DETERMINANTS OF ADOPTION INTENSITY OF ENVIRONMENTAL SUSTAINABLE FISHING TECHNIQUES BY ARTISANAL FISHERMEN IN AKWA-IBOM STATE, NIGERIA.

***Ehirim, N.C., Okunmadewa F.Y., Rahji M.A.Y., Awoyemi T.T., Oyekale A.S., Salman, K.K and Yusuf, S.A.**
Department of Agricultural Economics University of Ibadan Oyo State
*Corresponding Author's Address ehinadykus@yahoo.com (+2347038446724)

ABSTRACT
Fishing with heteroeneous and variant fishing technologies in Akwa Ibom State without caution to environmental sustainable fishing techniques (ESFT) is consequent to decline in catch, externalities and market failure. The study collected data from Oron, Ibono-Eket and Ikot Abasi in fresh water zone of the state using a multi-stage sampling procedure and analyzed them using both descriptive, inferential statistic and econometric tools. The area is predominantly married (81.4%) fishermen (70.5%) of mean age of 57.5 years with dugout canoe (65.1%) and mean fishing distance of 3.3mm. Recommended mesh size (3.10), CA&SF (3.48), flood plain fishing (3.09), G/C net fishing (3.36), R&L (3.46) and avoidiance of dynamite and poison (3.36) were all were all adopted. The innovators and early adopters dominate the late adopters and laggards (2:1) hence, adoption intensity is high with a fast horizontal and vertical channel of information diseamination and diffusion of ESFT. The model has a good fit. Adoption intensity of innovators and early adopters relative to the base categorywill likely increase with profit and extension contact but reduces with compaticability of the techniques, and extension effectiveness. It recommends that extension education and effectiveness on ESFT packages will ensure higher return and balanced ecosystem in the area.
Key words: Environment, Sustainability, Fishing, Techniques, Adoption and Intensity

INTRODUCTION
Fish has a lower cholestorol content and health risk factors than other sources of animal protein (Kantha, 1987) and so its demand has increased as it contributes to over 40% of animal protein intake in Nigeria (Olanike et. al., 2009). The quantity supplied is consistently lower than the increasing demand, thus an impotation of about 800,000 tons (valued at $900 million) in 2009, that later increased to about one million tons before early 2011 was made to urgment the shortage (Marcela and Uche, 2010). Although successive governments in Nigeria have tried to boost the quantity of catch of wild fish through institutional reforms (both fiscal and economic framework) such as tax exemption and input subsidy scheme (Jinadu, 1995), the opportunity no doubt, attracted a reasonable population (of over 70 percent) of small holder fishermen, usually called artisanal fishermen with crude fishing methods (NDDC, 2004). The poor socio-economic disposition of the fish folks coupled with their inter and intra fishing competition, have encouraged massive use of heterogeneous and variant fishing technologies, negative externality, market failure and inefficiency (David and Gianna, 2005) as consequensies. Eboh (1995) and Olanike et. al. (2009) noted that economic goals of farmers and fishermen alike often conflict with sustainable environmental goals and when a private economy lacks sufficient incentives to create potential market for common goods, there is a loss of efficiency Arrow (1969). Fishery resouce is open or accessible to everybody (public commons), thus it faces negative externalities (Mmom and Arokoyu, 2010), and at socially inefficient level, is Tragedy of the commons (Hardin's 1968). The interdependency of the economy and the fishery environment calls for a sustainable natural stock.

A balanced aquatic ecosystem ensures an optimal social welfare in the fish community in such a manner that one person is made better off without making anyone else worse off (FAO, 1999). Adoption of environmental sustainable fishing techniques (ESFT) according to Ita (1992) and Abiodun (1994), is imperative for a balanced ecosystem, efficient market and sustainable liveliood. This study is set to address the status and determinants of adoption potential of ESFT in Akwa Ibom State as policies made will ensure a balanced ecosystem and sustainable livelihood.

