Article History

Editors:
Marie Paz E. Morales, PhD

Received:
August 28, 2024

Revised:
August 27, 2025

Accepted:
August 28, 2025

Salindo, P.P., Salindo, J.K.B., Pelletero, V.B.M., & Osumo, R.B. (2025). Traditional knowledge as a mediator of climate awareness and agricultural resilience: Insights from Northern Negros, Philippines. *Asia Pacific Higher Education Research Journal, 12*(1), 1-17.

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Introduction

Climate change is changing farming worldwide, destabilizing food systems through extreme weather, altered rainfall patterns, and rising temperatures (Zhang et al., 2015). In Western Australia, farm income and crop production are projected to collapse by 2030 as the environment grows hotter and drier, with adaptation at all levels becoming non-negotiable (Ghahramani & Moore, 2016). The Philippines faces the same reality: erratic rainfall, drought, flooding, soil erosion, groundwater depletion, and post-harvest loss now threaten food security (James et al., 2021; Phenica et al., 2018).

This research shows that traditional knowledge connects awareness of climate risks to real resilience. Farmers make better choices when they understand these risks, but traditional practices like crop diversification, rainwater harvesting, and mutual aid turn awareness into resilience. However, these methods have limits. During prolonged droughts or severe storms, traditional coping strategies may not be enough, so support from modern science, institutions, and adaptive policies becomes essential (Mbah et al., 2021).

Even with these adaptive practices, resilience remains a complex issue. Seasonal calendars do not match unpredictable rainfall, and crop varieties that once thrived now struggle with droughts and floods. Communal work and resource sharing are strained when whole communities face hardship together. In some cases, holding on to tradition makes it harder to accept science-based solutions, creating tension between cultural continuity and needed adaptation (Hiwasaki et al., 2014)

To reconcile these contradictions, this study posits resilience as both systemic and cultural, arguing that traditional knowledge is both insufficient and necessary. Its continuity and future are in local knowledge, but its resilience is in being sustained by policy, science, and education. In this integrated way, resilience development in agricultural societies not only sustains livelihoods but also facilitates international obligations under SDG 4 (Quality Education) and SDG 13 (Climate Action) (Audefroy & Sanchez, 2017).

Traditional knowledge for climate resilience

Traditional knowledge includes practical, ecological, and cultural information shared across generations, giving it spiritual, economic, and social importance (Keats & Evans, 2020). This knowledge has helped communities become more resilient to climate change by guiding disaster prevention and environmental monitoring. Keats and Evans (2020) explained that it enables societies to develop ways to adapt. Audefroy and Sanchez (2017) showed how it supports disaster planning and adaptive farming. Similarly, McCubbin et al. (2015) described how traditional knowledge helps set up early warning systems for timely climate action.

In Southeast Asia, especially in the Philippines, traditional farming methods help communities stay resilient. Alam et al. (2017) found that techniques like traditional irrigation, agroforestry, and organic farming are essential for addressing water scarcity and keeping farms productive. Similarly, Reyes-García et al. (2019) observed that indigenous Andean farmers use both old and new ways to manage water and make the most of limited resources. These combined methods have helped keep crop yields steady in the Philippines, even when the weather is unpredictable (Camacho et al., 2016).

Nevertheless, signs show that traditional knowledge can be limited by severe or unusual climatic stress. For example, Kamakaula (2024) observed that prolonged droughts, stronger typhoons, or climate-related pest outbreaks can overwhelm traditional coping methods, reducing their effectiveness. In these cases, relying only on conventional practices without new adaptations can cause yield losses and increase vulnerability (Leal Filho et al., 2025). These findings indicate that while traditional knowledge is valuable , it must be combined with scientific forecasts, climate-resilient crops, and institutional support to remain effective in fast-changing conditions.

