

AGRICULTURAL EXTENSION ACCESS AND ADOPTION OF CLIMATE-RESILIENT PRACTICES AMONG SMALL-SCALE FISHERS IN OGUN WATERSIDE LGA, OGUN STATE

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ABSTRACT:

Small-scale fishers along Nigeria's coast are increasingly struggling with the climate change impacts. This study examined the factors that influence small-scale fishers in Ogun Waterside Local Government Area (LGA) of Ogun State, to adopt climate-resilient practices. Data were collected from 180 fishers across nine communities in the study area using structured questionnaires. Descriptive statistics revealed that majority of fishers are middle-aged, with a mean age of 48 years old and 17 years of experience in the occupation. Fishing serves as the primary livelihood for about 59% of the respondents. This study also found that access to extension services was generally low, with only 32% of fishers having regular access to extension agents. The adoption index indicated that climate-resilient practices are still emerging among fishers in the study area with only 15% demonstrated high adoption among the fishers. The Tobit regression revealed that access to credit, cooperatives or associations membership, extension service access significantly and positively influenced the adoption of climate-resilient practices. Fishers with these advantages were more likely to adopt new strategies. Conversely, age was found to have a negative effect, with older fishers less likely to adopt new adaptation measures. This study recommends raising awareness about climate change, strengthening social networks, improving access to financial resources, and delivering targeted extension services to influence adoption of climate-resilient practices among small-scale fishers in the study area.

Keywords: Climate variability, adaptation strategies, coastal dwellers, fisherfolk resilience

INTRODUCTION

Agriculture remains one of the important pillars of economic development in Nigeria, providing food, income and employment for a majority of the populace. In coastal communities, fishing activities contribute significantly to the livelihoods and household survival of the riverine communities. Many households in riverine communities rely on daily fishing activities to meet their daily needs. Small scale fishers therefore form the major backbone of coastal economies, making their productivity and resilience crucial to enhance food security and poverty reduction.

Small-scale fishers are those who engage in fishing activities using relatively low-capital, low-technology methods, usually for subsistence or local markets. They usually operate small boats or canoes, employ simple gear such as nets, traps, or lines, and work close to shore (Abdul Halim *et al.*, 2019). The small-scale fishers' activities are increasingly affected by continuous observable changes in climate and the aquatic environment.

Empirical evidence shows that climate change is increasingly threatening the sustainability and productivity of small-scale fisheries both globally and in Nigeria. Changes in rainfall patterns, fluctuations in water levels and rising temperatures have disrupted aquatic ecosystems, affecting fish yields, higher incidence of fish

diseases, and greater livelihood insecurity for fishing communities (Magawata and Ipinjolu, 2013; Akinboye and Tajudeen, 2025). In Nigeria, these environmental changes have led to declining fish catches and increased the vulnerability of artisanal fishers.

These outcomes increase uncertainty during fishing expeditions, affect the livelihood of the coastal dwellers and make fishers more vulnerable to hunger and income loss. (Opele *et al.*, 2022; Omitoyin and Fregene, 2009; Atairet *et al.*, 2024). In areas like Ogun Waterside Local Government Area, where fishing remains the primary occupation for many residents, these climate-driven disruptions are becoming increasingly visible and worrisome.

The ability of farming systems to withstand, recover from, and adapt to the effects of climate The concept of climate resilience in agriculture refers to the ability of production systems to anticipate, absorb, adapt to, and recover from climate-related shocks while maintaining sustainable productivity and livelihoods (Alvar-Beltrán *et al.*, 2021). In the fisheries sector, climate resilience involves adopting practices that reduce vulnerability to climate risks and enhance adaptive capacity. Such practices include adjusting fishing times and locations, using climate-resilient gear, diversifying livelihoods, shifting to more resilient fish species, engaging in aquaculture, and improving environmental and water quality monitoring.

Studies have shown that these strategies can mitigate the negative impacts of climate variability on fish productivity and improve food security among fishing households (Owoade *et al.*, 2025; Ikape *et al.*, 2025).