CONCEPTUAL FRAMEWORK
The environment and the economy are interdependent so sustainable environmental management is a sine quo non to sustainable

economic development (David and Gianna, 2005). A wedge exist between what an individual does with his environment (given a market price) and what the society wants him to do to protect the environment. Therefore, obnoxious fishing practices on ecosystem (environment) may cause market failure, especially when allocation of scarce resources fails to generate an optimum social welfare. Such a wedge may imply wastefulness or economic inefficiency and market failure. The tree pillar of sustainable livelihood; economic, social and environment (Bare, 2002) gave a solution to sustainable livelihood. The exploitation of fishery resources (environment) by the social system (fish folk) at bearable limit to gnerate a viable economy for equitable distribution will create a sustainable livelihood. This is shown in a sustainability matrix Bare (2002) in figure 1.

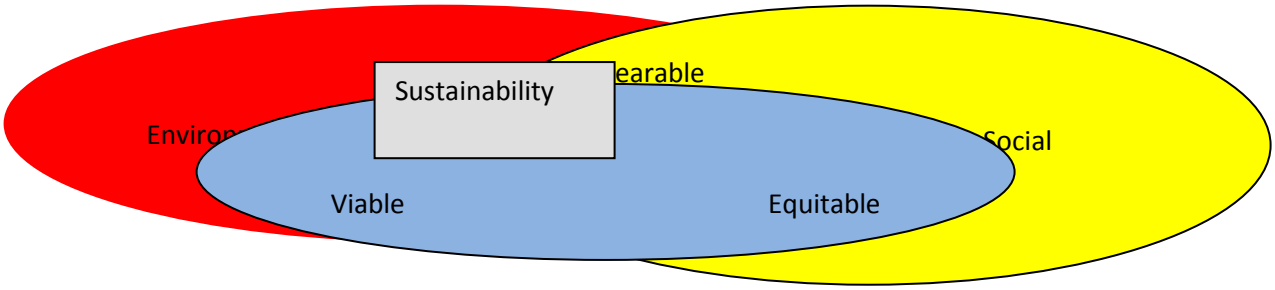

Figure 1: Sustainability Matrix (Bare, 2002)

ESFT is poised to maintain a suitable natural stock and continous catch all year round. This concept employs the application of environmental sustainable fishing techniques to ensure that fishes are not over-exploited despite the consistent removal of fish from the natural stock. According to Ita (1992), the use of ESFT such as the use of recommended mesh size of 7.5cm, catch-sort and drop technique or by-catch and discard method (Eayrs, 2005) etc., can keep the fishing environment as viable as possible and sustains the yield. Poor adoption of these technologies may attract increased catch at the moment but may not assure the fishermen a means of livelihood in the future (Abiodun, 1994).

MATERIALS AND METHOD

The study was done in Akwa Ibom State, which is between latititude 4° 32' and 5° 53' equator and longitude 7° 25' and 8° 25' of Greenwich. The area is bounded in the north by Cross River to the east by Abia State, west by Cross River and River with Abia State respectively and Atlantic Ocean in the south. It is in a humid tropic with tropical rainforest vegetation apperently due to it location, and mean annual rainfall and temperature rage of 2000 to 3000mm and 26 to 29°C respectively. The area is structurally triangular, encompasing the Qua Iboe and Imo river basins in west and eastern part respectively, with ocean front that occupies a distance of 1029km between Ikot Abasi in the west and Oron in the East. The area has 31 LGAs with 141 fishing settelments spread within the Qua Iboe and Imo river basins and fresh water swamp along the ocean front (NPC, 2006; AKSMED, 2004). A multi-stage sampling procedure was used in this study. First is a purposive selection of fresh water zone due to its predominant artisanal fishing activities. Second is a purposive selection of three LGA in the fresh water zone: Oron, Ibeno-Eket and Ikot Abasi due to large concentration of fishing settlements and finally a random selection 185 farmers from a list of 264 registered fishermen with the Ministry of Agriculture and Natural Resources Akwa Ibom State.