Governance plays a vital role in mainstreaming traditional knowledge. Chanza and De Wit (2016) argued for the incorporation of traditional practices into frameworks of climate governance to enhance local participation in the policy adaptation process. Mugambiwa and Tirivangasi (2017) called for community-led approaches that are culturally sensitive and sustainable. Policies must empower farmers to integrate traditional practices with scientific innovations that combat climate change while preserving cultural heritage (Ramya et al., 2023).

The synthesis of traditional and modern approaches enhances both climate adaptation and the sustainability of agricultural livelihoods, as well as environmental stewardship. As demonstrated across various studies, the interface promotes increased resilience, higher productivity, and reduced negative environmental impacts—a viable pathway for climate-resilient agriculture.

Traditional knowledge contributes significantly to resilience, particularly through the practices of adaptive agriculture, disaster readiness, and natural monitoring in Southeast Asia. Yet its particular influence in Northern Negros is uncertain. Although numerous studies center on hybrid methods combining traditional knowledge and contemporary strategies, typically emphasizing the Andes or Northern Philippines socio-cultural processes, and agricultural practice in Northern Negros is not well-studied. This study seeks to bridge the gap by examining how traditional knowledge contributes to local communities' resilience. The intent is to yield context-specific information for target education and policy-making.

Guiding Framework

The present research builds on two complementary models: the Awareness-to-Action Model (Bostrom et al., 1994; Grothmann & Patt, 2005) and Resilience Theory (Holling, 1973; Folke, 2006). These models jointly explain how climate change awareness—rooted in both scientific extension and local knowledge—is operationalized into adaptive actions that sustain agricultural resilience. The Awareness-to-Action Model explains how self-efficacy and perceived vulnerability, triggered by environmental hazards, directly motivate adaptation (Ricart et al., 2023). Resilience Theory builds on this by showing how these adaptive actions contribute to the long-term capacity of individuals and communities to endure shocks, reorganize, and maintain essential functions (Zohuri & Moghaddam, 2017). These two models show that being aware helps people adapt and is also vital for building resilience over time.

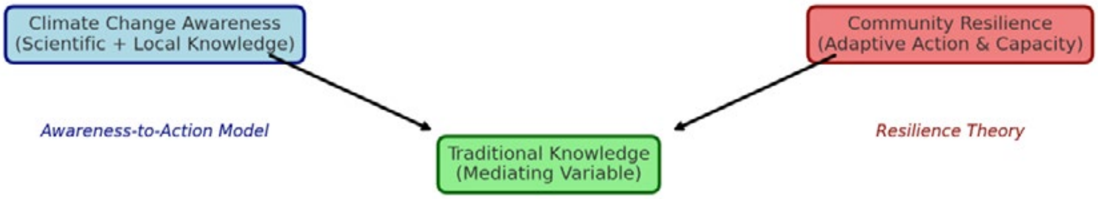
To reinforce this connection, traditional knowledge is used here as the mediating mechanism. Scientific awareness does identify risks, but it is the traditional knowledge that converts these into culturally embedded practices—altering planting calendars, crop diversification, or organizing communal labor. This ensures awareness is transformed into action in the social and ecological regimes that farmers inhabit. Comparative contexts reveal how this mediation differs: in the Philippines, seasonal signals are firmly embedded in communal farming and disaster risk reduction but unequally embedded in formal planning (Hiwasaki et al., 2014). In Sub-Saharan Africa, family-level approaches like intercropping or water harvesting work well but are limited by institutional gaps and drought intensity (Mbah et al., 2021). In Australia, Indigenous environmental knowledge is increasingly incorporated into national fire and land management, augmenting and not replacing science and policy (Nursey-Bray et al., 2019). All these examples illustrate that while traditional knowledge always fills the gap between awareness and action, its success relies on scale, context, and institutional backing (Dorji et al., 2024).