Several studies across Nigeria have examined fishers' perceptions of climate change and their adaptation responses. Atairet *et al.* (2024) found that socio-economic factors such as age, income, education, household size, and access to extension services significantly influenced the adoption of adaptive strategies among artisanal fishers in Akwa Ibom State. Similarly, Aderinola *et al.* (2021) reported that erratic rainfall, rising temperatures, and flooding reduced fish catches and increased operating costs among fishers in Badagry, Lagos State, highlighting the need for climate-smart fisheries policies. Efut *et al.* (2025) observed that although awareness of climate risks was generally high, adoption of adaptive measures varied due to financial constraints and limited technical support. Owoade *et al.* (2025) study further revealed that climate variability disrupted fishing calendars and increased livelihood vulnerability, with education, income, and access to extension services emerging as key determinants of adaptive behaviour.

The ability of farming systems to withstand, recover from, and adapt to the effects of climate variability and long-term environmental changes is known as climate resilience in agriculture. Its purpose is to maintain consistent and sustained food production even under tough conditions (Alvar-Beltrán *et al.*, 2021). In practical terms, resilience means that an agricultural system can foresee and prepare for climate shocks, adjust to ongoing changes, absorb disturbances, and bounce back from extreme weather occurrences.

Complementary evidence from aquaculture studies reinforces the importance of climate-smart innovations and institutional support. Agbeja and Umma (2025) and Awotunde (2024) emphasized integrated fish farming, water quality management, and climate-smart aquaculture practices as effective strategies for sustaining productivity under changing climatic conditions. Similar findings have been reported outside Nigeria, with Paul *et al.* (2023) showing that adaptation behaviour among small-scale aquafarmers in Bangladesh is strongly shaped by socio-economic factors and access to support systems.

Across these studies, access to agricultural extension services consistently emerges as a critical factor influencing the adoption of climate-resilient practices. Extension services provide technical guidance, disseminate climate-smart technologies, offer training, and raise awareness about climate risks and appropriate adaptation measures (Anang, 2024; Osuji *et al.*, 2025). Where extension services are accessible and effective, adoption of adaptive practices tends to be higher; conversely, weak extension systems are associated with low adoption rates and increased livelihood vulnerability. Despite the growing body of literature on climate change and fisheries in Nigeria, there remains limited empirical evidence specifically linking extension service access to

the adoption of climate-resilient practices among small-scale fishers in Ogun Waterside Local Government Area. Understanding the level of extension access, adoption patterns, and the factors influencing fishers' adaptation behaviour is therefore essential for designing targeted interventions and effective policy responses.

This study aims to provide empirical evidence on agricultural extension service access, adoption patterns, and the determinants of climate-resilient practices among small-scale fishers in Ogun Waterside Local Government Area of Ogun State. The findings are expected to inform climate-responsive fisheries policies and support programmes that can enhance resilience, safeguard livelihoods, and promote the long-term sustainability of fisheries in the study area and Nigeria as a whole.

MATERIALS AND METHODS

This study was conducted in Ogun Waterside Local Government Area (LGA) of Ogun State, Nigeria. Ogun Waterside is the only coastal local government in Ogun State and is widely known for its extensive water bodies and dominant fishing activities. Fishing remains the primary source of livelihood for a significant proportion of the populace, with men, women and young people engaged in capturing, processing and trading of fish. The LGA is particularly suitable for a study of climate adaptation because the communities depend almost entirely on marine resources for survival and income generation.

The research used both primary and secondary data. Primary data were generated through a structured questionnaire administered to small scale fishers while secondary data was sourced from academic publications, institutional bulletins, fisheries policy documents and government reports that are relevant to the study.

The study used two-stage sampling techniques. The first stage involved purposive selection of nine (9) communities with a high concentration of active fishers. These communities include Abagbore, Ebute Oni, Imakun, Imeki, Iwopin, Mosafejo, Ode Omi, Ologbun (Pipeline), and Olojumeta. The second stage which was also the last stage involved random selection of twenty (20) fishers in each of the nine communities. This gave a total of one hundred and eighty (180) respondents who were interviewed for this study.