ANALYTICAL FRAMEWORK AND MODEL SPECIFICATION

Data collected were analyzed with descriptive and inferential statistics as well as econometric tools. The mean adoption level, intensity, potential and categorization were analyzed using descriptive and inferential statistics while the determinants of adoption intesity of environmental sustainable fishing practices were estimated using econometric tools. The mean adoption level is estimated as:

$$M_j = \frac{\sum_{i=1}^{n} FX_{ij}}{\sum_{i=1} F} \text{----------} 3.1$$

$$0 \leq M_j \leq 6$$

Where M_j = Mean Adoption score in a jth technique
X_{ij} = An ith fishermans adoption stage following an [1]ordinal scaled adoption process in a jth technique
F = Frequency of Fishermen within the same adoption stage in a jth technique.

A cut-off mark of 3.0 (called the standard mid value or SMV) was used to isolate an adopted technique. Any technique with a mean score of $\geq$ 3.0 is adopted. A 10 point scale [2]compendium of environmental sustainable fishing technique (ESFT), is shown in a set notation.

$$EST = \{V_i : i,1...10\} \text{----------} 3.2$$

This study assess adoption potential of a fisherman in all the environmental sustainable fishing technique from his adoption intensity in each technique. Adoption intensity is the adoption stage of a fisherman that can be measured from his strength to adopt, based on his attitude towards the technique (Fakoya, 2006). Adoption potential therefore, measures the total adoption intensity of the fisherman on all the technique predisposed to him. A normal distribution theory (Equ.3.3) (Olowu and Oladeji, 2004) was applied to classify the adopter into five adopter's categories of innovators, early majority, late majority, late adopters and laggards (Moore, 1991).

$$AP = \frac{\sum_{i=1}^{N} AI_i}{n} \pm Std.Dev(n) \text{----------} 3.3$$

Where AP = Adoption Potential
AI = Adoption intensity
Std. Dev. = Standard deviation
n = Successive Adoption intensity.

The categorization of adoption potential of the fishermen is the basis for specification and estimation of the multinomial logit model in this study. This expressed the likelihood of belonging to one category (due to adoption potential) of adopters group relative to a base category. A multinomial logit model is a polychotomous model (Madalla, 1983; Cramer, 1991; Nkamleu and Coulibaly, 2000) that is predicted on the utility derivable by an ith adopter falling in a choice base on his level of adoption intensity. If the utility derived from being in a certain category is expressed as:

$$U_{ij} = \gamma_j N_{ij} + \varepsilon_{ij} \text{----------} 3.4$$

[1] Ordinal rating scales were framed following a fisherman's adoption stages (Lionberger, 1960 and Cameron, 1999). A seven-point likert type of scale (called NAEITA + D) with values of Not-aware = 0; Aware = 1; Evaluated = 2; Interested = 3; Tested/Tried = 4; Adopted = 5 and Discontinued = 6 was used to determine each fisherman's level of adoption of environmental sustainable fishing technique (Ozor and Madukwe, 2001).

[2] The use of recommended mesh size, Catch-sort and Drop technique or By-catch and Discard Method (Eayrs, 2005), Complying with Close Area and Close season fishing practice, Intensifying the use of flood plains and the addition of organic manure in the flood plains and the continental shelves, Use of clap nets and gill nets in the flood plains, Encouraging aquaculture along artisanal fishing, Adopting water tenure system and Maintaining about 5 or more nautical miles in fishing, Registration and licensing of the fishermen as well as keeping catch data, Complying with gear regulation and quota restriction, Prohibition of the use of poison and dynamites or explosives. These were actually the techniques that can sustain the maximum sustainable yield (MYS) which the fish community is expected to adhere to strictly (Ita, 1992).

Where;

U_{ij} = Utility derived by ith adopter its jth category due to his adoption intensity

N_{ij} = The set of determinants that is constant across alternative categories

N_1 = Age of the fisherman in years
N_2 = level of fishing experience in years
N_3 = household size (nominal value)
N_4 = level of formal education in years
N_5 = Level of Extension Effectiveness Index (nominal values)
N_6 = Technology compatibility index
N_7 = Income generate from artisanal fishing in Nigeria (₦). This is obtained from the difference between total revenue and total cost from the enterprise,
N_8 = Compatibility Index
N_9 = Number of Extension Contact
N_{10} = Number of information sources

ε_{ij} = The random error.