In Canlaon City, increased farmers' awareness of changing rainfall patterns and an increase in temperature has triggered risk-reducing action in line with the Awareness-to-Action mechanism. These adaptations build up over time as "resilience capital," consistent with the long-term adaptability of Resilience Theory. Evidence converges: efficacy and risk perception motivate proactive adaptation (van Valkengoed et al., 2023); awareness informs African smallholder decision-making (Madamombe et al., 2024); and in the Philippines, indigenous knowledge supports disaster preparedness (Irene & Abadiano, 2017) and webs of resilience (Pacoma et al., 2022).

This research thus presents a conceptual framework: the Awareness-to-Action Model describes the catalyst for adaptation, the Resilience Theory describes its endurance, and traditional knowledge acts as the connecting tissue that ties both together into a unifying narrative of climate-resilient agricultural systems.

Figure 1

Conceptual Model of the Study



This model illustrates how the farmers' awareness of climate change builds resilience at the community level. The research addresses a gap by exploring how traditional knowledge acts as a mediator of awareness and resilience in Northern Negros, a typhoon- and drought-prone area with limited institutional support. Emphasis on this context is what exposes how regional conditions condition the contribution of traditional knowledge in varying ways. The research further encourages the incorporation of traditional knowledge and climate literacy in education, teacher education, and community education. Key inquiries include: What is the level of climate change awareness among farmers in Canlaon? What are the traditional knowledge-based adaptation practices used to enhance resilience in response to climate change? How do climate change awareness and the application of traditional knowledge predict resilience among farming communities?

Methodology

Research Design

A descriptive-quantitative research study using survey instruments was conducted to evaluate farmers' climate change awareness, its implications for agriculture, traditional knowledge, and adaptation measures in Canlaon City. Quantitative data are particularly suitable for addressing social issues such as climate awareness and resilience, as they can encompass extensive amounts of data and reveal behavioral and adaptation patterns.

Research Locale

This research focuses on the City of Canlaon, located in northern Negros Oriental, Philippines, with an area of 16,662 hectares, of which 9,783 hectares are devoted to agriculture. Canlaon has twelve barangays and is one of the major cities in the region that produces a wide variety of vegetables. Due to its agricultural importance, Canlaon provides an appropriate context in which to reflect on how traditional knowledge helps achieve climate adaptation, showing a case at the local level that mirrors international moves to enhance community resilience in sectors of agriculture impacted by climate change, as in other agrarian regions in the world.

Respondents

Stratified sampling was employed in this study. Stratification was achieved through the demographics of age, gender, education, income, and years of experience in farming. Categorizing the entire population into mutually exclusive groups and sampling proportionally. Slovin's formula was used to calculate the sample size from the total population of 30,653. It is a formula of preference for known populations, as it is simple and gives accurate results. Seven agriculturally significant barangays, namely Bayog, Linothangan, Lumapao, Malaiba, Masulog, Panubigan, and Pula, had a total of 394 respondents. Slovin's formula has certain limitations. It assumes an equal distribution of the population, which may not be in a diverse group. The assumption may result in underestimating wage or educational inequality.

Table 1

Distribution and Demographic Profile of Respondents (n = 394)

Category	Subcategory / Barangay	Population (N)	Population %	Sample (n)	Sample %
Barangay	Bayog	2,801	9.14	36	9.14
	Linothangan	3,735	12.18	48	12.18
	Lumapao	2,954	9.64	38	9.64
	Malaiba	4,046	13.20	52	13.20
	Masulog	5,374	17.52	69	17.52
	Panubigan	6,769	22.08	87	22.08
	Pula	4,974	16.24	64	16.24
Total		30,653	100.00	394	100.00
Age group	18–25	389	1.00	5	1.00
	26–33	2,724	9.00	35	9.00
	34–41	7,628	24.00	95	24.00
	42–49	7,628	24.00	95	24.00
	50–57	7,051	23.00	91	23.00
	58+	5,233	19.00	73	19.00
Total		30,653	100.00	394	100.00
Sex	Male	18,653	61.00	240	61.00
	Female	11,999	39.00	154	39.00
Total		30,653	100.00	394	100.00
Educational attainment	Illiterate	311	1.00	4	1.00
	Adult Education	1,245	4.00	16	4.00
	Primary Education	17,166	56.00	221	56.00
	Secondary	11,931	39.00	153	39.00

