IJAAR PUBLISHING®

African Journal of Sustainable Agricultural Development | ISSN: 2714-4402
Vol. 6, Number 3 (2025) | www.ijaar.org/ajsad

SOCIO-ECONOMIC DETERMINANTS OF ADAPTATION MEASURES TO FLOOD DISASTER AMONG FARMERS IN IMO STATE, NIGERIA

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ABSTRACT

The study examined the socio-economic determinants of farmers on flood disaster and adaptation measures in Imo State, Nigeria. Specifically, the study described the socio-economic characteristics of farmers in the study area; ascertained the perceived intensity of flood disaster; described the various adaptation strategies used by farmers in reducing the effects of flood disaster on their livelihood activities and determine the influence of farmers socio-economic characteristics and their various choices of flood disaster adaptation measures. A multi-stage sampling procedure was used in selection of one-hundred and forty-four (144) farmers for the study. Primary data were collected through the use of structured questionnaire and interview schedule. Descriptive (frequency, percentage and mean) and inferential statistical (multinomial logit regression) tools were used to analyze the data for the study. Findings revealed that farmers mean age was 45.01years. Majority (63.19%) were male, married (84.72%) with an average households size of 8 persons. About 62.50% did not have access to extension agents while approximately 70.14% were members of cooperative. Findings confirmed the incidence of flood disaster in the area as all (100%). The major flood adaptation strategies used by farmers were livelihood diversification (99.31%), afforestation (97.22%), use of Sand bags (95.83%), early planting and harvesting (88.19%), rain water harvesting (86.81%) and having store/shops far away from flood prone area (83.33%). The estimation of the multinomial logit model for the study revealed that age, sex, farming experience, marital status, education level, household size, income, membership of cooperative, extension contact and access to farm credit significantly affected the use of various flood disaster adaptation measure in the area. Therefore, farmers should pool resources together through strengthened cooperative society as these would enable them to project a collective demand, access resource in the control of flood disaster. Also, early warning sign alert should be increased by extension agents and NiMET as these would help farmers relocate or plan ahead of unforeseen flood disaster.

Keywords: Flood, Flood disaster, Livelihoods, Adaptation Strategies

Egwuonwu, H. A. & Akwiwu, U. N. (2025). Socio-Economic Determinants of Adaptation Measures to Flood Disaster among Farmers in Imo State, Nigeria. *African Journal of Sustainable Agricultural Development.* 6(3), 48-60. DOI: https://doi.org/10.5281/zenodo.17431766

1.0 Introduction

Flooding is a common disaster that has claimed more lives and lives and caused more property damage than any other natural phenomenon. According to statistics, flooding threatens over 100 million people each year (Food and Agriculture Organization (FAO), 2021). Flooding is currently affecting rural communities in Sub-Saharan Africa, threatening people's politics, social and economic life as well as agricultural development. Nigeria is one of the most vulnerable countries to flooding, which affects numerous aspects of disaster and food security (Buba et al., 2021). Flooding is defined as the total or partial inundation of a typically dry area caused by tidal or inland water overflow or rapid runoff accumulation (Scottish Environment Protection Agency (SEPA), 2021). Flood happens when a stream runs out of its confines and submerges surrounding areas (Dube et al., 2021). The instantaneous effect of this flood includes destruction of crops, loss of livestock, aquaculture, damage to properties, loss of lives and livelihood, and food insecurity among the affected communities (Ivan et al., 2020). Some of the immediate impacts of flooding include loss of human life, damage to properties, destruction of crops, loss of livestock, and deterioration of health conditions owing to waterborne diseases. As communication and network links and infrastructure such as power plants, roads, and bridges are damaged and disrupted, some economic activities may come to a standstill.