This model is built on *'j'* possible catgories, as *'j' = 1,2,3...,J.* – that are exclusive and exhaustive (Cramer, 1991). In this analysis, the five (5) categories considered are: (1). None adopters or Laggards, (2). Late Adopters, (3). Late Majority, (4). Early Majority, and (5). Innovators.

The multinomial logit assigns probabilities $P_{ij}(1,2,...5)$ to the likelihood of an ith fisherman or adopter belonging to any of the 5 adopters' category The multinomial logit model as designed by Kennedy, (1988), Greene (1993) and Babcock et. al., (1995) is giving by

$$P_{ij} = \frac{\exp^{\gamma_j N_i}}{1+\sum_{J=I}^{5}\exp^{\gamma_j N_i}} \qquad j = 1,2,...,5 \text{ ---------- } 3.5$$

P_{ij} is the probability of being in each of the groups 1,2,…,5

$$P_{i0} = \frac{1}{1+\exp^{\gamma_j N_i}} \qquad j = 0 \text{ ---------- } 3.6$$

P_{i0} is the probability of being in the reference group; γ_{ij} are estimated vectors (Greene, 1993). In practice, however, the reference category is usually normalized to zero as the probability for belonging to all adopters category is summed up to unity (Madalla, 1983; Greene1993; Kimhi, 1994). Hills (1983) noted that coefficient of the reference category is;

$$\gamma_0 = -(\gamma_1 + \gamma_2 + \gamma_3 + \gamma_{5-1}) \text{ ---------- } -3.7$$

This is estimated in such a way that for each explanatory variable, the negative of the sum of its parameters for the groups is the parameter for the reference group. The marginal effects or partial derivatives $\left\{\frac{dP_j}{dN_i}\right\}$ are obtained by differentiating equation (3.5) and (3.6). The derivation techniques implicitly indicate that neither the sign nor the magnitude of the marginal effect need bear any relationship to the sign of the co-efficient used in obtaining them (Greene, 1993). They are also subject to changes at different points of the slope.

RESULT AND DISCUSSION

SOCIO-ECONOMIC CHARACTERISTICS OF THE FISHERMEN IN AKWAIBOM STATE, NIGERIA

Table 1. presents the socio-economic characteristics the fishermen in the state. They are mostly married (81.4%), males (91.5%) of an average age of 57.5 years with more than 65% of them above 50 years. This shows that they are relatively old, hence adoption of ESFT may be low with a high risk aversion. Although their formal eduction attainment is low with more than 55% of them attaining a maximum of primary school, mean fishing experience of 21.2 years indicates a high management skill for ESFT, as they may be conversant with the fishing terain and seasons.

ARTISANAL FISHING INPUTS AND SOME FISHING ACTIVITIES IN AKWA IBOM STAE NIGERIA

The area is predominantly fishermen with more than 70.5% engaging in fishing only due to its open access (70.5%). Dugout canoe (65.1%) and plank canoe (45.0%), dominated the motorized canoe (16.3%) with a mean fishing distance of 3.3nm and about 78.3% fising in less than 5nm. The use of long lines nd hook (38.8%) is common with about 24.8% and 18.6 of them using cast and drift nets respectively. Few of them (17.5%) adopt trapping as their means of catch.

ADOPTION OF ENVIRONMENTAL FISHINGTECHNIQUE IN AKWAIBOM STATE

The result in Table 3., shows that the use of recommended mesh size of 7.5cm (3.10), close area and season fishing activities (3.48), use of flood plain fishing (3.09), use of gill and clap net fishing (3.36), registration and licencing (3.46) and avoidiance of dynamite and poison (3.36) were all were all adopted techniques as their mean adoption values are higher than the standard mid value of 3.0. However, catch sort and drop or by-catch and discard method (1.12) and aqua-cultural practices (2.27) were poorly adopted in the area with about 38.0 and 22.5% of the fishermen respectively not aware the techniques in the area. Abiodun (1994) and Ita (1992) noted that these techniques reduce the burden on the natural fish stock.