Total		30,653	100.00	394	100.00
Monthly income (₱)	1,000–5,000	13,488	44.00	173	44.00
	6,000–10,000	12,872	42.00	165	42.00
	11,000–15,000	3,346	11.00	43	11.00
	16,000+	1,012	3.00	13	3.00
Total		30,653	100.00	394	100.00
Years of farming	1–10 years	4,280	14.00	55	14.00
	11–20 years	8,874	29.00	114	29.00
	21–30 years	5,521	18.00	71	18.00
	31–40 years	9,493	31.00	122	31.00
	41+ years	2,453	8.00	32	8.00
Total		30,653	100.00	394	100.00

Instrumentation

The adapted questionnaire of Theodory's (2021) model was indeed tailored to identify climate change awareness and indigenous knowledge in Canlaon City. Local farming practices, water gathering and management, and weather forecasting—within the local systems of knowledge—were stressed. The items were crafted to draw on local sources, such as elders, rituals, and customary practices, and adapted into understandable local languages for better understanding and intelligibility. The questionnaire instrument had four sections: respondent profile, climate change awareness, sources of traditional knowledge, and adaptation strategies. It had land use strategies appropriate for soils, traditional soil conservation, and traditional water systems. Validity was also improved by verification with agricultural officers, experts, and local authorities. The tool's validity was rated at 4.16 by experts. A 30-subject pilot test yielded Cronbach's alpha values of 0.78 (climate change awareness) and 0.81 (traditional knowledge), thereby establishing the instrument as suitable and reliable for use within Canlaon's context.

Data Collection

Formal letters were submitted to secure approvals before data collection. Questionnaires were manually distributed in selected barangays to speed up responses. Misunderstandings were clarified in person, though language and cultural barriers posed challenges, especially in remote areas. Local guides familiar with community dialects and customs assisted in translating and explaining items on climate change and traditional knowledge.

For confidentiality, replies were anonymized. Informed consent was requested after informing the purpose of the study and the sensitivity of traditional knowledge. Data were encoded and processed electronically. The results offer rich insights into climate awareness and the contribution of conventional expertise towards the establishment of community resilience.

Data Analysis

The numerically analyzed survey data were investigated using descriptive statistics to report on respondents' demographics, climate change awareness, and adaptation measures in Canlaon City. Multiple linear regression analysis was employed to assess the relationship between climate change awareness and resilience, and to determine the predictive strength of traditional knowledge. This is to identify trends and general patterns regarding the frequency of practice and resilience. The results provided a statistical basis for drawing conclusions and policy and educational recommendations accordingly.

Ethical Considerations

The survey was administered personally for ethical reasons, with informed consent. Participants were requested to sign their consent voluntarily, and researchers ensured confidentiality in that results would not have personal names, and took care of their protection from any kind of harm. The participants had the right to withdraw from this research project at any time, as their rights and well-being were of paramount importance.

Results and Discussions

Awareness of the respondents on climate change

Table 2

Level of awareness of the respondents on climate change

Local Perception	$\overline{WX}$	Verbal Description
Increasing the amount of rainfall during rainy season	3.13	Aware
Decreasing rainfall amount during the rainy season	3.02	Aware
Increasing length of the rain season	3.11	Aware
Decreasing length of the rain season	3.10	Aware
Early onset of rainy days	3.05	Aware
Late-onset of rain days	3.00	Aware
Increase in strong wind events	3.01	Aware
Increasing temperature of the area	3.10	Aware
Decreasing the emperature of the area	3.04	Aware
Total	3.06	**Aware**

In Table 2, the results indicate that farmers in Canlaon City exhibit awareness of evolving climatic conditions. This localized awareness is congruent with more extensive scientific conclusions articulated by Pachauri et al. (2014) and the IPCC (2019), thereby reinforcing the assertion made by Nalau and Verrall (2021) that acknowledging local climatic impacts serves as an indicator of environmental consciousness. Nevertheless, despite this elevated level of awareness, adaptive responses remain notably constrained.