Nigeria's flooding is mainly human-induced with current poor planning practices. The study of Cai et al. (2020) found that indiscriminate dumping of refuse inside the stream-rain, river channels, inside the surface drains, along the roadside, and dumping of municipal wastes on the flood plain are some factors that exacerbate flood disaster. While the National Emergency Management Agency (NEMA) (2021) found that poor urbanization, like the construction of buildings along flood plains, large-scale encroachment into the river flood plains, and large-scale road construction with excessive land reclamation, leads to flood disasters. The governments at large have continued to pay less attention to addressing the critical issue of flooding, and this exacerbated the flooding situation that affects farmers livelihoods negatively (Echendu, 2020). In order to thwart the negative impact of flooding, most farmers in Imo State may have started practicing some adaptation measures. On the other hand, adaptation could be defined as a change in structure, function, or behavior by which a species or individual improves its chance of survival in a specific environment (Abass et al., 2020). Adaptation strategies are those methods that enable the individual or the community to cope with or adjust to the impacts of the climate in the local areas (Nwachukwu et al., 2018). Flood adaptation strategies are longer-term (beyond a single rainfall season) strategies that will be needed for farmers to respond to a new set of evolving flood conditions that they have not previously experienced. Some of those flood adaptation strategies farmers practice includes; depending on early warning signs, construction of dam, use of improved varieties of crop and use of improved livestock breed, rain water harvesting, afforestation, adjusting planting and harvesting time.

It is clear that some areas in Imo State experience flood disasters, but their socio-economic characteristics that influence their choice of various adaptation options are not quite known. It is important to note that an effective response of farmers to flood disaster means higher means of livelihood, standard of living, and food security, and any increase in food security translates into more resources for the farmers. Unfortunately, few studies have been able to extensively understand the above assertion. This creates a wide gap in knowledge and literature. It was against these backdrops that the study was carried out. Therefore, the study

specifically described the socio-economic characteristics of farmers in the study area; ascertained the perceived intensity (seasonality, type, severity, frequency, and duration) of flood disaster; described the various adaptation strategies practices by farmers in reducing the effects of flood disaster on their livelihood activities and determine the influence of farmers socio-economic characteristics and their various choices of flood disaster adaptation measures**.**

2.0 Methodology

The study was carried out in Imo State, Nigeria. The State lies between Latitudes 4°45'Nand 7°15'N and Longitude 6°50'E and 7°25'E. It is bounded on the east by Abia State, on the west by the River Niger and Delta State; and on the north by Anambra State, while Rivers State lies to the south (National Boundary Commission (NBC), 2020). Imo State covers an area of about 5,067.20 km^2, with a population of 3,934,899 [National Bureau of Statistics (NBS), 2007)]. The State experiences two major seasons: dry and rainy seasons. The State has also experience various incidence of flood disaster. All this necessitated the selection of the area for the study. The sample for the study was drawn from farmers in the study area. A multi-stage used in the selection of farmers. Firstly, purposive sampling was used to select the two (2) agricultural zones of the State (Orlu and Owerri) areas that frequently have experienced incidence of flooding and flood disaster. one (1) Local Government Areas (LGAs) were purposely selected from each of the two agricultural zones (Oguta and Ohaji Egbema LGAs) for the study. Subsequently, three (3) communities were randomly selected from each of the two (2) selected LGAs to give a total of six (6) communities for the study (Mgbelle, Egwe, Uzombe, Assa, Obitti, Oloshi). Finally, twenty four (24) farmers were randomly selected from each of the six (6) to give a total sample size (n) of one-hundred and forty-four (144) farmers for the study. Primary data were used for the study. Data were collected through the use of structured questionnaire and interview schedule. Descriptive (frequency, percentage and mean) and inferential statistical (multinomial logit regression) tools were used to analyze the data for the study.

The dependent variable in this study is the choice of flood disaster adaptation strategies from the list of adaptation strategies examined in this study, while the independent variables (X) are;

X_1 = Age (years)
X_2 = Sex (Male = 1, Female = 0)
X_3 = Marital Status (Married = 1, Otherwise = 0)
X_4 = Household size (Number of persons)
X_5 = Educational level (Number of years spent in school)
X_6 = Annual income (Naira)
X_7 = Membership of cooperative (member = 1, non-member = 0)
X_8= Farming experience (Years)
X_9= Access to credit (access = 1, non-access = 0)
X_{10}= Access to extension agents (access = 1, non-access = 0)
e_i = error term