The data were analysed using both descriptive statistics and inferential methods. Socio-economic characteristics of respondents were analysed using means, percentages and frequency distributions. Descriptive statistics were also used to determine the level of fishers access to extension services. The adoption of climate-resilient practices was measured using an adoption index, following the approach of Kishnawat *et al.* (2024) and Jakhar *et al.* (2025). Adoption index refers to degree of adoption of technologies. It was measured on three-point continuum as low, moderate and high (Jakhar *et al.*, 2025). Respondents were scored based on the number of adaptive practices they used, and the index was calculated as the obtained adoption score divided by the maximum



possible score, multiplied by one hundred. This allowed for a standardised comparison of adoption intensity across all respondents.

$$\text{Adoption Index} = \frac{\text{Obtained Adoption Score}}{\text{Maximum Obtainable adoption score}} \times 100$$

Tobit regression analysis was employed to identify the factors that influence the adoption of climate-resilient practices among small-scale fishers. The dependent variable, Y, represents the proportion of recommended climate resilient practices adopted by each fisher. This approach has been widely used in adoption studies where the dependent variable is censored or bounded between 0 and 1 (Kishnawat *et al.*, 2024; Jakhar *et al.*, 2025).

$$Y = \frac{\text{Number of climate resilient practices adopted}}{\text{Number of recommended practices identified on the field}}$$

The Tobit model captured both the likelihood of adoption and the intensity of adoption, which is appropriate given that the adoption proportion is bounded between zero and one. The model was specified as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + e_i$$

Where:

- Y is the proportion of climate-resilient practices adopted
- β_0 is the intercept
- X_1 = Age of fisher in years
- X_2 = Gender, coded as male = 1, female = 0
- X_3 = Level of education in years
- X_4 = Household size (number)
- X_5 = Awareness of climate change, measured on a Likert scale
- X_6 = Years of fishing experience

- X_7 = Access to extension services, coded as yes = 1, no = 0
- X_8 = Annual income from fishing in Naira
- X_9 = Access to credit, coded as yes = 1, no = 0
- X_{10} = Membership of a cooperative or fisher association, coded as yes = 1, no = 0
- e_i = Error term

RESULTS

Socio-Economic Characteristics of Small-Scale Fishers in the Study Area

The socio-economic characteristics of small-scale fishers in the study area are presented in Table 1. The results showed that fishing activities are largely male-dominated in the study area, with men representing 76.7% of the respondents. The average age of the fishers was 48 years, with most of the respondents falling within the age bracket between 31 and 50 years of age. In addition, 70.6% of the respondents were married and majority (55.2%) of the respondents had household size between 4 and 6 members. The average household size is 6 members per household. Educational attainment was generally low, with 63% of the respondents having only primary education or no formal schooling.

Table 1 also showed that 58.9% of the respondents rely on fishing as their primary source of livelihood, while 41.1% complement their income with other livelihood activities. The average fishing experience was 17 years and fishing income per month among respondents varied considerably, with an average of ₦69,818. The study further revealed that majority of the respondents (68.9%) belonged to associations and 68.9% of the fishers had access to credit facilities.

Table 1: Socio-Economic Characteristics of Small-Scale Fishers (n = 180)

Variables	Frequency	Percentage (%)	Mean
Gender			
Male	138	76.7%	
Female	42	23.3%	
Age (yrs)			48
≤30 yrs	22	12.2	
31–40 yrs	55	30.6	
41–50 yrs	63	35.0	
>50 yrs	40	22.2	
Marital Status			
Single	21	11.7	
Married	127	70.6	
Widowed/Divorced	32	17.7	
Household Size			6
1–3 persons	38	21.1	
4–6 persons	94	52.2	
>6 persons	48	26.7	
Education			
No formal education	34	18.9	
Primary	66	36.7	
Secondary	58	32.2	
Tertiary	22	12.2	



Variables	Frequency	Percentage (%)	Mean
Primary Occupation			
Fishing only	106	58.9%	
Fishing + other livelihood activities	74	41.1%	
Fishing Experience (yrs)			
≤10 yrs	40	22.2	17
11–20 yrs	90	50.0	
>20 yrs	50	27.8	
Fishing Income per Month (₦)			
≤ ₦60,000	46	25.6	₦69,818
₦61,000–₦120,000	82	45.6	
> ₦120,000	52	28.8	
Credit Access			
Yes	92	51.1	₦
No	88	48.9	
Association Member			
Yes	124	68.9	
No	56	31.1	