ADOPTION INTENSITY/POTENTIAL AND LEVELS OF ADOPTER'S CATEGORY OF ESFT.

Table 4 shows the distribution of fishermen according to their adoption potential in the area. A mean adoption intensity of 19 with a standard deviation of 11, gives a limit of 19.0 ± 11, thus positioning the fishermen at different adoption potential. The first adoption potential has adoption intensity limit of between 41.5 and 60. This adoption potential represent the model fishermen usually called innovators while the potential limit of 30.5 to 40 are for early adopters category. Other adoption potential limits are 19.5 to 30 the late majority while 8.5 to 19 and 0 to 8 are for late adopter and the laggards/never adopter's category respectively. The result further reveales that late adopters and laggards are about 30.2% with majority (38.8%) of the fishermen falling within late majority adopters category and 25.6% of them in early majority category. The relatively large proportionlate and early majority category is an indication that adoption strenght of fishermen are at a moderate stage. Again, the relative larger ratio of innovators and early adopters to late adopters and laggards of 2:1 respectively shows both horizontal and vertical channel of information diseamination and diffusion of ESFT will be very fast. Changed agent and extension agents are advised to take advantage of this to spread the benefits of ESFT.

DETERMINANTS OF ADOPTION INTENSITY OF DIFFERENT ADOPTERS OF ESFT IN AKWA IBOM STATE

The result in Table 5 shows the determinants of adoption intensity of different adopters of ESFT in the area. The chi (X^2) and the log likelihood estimates of 134.06 and -103.06 respectively with a Psuedo R^2 of 0.393 shows that the model has a good fit. Therefore, 39.3% variations in adoption intensity of ESFT in the area can be explained for by the variation in the included explanatory variables. The late adopters forms the base category of this study while the estimated marginal effect of most variables yielded unrealistic estimate as they are mostly inconsistent and insignificant.

Nkamlue and Coulibaly (2000) noted that estimated marginal effect of multinomial logit model may not have the same slope parameters with their probabilities as in most dichotomous choice logit model. Hence, such inconsistences may place the estimated probabilities at a better performance. The result further reveals that net income, extension contact and practicability of

the technique as well as extension effecitiveness each is significantly different from zero. Though compatibility of the techniques and extension effectiveness has a negative effect but significant effect on probaility of adoption intensity of innovators and early adoptes category relative to base category, the net income and extension contact however, show a reverse effect. The probability of adoption intensity of innovators and early adopters relative to the base category, increase with profit and extension contact but reduces with compaticability of the techniques, and extension effectiveness. There is increased likelihood extension contact without ESFT packages. Adoption intensity of artisanal fishermen for ESFT will likely increase across the innovators and early adopters with increase in profit from fishing activities. It implies that the level of profit will probabily increase adoption intensity of ESFT as against a piriori expectations. Hence, artisanal fishermen are sure of sustainable livelihood despite the continued adoption of ESFT in the area. This finding contradicts Eboh (1995) and Olanike et. al. (2009) reports that economic goals of farmers and fishermen alike often conflict with sustainable environmental goals. Laggards are by this finding encouraged to adopt ESFT to increase their profits.

Again, extension education and effectiveness should place emphasis on adoption of ESFT of never adopters or laggards while ensureing that the technique is compactible with their norms and values. Fishing experience significantly increases probaility of adoption intensity of innovators relative to the base category, just as increase in age does to never adopters or laggards. This imples that adoption intensity of laggards tends towards old fishermen than young fishermen but experience may build more innovators in the area.

CONCLUSION AND RECOMMENDATIONS

There is increasing evidence of depleted ecosystem due to increasing quest for livelihood among the artisanal fishermen. A sustainable livelihood in artisanal fishery can be achieved through adoption of ESFT in Akwa Ibom State as probability of adoption intensity increase with profit from the enterprise fishing experience and extension contact but reduces with extension effectiveness. Hence, there is an increased likelihood of extension contact without diseamination of ESFT packages in the area.