Finally, the formular of multinomial logit regression is given below as follows:
If p_{ij} is the probability of y_i falling in category $j, j = 1, 2, ..., J,$ then

$$\ln\left(\frac{p_{ij}}{p_{iJ}}\right) = \alpha_j + \beta_j X_i, \quad j = 1,2,....,J-1 \quad \text{.....(3.2)}$$ leading to

$$p_{ij} = \frac{e^{\alpha_j + \beta_j X_i}}{1 + \sum_{k=1}^{J-1} e^{\alpha_k + \beta_k X_i}}, \quad j = 1,....,J-1 \quad \text{.....(3.3)}$$

and

$$p_{iJ} = \frac{1}{1 + \sum_{k=1}^{J-1} e^{\alpha_k + \beta_k X_i}}$$

Where P = Response Probability (J =0,1,2,3,---7) .....(3.4)

Y = Flood disaster adaptation strategies category; J = 1, 2, …,7;

X = Flood disasters adaptation strategies variable replaced with letter F

F = Name of Flood disasters adaptation strategies

F_1= Diversification,

F_2= Afforestation,

F_3= Use of Sand bags,

F_4= Depending on early warning signs,

F_5= Early planting and harvesting,

F_6= Rain water harvesting,

F_7= Having store/shops far away from flood prone area,

e_i = Error term

P_{ij} =Probability response j^{th} observation of the i^{th} farmer

k-1 = j^{th} observation of the i^{th} farmer

l_n = Log likelihood

J = Response category

β_1 = Estimated regression coefficients

3.0 RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of the Farmers

The result of the socio-economic characteristics of farmers is presented in Table1. It reveals that farmers (50.70%) were between the ages of 41 and 50 years and the average age was 45.01years.The farmers were mainly males (63.19%), majority (56.25%) had secondary education while greater proportions (84.72%) of the farmers were married. The majority (59.72%) of the farmers had between 20-29years of farming experience and the mean year of farming experience was 24.00 years. Reasonable proportion (64.58%) of the farmers had household size of 6-10 persons while the mean household size was 8.0 persons. The majority (70.14%) of the farmers belonged to one form of cooperative society or the other in the area while majority (62.50%) of the farmers had contact with extensions agent. Greater proportion (64.58%) of the farmers had access to credit, majority (54.17%) of the farmers had an annual farm income of between ₦300,001-₦400,000 in Imo State. The mean annual farm income was ₦420,000.00 which is approximately to ₦35,000.00 per month.

Table 1: Socio-economic Characteristics of the Farmers

Variables	Frequency	Percentage	Mean ($\bar{x}$)
Age (Years)			
31-40	46	31.95	
41-50	73	50.70	
51-60	14	9.72	
61-70	8	5.55	
71-80	3	2.08	
Sex			
Male	91	63.19	
Female	53	36.81	
Educational Level			
Non-formal education	4	2.78	
Primary education	47	32.64	
Secondary education	81	56.25	
Tertiary education	12	8.33	
Marital Status			
Singled	18	12.50	
Married	122	84.72	
Widowed	4	2.78	
Farming Experience		)	
01-09	18	12.50	
10-19	33	22.92	
20-29	86	59.72	
30-39	7	4.86	24 years
Household Size (Number of Persons)			
1-5	15	10.42	
6-10	93	64.58	8 persons
11-15	36	25.00	
Membership of Cooperatives			
Member	101	70.14	
Non-member	43	29.86	
Extension Agents Contact			
No contact with extension	90	62.50	
Contact with extension	54	37.50	
Access to Credit			
Access	93	64.58	
Non Access	51	35.42	
Annual Farm Income (₦)			
100,001-200,000	8	5.55	
200,001-300,000	25	17.36	
300,001-400,000	78	54.17	
400,001-500,000	33	22.92	**420,000.00**