This is consistent with the Awareness-to-Action Model proposed by Bostrom et al. (1994) and Grothmann and Patt (2005), which posits that awareness alone is insufficient to trigger action without the perception of self-efficacy and capacity. In Canlaon, there is awareness of climate risk but with restricted access to education, institutions, and finance. These conditions are the reasons why awareness has yet to be followed by mass behavioral change. Contrary to wealthier contexts, where intention is acted upon (Ruiz-Mallén et al., 2022), reactions in this location remain passive and piecemeal.

The theory of resilience (Holling, 1973; Folke, 2006) also sheds light on the outcomes by pointing to the capacity of systems—such as farming communities—to withstand and adapt under the influence of climatic drivers. Canlaon farmers possess traditional knowledge, often passed down from one generation to the next, that has served as an adaptive mechanism. This knowledge base, however, currently remains underutilized due to the lack of formal infrastructure support, such as educational programs targeting it and its development, to enable it to act as a resilience-building strategy.

The perception-action gap highlights the need to integrate traditional knowledge within institutional systems, particularly in extension education, to bridge capacity gaps. It reinforces the appeal of Asmamaw et al. (2020) and van den Burg et al. (2024) for organized support systems that translate awareness into action. To develop resilience, traditional knowledge has to be institutionalized by facilitating policies, education, and economic security measures (Ramya et al., 2023). Awareness alone can then stimulate adaptive actions and enhance climate resilience.

Traditional knowledge-based adaptation practices leading to resilience

Table 3 shows that a vast majority of agrarians rely on pesticides and insecticides to control pest infestations. At the same time, the use of fertilizers and compost is relatively low. This aligns with the findings of Chepchirchir et al. (2021), which suggest that farmers often prefer readily available and familiar chemical measures to counter crop threats. However, such reliance on the use of synthetic inputs creates ample environmental and health concerns, hence highlighting the need for educational efforts for the promotion of safer and more sustainable options.

Table 3

Traditional knowledge-based adaptation practices

	Frequency	Rank
Pest control		
Application of pesticides/insecticides	235	1
Application of Commercial Fertilizer	39	2
Application of Organic Fertilizer/ Compost	25	3
Drought adaptation		
Installation of the indigenous shower system	202	1
Installation of the Traditional Irrigation	52	2
Installation of Modern Irrigation	7	3
Water resources management		
Using the Traditional Irrigation	222	1
Using the Modern Irrigation	68	2
Regulated use of Water Supply	10	3
Strong winds adaptation		
There is nothing that can be done	182	1
Not planting any agricultural crop	35	2
Damaged Control	16	3
Harvesting of crops earlier	14	4
Construction of Wind Breakers	12	5

In water management, conventional methods such as indigenous shower systems and gravity irrigation predominate in drought prevention practices. Innovative irrigation remains underexploited due to its high costs and inadequate access to technology (Jahangirpour & Zibaei, 2022). This is akin to broader trends in low-input rural environments, where economic and institutional limitations restrict the adoption of modern technology. Farmers are not willing to use water-saving appliances due to fear or ignorance, based on Zhang et al. (2019).

In addressing the repercussions of strong winds, many farmers perceive a lack of adequate responses, with only a minority taking measures such as establishing windbreakers or temporarily ceasing planting activities. This discrepancy in perception underscores the need to increase awareness about viable adaptation strategies and the benefits they offer (Guja et al., 2024).

These findings support the applicability of the Awareness-to-Action Model (Bostrom et al., 1994; Grothmann & Patt, 2005), which suggests that awareness will not be followed by action if individuals do not possess feelings of control and access to provided solutions. The limited application of new technologies by farmers and adherence to traditional methods in this context indicate a gap between awareness and self-efficacy (Shehrawat et al., 2024). Closing this gap requires coordinated extension programs, access to appropriate technologies, and financial support (Liu et al., 2025).