Source: Field Survey, 2025

Access to Agricultural Extension Services

The descriptive analysis of extension access among small-scale fishers in Ogun Waterside LGA are presented in Table 2. The results showed that only 32% of fishers reported regular contact with extension agents, while 41% had occasional contact, and 27% had no contact at all. Table 2 further revealed that majority (62%) of the

respondents indicated that advice provided by the extension agents focused predominantly on general fishing techniques, whereas guidance on climate-resilient practices was received by only 21% of fishers. The perceived usefulness of extension services was moderate for most respondents, with 48% of the respondents rating the extension services as moderately useful.

Table 2: Descriptive Analysis of Extension Access among Small-Scale Fishers (n = 180)

Variable	Category	Frequency	Percentage (%)	Remarks
Extension Contact	Regular	57	32	A minority receive consistent extension support
	Occasional	74	41	Limited engagement with extension services
	None	49	27	Significant number have no access to extension agents
Type of Advice Received	General fishing techniques	112	62	Most common guidance provided to fishers
	Seasonal updates	85	47	Focused on timing and local fishing conditions
	Climate-resilient practices	38	21	Few fishers receive guidance on adaptive measures
Perceived Usefulness of Extension Services	Highly useful	46	26	Limited number of fishers find it fully relevant
	Moderately useful	86	48	Indicates moderate benefit with room for improvement
	Not useful	48	26	Some fishers perceive little value in current services

Source: Field Survey, 2025

Adoption of Climate-Resilient Practices

The adoption of climate-resilient practices among small-scale fishers was analysed using an adoption index and the results are presented in Table 3. Analysis revealed that 57

fishers, representing 32%, had low adoption of climate-resilient practices, 95 fishers (53%) had moderate adoption, and 28 fishers (15%), had high adoption.

Table 3: Adoption of Climate-Resilient Practices (n = 180)

Variable	Category	Frequency	Percentage (%)	Remarks
Adoption of Climate-Resilient Practices	Low adoption (0–33%)	57	32	Early stage of adaptation
	Moderate adoption (34–66%)	95	53	Majority have begun adopting practices
	High adoption (67–100%)	28	15	Few fully implement recommended strategies

Source: Field Survey, 2025

Determinants of Adoption of Climate-Resilient Practices

The Tobit regression results on determinants of climate-resilient practices adoption among small-scale fisher are presented in Table 4. The model was statistically significant (Prob > F = 0.000) with a Pseudo R² of 0.133. The coefficient of Age was negative and significant (-0.372, p < 0.10). The coefficient of climate change awareness was positive and significant (0.706, p < 0.01).

Extension services also had a positive and significant effect on the adoption of climate-resilient practices (0.026, p < 0.10). This study further revealed that access to credit had a significant positive effect on the adoption of climate-resilient practices (0.221, p < 0.05). Membership of a cooperative or fisher association had significant positive influence on the adoption of climate-resilient practices (coefficient = 0.412, p < 0.001).

Table 4: Tobit Regression Results on Determinants of Climate-Resilient Practices Adoption

Variables	Coefficient	Std. Error	t-value
Age	-0.372*	0.204	-1.83
Gender	0.174	0.137	1.27
Level of education	0.035	0.022	1.58
Household size	0.122	0.099	1.24
Climate change awareness	0.706***	0.130	5.43
Fishing experience	-0.195	0.259	-0.75
Extension services	0.026*	0.137	1.93
Fishing Monthly income	0.044	0.044	0.99
Access to credit	0.221**	0.078	2.83
Cooperative or Fisher association	0.412***	0.087	4.74
Prob > F	0.000		
Pseudo R ²	0.133		
Log likelihood	-91.201		
F (10, 169)	12.35		

Notes: ***, **, * denote 1%, 5%, and 10% level of significance respectively

Source: Field survey, 2025

DISCUSSION

The negative relationship between age and adoption of climate-resilient practices suggests that the older fishers are less likely to adopt climate-resilient practices. This corroborates the idea that younger fishers may be more open to learning and adopting new strategies, while older fishers may rely only on traditional methods they are familiar with. This finding supports the study by Ayisi *et al.* (2024), which showed that age affects how people respond to climate change. Older individuals are generally less likely to adopt adaptive or mitigative measures, possibly because they are less exposed to new information, more set in their ways, or have lower physical capacity to make changes. Younger people, on the other hand, are more willing and able to try climate-resilient practices, likely due to better access to education, information, and a greater openness to change. This highlights the role of age as a key factor influencing the adoption of climate adaptation strategies among small-scale fishers.