Field Survey Data, 2025

3.2 Intensity of Flood Disaster in Terms of Seasonality, Frequency and Duration

The outcome of the farmers' distribution based on intensity of flood disaster in terms of seasonality, frequency and duration in the study area is compiled in Table 2. The finding reveals that 100% of the farmers identified rainy season as the most time that experience flood disaster. This support the view of Akukwe et al. (2018) that rainy season across South-east Nigeria is the time of year when most of the average annual rainfall occurs with spontaneous increase in water level of oceans, rivers and sea. On the other hand, 96.53% of the farmers stated that they experienced flood disaster thrice in rainy season while others experienced within twice (63.89%) and once (7.64%) in rainy season. In the same way, farmers identified May-June (97.92%), April-May (89.58%), July-August (77.08%), September-October (58.33%) and March-April (39.58%) as the duration of the year they experienced heavy flood disaster in the area. It is unlikely for farmers to increase their livelihood activities in the face of increasing flood disaster. The May-July 2012 and floods across Nigeria and mainly in Imo State, pushed rivers over their banks and submerged hundreds of kilometers of urban and rural lands thereby negatively affecting the livelihood activities of farmers (NEMA, 2021).Therefore, it is imperative that farmers put in place precautionary measures ahead of this month so as to reduce the intensity and duration of flooding in the area.

Table 2: Intensity of Flood Disaster in Terms of Seasonality, Frequency and Duration

S/No	Intensity of Flood Disaster		
A	**Seasonality**	***Frequency**	**Percentage (%)**
1	Rainy season	144	100.00
B	**Flood Occurrence During Rainy Season**		
1	Once	11	7.64
2	Twice	92	63.89
3	Thrice	139	96.53
C	**Duration**	**Frequency**	**Percentage (%)**
1	March-April	57	39.58
2	April-May	129	89.58
3	May-June	141	97.92
4	July-August	111	77.08
5	September-October	84	58.33

***Multiple responses were recorded; Field Survey Data, 2025**

3.3 Various Adaptation Strategies Practices by Farmers in Reducing the Effects of Flood Disaster on their Livelihood Activities

The result of farmers distribution based on their various adaptation strategies practices by farmers in reducing the effects of flood disaster on their livelihood activities in the area is compiled in Table 3.It reveals that livelihood diversification (99.31%), afforestation (97.22%), Use of Sand bags (95.83%) and depending on early warning signs (93.06%) were identified by the farmers as one of their various adaptation strategies in reducing the effects of flood disaster on their livelihood activities. Diversification enables farmers to effectively manage risk while combining a wide variety of investments within various portfolios. Afforestation can restore environment and also helps protect the environment from soil erosion and flooding. According to United Nations (2021) an early warning sign is one of the

most effective tools in reducing vulnerabilities and improving preparedness and response of households to flood disaster. Finding also reveals that early planting and harvesting (88.19%), rain water harvesting (86.81%) and having store/shops far away from flood prone area (83.33%) were identified by the farmers as one of their various adaptation strategies in reducing the effects of flood disaster on their livelihood activities.

Other flood disaster coping measures identified by the farmers includes improving drainage (40.97%), abatement (22.92%), use of insurance scheme (14.58%), building of canal (8.33%) and construction of basement (6.25%). The study found that farmers relatively low used the about measures which includes of abatement, insurance scheme, building of canal, and construction of basement. These could be as a result of financial demand in the use of the practice these measures which farmers may not be able to afford. Therefore, it becomes clear that the incidence of flood disaster is evident in the area and farmers have started coping by using various measures to reduce its negative effect on their livelihood activities. More so, it is necessary to note that any measures to be developed for the farmers usage in flood disaster control must not only be adapted to local usage but also affordable. The study of Nwagbo (2021); Uzoh (2021) who found similar coping strategies practice by farmers across South-east, Nigeria in reducing the effect of flood disaster in their livelihood activities.

Table 3: Various Adaptation Strategies Practices by Farmers

Adaptation Strategies	Frequency	Percentage (%)
Livelihood diversification	143	99.31
Afforestation	140	97.22
Use of Sand bags	138	95.83
Depending on early warning signs	134	93.06
Early planting and harvesting	127	88.19
Rain water harvesting	125	86.81
Having store/shops far away from flood prone area	120	83.33
Improving drainage	59	40.97
Abatement	33	22.92
Use of Insurance scheme	21	14.58
Building of canal	12	8.33
Construction of basement	9	6.25