Concurrently, the research corroborates Resilience Theory (Holling, 1973; Folke, 2006), which recognizes the pivotal role of traditional knowledge and adaptability in the maintenance of agricultural systems under climate-stress conditions. The continued use of local methods—albeit without significant formal backing—demonstrates the community's inherent resilience, while also highlighting areas where resilience could be enhanced through institutional support (Anugwom & Anugwom, 2022).

Resilience in agriculture calls for strategic enhancement of extension services, supported by coordinated national and local Government budgets and supplemented by development partners' investments, to incorporate integrated pest management and climate-smart agriculture (Pretty & Pervez Bharucha, 2015). The extension services involve extending field officer networks, setting up mobile advisory units, and using digital platforms to widen coverage, especially in hard-to-reach areas. Capacity development programs must be directed towards socio-economic and environmental benefits of sustainable methods (Agyei & Stringer, 2021). However, the adoption can be promoted by the use of specific subsidies to high-technology irrigation systems (Serote et al., 2023) and incentives like grants, input subsidies, and assured market linkages. Resilience efforts must further emphasize actions targeting localized vulnerabilities, particularly those that arise from wind and drought hazards (Alvar-Beltrán et al., 2021), hence building adaptive and sustainable agriculture systems.

Link between climate change awareness and resilience

A multiple regression analysis was conducted to examine whether awareness of climate change predicts resilience scores in farming communities (Table 4). The overall model was not statistically significant, $F(9, 40) = 1.64$, $p = .137$, with $R^2 = .27$ and adjusted $R^2 = .11$.

Table 4

Multiple regression predicting resilience scores from climate change awareness

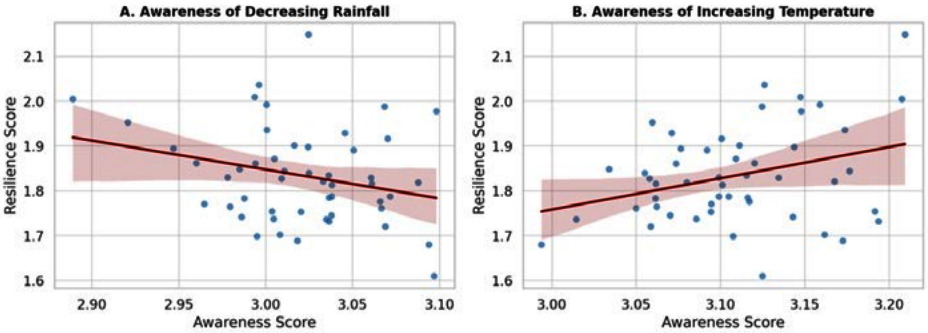
Predictor	B	SE B	β	t	p
Constant	1.72	2.88	—	0.60	.554
Awareness: Increasing rainfall	-0.04	0.37	-0.02	-0.11	.915
Awareness: Decreasing rainfall	-0.66	0.36	-0.41	-1.82	.076
Awareness: Increasing rainy length	-0.37	0.31	-0.23	-1.19	.239
Awareness: Decreasing rainy length	0.40	0.37	0.24	1.09	.282
Awareness: Early rainy onset	-0.31	0.31	-0.19	-1.01	.317
Awareness: Late rainy onset	-0.06	0.30	-0.03	-0.19	.850
Awareness: Increasing wind events	0.30	0.41	0.17	0.75	.458
Awareness: Increasing temperature	0.58	0.32	0.36	1.83	.074
Awareness: Decreasing temperature	0.19	0.29	0.12	0.65	.520

Note. R2=.27R^2 = .27R2=.27, Adjusted R2=.11R^2 = .11R2=.11, F(9,40)=1.64,p=.137F(9, 40) = 1.64, p = .137F(9,40)=1.64,p=.137. B = unstandardized regression coefficient; β = standardized coefficient; SE B = standard error of B.