Awareness of climate change had a positive and significant effect on adoption. Fishers who understand the risks of climate variability such as irregular rains, rising tides, changing seasons or declining fish stocks are much more likely to adopt climate resilient practices. This met our *a priori* expectation and is consistent with the findings of Ayisi *et al.* (2024), who reported that fishers with greater awareness of climate change are more willing to use adaptive strategies. This highlights the role of knowledge and information in helping fishers respond effectively to climate challenges.

The positive influence of extension services indicates that access to extension services enhances the adoption of climate-resilient practices. Fishers who receive guidance, training, or technical support from extension agents are more likely to implement adaptive measures because they gain practical knowledge, learn about new technologies, and become aware of strategies to cope with climate variability. This finding is in line with our *a priori*



expectations and supports the earlier findings of Owoade *et al.* (2025), who also revealed that regular contact with extension personnel significantly affects adoption behaviour among fishermen. This highlights the critical role of extension services in equipping small-scale fishers with the skills and information needed to respond effectively to climate-related challenges.

The study also found that access to credit influenced adoption of climate-resilient practices. Fishers with access to loans or financial resources invested more in improved fishing gear, diversify their income sources, and implement other adaptive strategies than other who had no access. This finding corroborated with the studies of Abraham and Fonta (2018), who reported that financial inclusion significantly enhances the adoption of climate-smart practices among farmers in the northern part of Nigeria. In essence, while awareness can motivate fishers to consider adaptive measures, access to credit provides the means to turn that motivation into concrete action.

Association membership significantly increased the likelihood of adopting climate-resilient practices. Fishers, who belong to associations benefit from shared knowledge, peer learning, collective access to extension services, and group credit opportunities, which collectively reduce barriers to implementing adaptive strategies. This finding is consistent with the earlier studies of Ogunleye *et al.* (2021), who revealed that social capital, through organised groups or associations, significantly increase both the likelihood and intensity of adaptation among farmers. This result aligns with our *a priori* expectation that social networks will facilitate the diffusion of innovations and enhance the adoption of climate-resilient practices.

Overall, the findings underscore the need for more targeted extension services, increased awareness creation, strengthened fisher associations, and improved credit access to enhance adoption of climate-resilient practices in the study area.

CONCLUSION

In conclusion, adopting climate-resilient practices among small-scale fishers in Ogun Waterside LGA depends on several key factors. Fishers who are aware of climate change, belong to associations, have access to credit, and have access to extension agents are more likely to adopt adaptive strategies. Older fishers were less likely to adopt new practices, showing the need for age-sensitive support. By combining awareness, social networks, financial resources, and appropriate guidance, the resilience and livelihoods of fishers can be significantly improved. This approach is relevant not only for Ogun Waterside LGA but also for other coastal communities facing similar climate change challenges.

In view of this study findings, the following recommendations are made:

- i. Target Age-Specific Interventions: Adaptation programmes should consider age-related constraints and design support strategies suitable

- for older fishers, such as practical demonstrations, simplified techniques, or peer mentorship schemes.
- ii. Promote Climate Change Awareness: Educational campaigns and training programmes should be intensified by government and other relevant stakeholders to ensure fishers understand climate change, the impact of climate change and the benefits of adaptive strategies.
- iii. Enhance Extension Services: Extension agencies should increase outreach to fishing communities and provide targeted guidance on climate-resilient practices. Special attention should be given to older fishers to encourage their adoption.
- iv. Expand Access to Credit: Financial institutions and other relevant stakeholders should provide tailored credit facilities to fishers, enabling investment in adaptive fishing gear, diversified income sources, and other climate-smart measures.
- v. Strengthen Cooperative Membership: Formation and support of fisher cooperatives should be encouraged, as these groups facilitate knowledge sharing, collective bargaining, and access to extension services and credit.

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