***Multiple responses were recorded; Source: Field Survey Data, 2025**

3.4Socio-economic Determinants of Farmers Flood Disaster Adaptation Measures

Result of socio-economic determinants of flood disaster adaptation measures is shown in Table 4. The flood disaster adaptation strategies considered were the mostly used by the farmers which include diversification, afforestation, use of sand bag, depending on early warning signs bags, early planting and harvesting, rain water harvesting, having store/shops far away from flood prone area. The estimation of the multinomial logit model for this study was undertaken by normalizing one category, which is normally referred to as the “reference or base category”. In this analysis, the last category (no flood disaster adaptation measures) is the reference category. The study identified ten (10) essential socio-economic characteristics of farmers affecting their flood disaster adaptation measures decisions. They included age, sex, farming experience, marital status, education level, household size, income, membership of cooperative, extension contact and access to

farm credit. Results shows that the Likelihood Ratio Chi Square ($\chi 2$) values was 92.83% and significant at 1% probability level, suggesting that the models have a strong explanatory power. This also indicates that the model had a good fit in multinomial logistic regression. The significance of this likelihood ratio statistics test indicates that farmers' socio-economic characteristics significantly affected the use of various flood disaster adaptation measure in the area. Consequently, the estimated marginal effects, interpretation and discussion of the multinomial logit result are shown below.

Age (X_1): Age of the farmers significantly affected the use of various flood disaster adaptation measures. Age significantly decreased the probability of uptake of afforestation, use of sand bags, early planting and harvesting and, rain water harvesting This is an indication that younger farmers practiced more of the above measure because they are still within the active age and possess more of physical energy and strength their older counterparts. Younger farmers could also be more enthusiastic and innovative to try various flood disaster adaptation measure in improving their livelihood activities. The result is in consonant with the study of Nkwunonwo (2020) that older farmers have negative uptake of flood disaster measures that require more of physical energy. More so, the study found that diversification, depending on early warning signs, having store/shops far away from flood prone and use of insurance scheme were practiced more by the older farmers. The reason could be largely as a result of the less-energy requirement, knowledge and experience older farmers have gained over time in use of the practice to reduce flood disaster menace in the area.

Sex (X_2): Sex had a negative and but significant coefficient with Afforestation, depending on early warning signs, rain water harvesting, having store/shops far away from flood prone and use of insurance scheme. This implies that female farmers practiced more afforestation, depending on early warning signs, rain water harvesting and having store/shops far away from flood prone than their male counterpart. These could be attributed to relatively less energy demand of the above flood disaster adaptation measures. The finding is in parity with the study of Cvetković et al., (2018) who asserted that females were more concern and involved in reducing the menace of flood disaster as they tends to be more affected as a result of their role in households in providing food for the family through arable crop farming.

Marital Status (X_3): Marital status positively and significantly affected the use of almost all the flood disaster adaptation measures expect the depending on early warning signs and use of insurance. The result shows that married farmers had likelihood of having household members who could help to carry-out several flood disaster flood adaptation measures than their single counterpart in the area. This is an indication that farmers who were married had likelihood of using diversification by 6.5%, afforestation by 5.4%, use of sand bag s by 5.2%, early planting and harvesting by 6.1%, rain water harvesting by 4.3% and having store/shops far away from flood prone area by 8.7%. This finding supports the result of Hamdiyah (2020) who asserted that married farmers tend to have easy access to production variables such as pooled fund, land and large family size which are traditionally owned and provided by household heads (husbands) to compliment households flood disaster management decision.

Educational level (X_4): Education of the farmers was statistically positive across all the flood disaster adaptation measures modeled. A unit increase in the number of years spent in school is likely to increase the practice of diversification by 9.4%, afforestation by 8.1%, use of sand bags by 8.8%, depending on early warning signs by 8.3%, early planting and

harvesting by 7.9%, rain water harvesting by 6.8% and having store/shops far away from flood prone area by 7.3%. This implies that education increased the uptake of the flood disaster adaptation measures. Therefore, this result highlights the importance of education in flood disaster adaptation measures in Imo State, Nigeria. The finding corroborates the results of Jonathan et al., (2020) who asserted that education influences farmers decision making positively and understanding of coping strategies to flood disaster management.