Among the predictors, two variables approached significance: awareness of decreasing rainfall (β = −.41, $p = .076$) was negatively associated with resilience, while awareness of increasing temperature (β = .36, $p = .074$) was positively associated, as shown in Figure 2.

Figure 2

Scatterplots with regression lines showing the relationship between awareness indicators and resilience scores.



Note. Panel A shows a negative association between awareness of decreasing rainfall and resilience. Panel B shows a positive association between awareness of increasing temperature and resilience.

Even if the regression model is not significant, this is indicative of minor effects and unobserved factors, e.g., access to markets, institutional settings, and household incomes, that have more potent effects on resilience than awareness. However, the near-significant predictors (increase in temperature) indicate that awareness only works when it is embedded in practices, e.g., reform in the planting calendar, traditional irrigation, organic fertilization, and timely harvesting (Bassiag, 2023). Awareness of the reduction in rainfall, but without sufficient water infrastructure, conversely, can have a detrimental impact on adaptation, as in rural communities (Chanza & De Wit, 2016). Far from indicating irrelevance, the deficiency points towards holistic enabling systems. Specific action to address this is: (a) planning for localized extension modules that incorporate climate education; (b) provision of resilience funding for the revival of traditional water and soil management systems; (c) institutionalization of farmer-managed cooperatives to provide improved financial and technical inputs; and (d) development of integrated forecasting platforms that balance scientific knowledge with indigenous alerts, thus converting awareness into community-driven resilience.

The results indicate that regression analysis positions indigenous knowledge at the forefront of the mediator variable between awareness and resilience. Although awareness enables the recognition of climate hazards, resilience is only realized when traditional knowledge is embedded within social capital, adaptive practice, and institutional support (Aldrich & Meyer, 2015; Fazey et al., 2018; Makondo & Thomas, 2018).

Conclusion and Recommendations

This study probed climate change awareness and community resilience, with emphasis on the adaptive function of indigenous knowledge among farmers in Canlaon City. Employing a descriptive-quantitative research design, the study measured climate knowledge, adaptation strategies, and identified strong climate variability awareness and the use of local practices in irrigation, pest management, and water control.

The study shows that traditional knowledge alone is not sufficient but instead complements a broader framework of adaptive capacity. According to the Awareness-to-Action Model and the theory of Resilience, awareness leads to resilience only when it is supported by technology, institutional backing, and education.

Northern Negros' success stems from the effective combination of traditional and modern systems. Policy interventions should aim to merge local traditions with scientific methods, strengthen support structures, and eliminate barriers to economic and educational opportunities. To fully grasp the long-term impact of this integration, future research should employ a mix of approaches or take a longitudinal approach. Follow-up studies should also use a variety of methods or track outcomes over time to capture the lasting effects of this synergy.

■ ■ ■

Statements and Declarations

Funding Details

This research is funded by the Negros Oriental State University-Guihulngan Campus Research Office through the Research, Innovation, Development, and Extension Office of Negros Oriental State University-Main Campus under Memorandum of Agreement (MOA) REXIL Project No. 2019-6.

Disclosure Statement

The author has no conflicts of interest to disclose.

Declaration of AI in scientific writing

During the preparation of this work, the author(s) utilized tools such as ChatGPT and QuillBot to help organize their thoughts and improve grammatical accuracy. Following the use of these tools, the author(s) thoroughly reviewed and edited the content to ensure it meets the publication's standards. They take full responsibility for the final version.

Acknowledgement

The authors extend their gratitude to Negros Oriental State University and the Research, Innovation, Development, and Extension Office for their support in conducting this research. The authors thank the field assistants, officials of the local government in the study areas, for their support.

Ethical approval

This research work has been conducted with ethical standards. Informed consent was obtained from all the participants at the beginning of the study. Although there was no formal ethics committee within the university's structure during the conduct of this research, the research work was carried out following established ethical guidelines and principles .

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