Household size (X_5): Household size which could be regarded as a proxy for family labour was statistically positive and increased the likelihood of practicing diversification by 5.8%, afforestation by 8.4%, use of sand bag s by 7.6%, early planting and harvesting by 5.1%, rain water harvesting by 7.3%, having store/shops far away from flood prone area by 9.5%. Labour is one of the most essential key to successful flood disaster management. For instance, labour is required to implement most measures such as improving drainage, using abatement, afforestation and use of sand bags amongst others. The finding is also supported by the result of Dekongmen et al., (2021) who opined that large household size has shown to provide cheap and available source of labour for farmers in practice of sustainable flood disaster adaptation measures development strategies.

Annual Income (X_6): The income of farmers had a positive and significant influence on the likelihood of practicing all the flood disaster adaptation measures modeled expect depending on early warning signs. The result shows that a significant increase in magnitude of farm income is likely to increase the practice of diversification by 5.7%, afforestation by 7.7%, use of sand bags by 7.5%, early planting and harvesting by 6.9%, rain water harvesting by5.5% and having store/shops far away from flood prone area by 8.1%. The result implies that farmers with higher farm income practiced these flood disaster adaptation measures to reduce the effect of flood disaster on their livelihood activities and improve their standard of living than their counterpart with relatively low income. Most flood disaster adaptation measures are costly and when farmer are unable to raise the required fund to practice any adaptation measures they are likely to face the effect in their livelihood activities. The study of Manawadu and Wijeratne (2021) argued that higher-income farmers are less risk averse and have more access to information and flood disaster inputs, a longer-term planning horizon than less-income farmers.

Membership of Cooperative Society (X_7): Membership of cooperative had a positive and significant influence across all the flood disaster adaptation measures modeled. The finding shows being a member of cooperative society increases the likelihood of practice of diversification by 5.5%, afforestation by 6.5%, use of sand bags by 5.1%, depending on early warning signs by 6.2%, early planting and harvesting by 7.6%, rain water harvesting by 6.9%, and having store/shops far away from flood prone area by 7.6%. Membership of cooperative enables farmers achieve a common goal in record time and with less energy when compared with a farmer working alone. The study is in line with the result of Hashim et al., (2021) who reported that cooperatives can pool resources together and achieve great goals which are out of reach of each farmer working alone.

Farming experience (X_8): Farming experience was statistically positive across all the flood disaster adaptation measures analyzed. This result shows that a 1-year increase in the farming experience is likely to increase the practice of diversification by 6.6%, afforestation by 8.1%, use of sand bags by 6.5%, depending on early warning signs by 7.0%, early planting and harvesting by 8.6%, rain water harvesting by 7.4% and having store/shops far away from

flood prone area by 6.9%. Farmers with increased experienced are likely to have more information and knowledge on flood disaster management and are usually progressive across their various rural communities. The use of flood disaster adaptation measures could be regarded as a learning process and experienced farmers have gained a better knowledge in its practice than inexperienced or less experienced farmers. The finding shares view with the study of Oyebode (2021) who found that experience enhances the use of flood disaster adaptation measures and experience farmers expected to run a more efficient and profitable livelihood enterprise.

Access to Credit (X_9): Access to credit was statistically positive across all the flood disaster adaptation measures analyzed. This implies that access to credit increased the uptake of the all the flood disaster adaptation measures in the model. This is also an indication that farmers who have access to credit practiced these flood disaster adaptation measures to increase their livelihood, income and standard of living than their counterpart who lack access to credit. When farmers have access are limited or not forthcoming, it invariable affect their livelihood activities and their coping capacity. Positive access to credit remains one of the useful necessities in flood control mechanism and much more than a means to cope with the increasing menace of flood disaster (FAO, 2022).

Extension Contact (X_{10}): Extension contact had a positive and significant influence across all flood disaster adaptation measures modeled. The finding shows that a unit increase in the number of extension access of the farmers increased the likelihood of practicing diversification by 6.0%, afforestation by 7.6%, use of sand bags by 8.1%, depending on early warning signs by 7.9%, early planting and harvesting by 5.1%, rain water harvesting by 6.8%, having store/shops far away from flood prone area by 8.2%. The result indicates that farmers who had high extension access had likelihood of practicing all the flood disaster adaptation measures analyzed than their counterpart who lacked contact with extension agents in the area. Extension services provide an important source of information and modern knowledge on flood disaster adaptation measures as well as other sustainable agricultural production and flood management practices. Farmers who have extension contacts have better chances of practicing modern flood disaster adaptation measures to increase their livelihood activities and standard of living.

Table 4: Estimated Multinomial Logit Regression of the Socio-economic Determinants of Farmers Flood Disaster Adaptation Measures

Explanatory Variables	F_1	F_2	F_3	F_4	F_5	F_6	F_7
Age	0.062e-01	-0.055	-0.060	0.073	-0.064	-0.046	0.077
	(3.32)**	(-4.92)**	(-4.16)**	(5.11)**	(-3.73)**	(-2.74)**	(2.63)**
Sex	0.051e-03	-0.043	0.055	-0.052	-0.73	-0.062	-0.069
	(3.72)**	(-2.70)**	(-4.02)**	(-2.43)*	(-2.92)**	(-2.32)*	(-2.61)**
Marital Status	0.065e-04	0.054	0.052	-0.042	0.061	0.043	0.087
	(4.63)**	(3.37)**	(2.95)**	(-2.82)**	(2.54)*	(3.54)**	(2.38)*
Household Size	0.058e-09	0.084	0.076	-0.062	0.051	0.073	0.095
	(3.83)**	(3.64)**	(3.82)**	(-3.74)**	(4.52)**	(2.45)*	(3.63)**
Educational Level	0.094e-03	0.081	0.088	0.083	0.079	0.068	0.073
	(3.98)**	(3.84)**	(4.31)**	(4.64)**	(3.02)**	(3.90)**	(3.55)**
Annual Income	0.057e-08	0.077e-03	0.061e-05	0.075e-09	0.069e-08	0.055e-02	0.081e-01
	(2.74)**	(2.39)*	(-3.49)**	(3.42)**	(2.58)**	(2.89)**	(3.54)**
Membership of Cooperative	0.55e-05	0.065	0.051	0.062	0.076	0.069	0.076
	(3.55)**	(3.42)**	(3.28)**	(4.44)**	(2.83)**	(3.65)**	(4.63)**
Farming Experience	0.066e-04	0.081	0.065	0.070	0.086	0.074	0.069
	(2.98)**	(3.83)**	(2.17)*	(2.69)**	(3.60)**	(3.29)**	(3.76)**
Access to Credit	0.074e-04	0.095	0.068	0.091	0.038	0.080	0.042
	(5.89)**	(2.07)*	(1.79)	(2.46)**	(3.03)**	(3.40)**	(2.92)**
Access to Extension Agents	0.060e-02	0.076	0.081	0.079	0.051	0.068	0.082
	(3.91)**	(2.63)**	(3.96)**	(2.73)**	(1.94)*	(2.91)**	(3.82)**
Pseudo R^2	0.928						
Likelihood Chi square	95.880**						
Sample Size (n)	144						

Values in parenthesis are Z-Values; ** Significant at 1% level, * Significant at 5% level, Field Survey, 2025

Keys: **F_1:**Diversification; **F_2:**Afforestation; **F_3:**Use of Sand; **F_4:**Depending on early warning signs bags; **F_5:**Early planting and harvesting; **F_6:**Rain water harvesting;**F_7:**Having store/shops far away from flood prone area

Conclusion and Recommendation

The study revealed that the farmers practiced some flood disaster adaptation measures such as livelihood diversification, afforestation, use of sand bags, depending on early warning signs, early planting and harvesting, rain water harvesting and having store/shops far away from flood prone area to thwart the negative effects of flood disaster. Also, the farmers choice of flood disaster adaptation measures is influenced by their socio-economic characteristics. Specifically, age, marital status, educational level, household size, annual income, membership of cooperative society and extension contact positively influence farmers use of various flood disaster adaptation measures. Therefore, it was recommended that farmers should pool resources together through strengthened cooperative society as these would enable them to project a collective demand, access resource in the control of flood disaster. Early warning sign alert should be increased by extension agents and NiMET as these would help farmers relocate or plan ahead of unforeseen flood disaster. Ultimately, government effort should focus on capacity building for farmers on flood disaster control practices through strengthened agricultural extension service system as these would not only

improve farmers' practice of flood disaster measure but also increase their livelihood activities positively over time in the area.

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