Extension education and effectiveness should place emphasis on adoption of ESFT of never adopters or laggards while ensureing that the technique is compactible with their norms and values of the society. The study therefore, recommend that;

Increasing doption intensity of ESFT by fishermen is a sine qua non to sustainable livelihood extension education on ESFT should target the younger than older fish folk for the enterprise.

Extension education and effectiveness should place emphasis on adoption of ESFT of never adopters or laggards while ensureing that the technique is compactible with the norms and values as well as belief of the people.

The probability of adoption intensity ESFT by innovators and early adopters increases with profit made from catch in the area, hence never adopters should be see this as an incentive to facilitate there use of ESFT as that is not a disincentive to their economic objective.

Policies towards sustainable aquatic environmental management must emphasize on the strict compliance with adoption of ESFT to ensure that the resource does not go beyond maximum sustainable yield and encourage sustainable livelihood among fish folks in the area.

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Table 1: Distribution of Fisherman by SocioEconomic Characteristics

Variable	Frequency	Relative (%) Frequency
Age (Years)		
20 or less	5	3.9
21-30	10	7.8
31-40	10	7.8
41-50	20	15.5
51-60	25	19.3
61-70	21	16.3
More than 70 Years	38	29.4
Total	129	100.0
Mean	57.5	-
Level of Formal Education		
No Formal Education	13	10.0
Adult Education	22	17.1
Primary Education	36	27.9
Secondary Education	48	37.2
Tertiary Education	10	7.8
Total	129	100.0
Mean	7.7	-
Years of Fishing Experience		
1-10	56	43.4
11-20	6	4.7
21-30	60	46.4
31-40	5	3.9
Above 40 Years	2	1.6
Total	129	100.0
Mean`	21.2	-
Extension Contacts Made		
No Extension Contact	25	19.3
1-5	51	39.5
6-10	31	24.0
11-15	21	16.3
More than 15	1	0.7
Total	129	100.0

Mean	5.46	-
Household Size		
1-5	61	47.3
6-10	39	30.2
11 or More	29	22.5
Total	129	100.0
Mean	7.0	-
Gender		
Male	118	91.5
Female	11	8.5
Total	129	100.0
Marital Status		
Single	21	16.3
Married	105	81.4
Divorce/Separated	3	2.4
Total	129	100.0

Source Field Survey 2011.

Table 2: Distribution of Fishermen by their Assets and Fishing Activities

Variables/ Description	Frequency	Relative (%) Frequency
Fishing Distance		
Less than 1 Nautical mile	64	49.6
1 - 5	37	28.7
6 - 10	16	12.4
Greater than 10 Nautical miles	12	9.3
Total	129	100.0
Mean Distance covered	3.3	
Fishing Gears		
Long lines/Hooks	57	38.8
Cast Netting	32	24.8
Drift Netting	24	18.6
Trapping	22	17.5
Others	6	4.7
Total	141^{+}	-
Fishing Vessel		
Dugout Canoes	84	65.1

Plank Canoes	58	45.0
Motorized Canoes	21	16.3
Total	163^{+}	-
Access to Water		
Open Access	91	70.5
Closed Access	38	29.5
Total	129	100.0
Occupation		
Fishing Only	91	70.5
Fishing and Farming Only	2	1.6
Fishing and Trading Only	33	25.6
Fishing and Schooling Only	1	0.8
Fishing and Civil Service	2	1.6
Fishing and Craft	0	0
Total	129	100.0
Technology Compatibility and		
Practicability	58	45.0
Yes	42	32.5
No	29	22.5
Indifference	129	100.0
Total		

Source Field Survey 2011.

Table 3: Adoption Level of ESFT by Fisherman in Akwa Ibom State.

		Adoption Process									
Fishing Technologies Available to Fishermen		**NA**	**AW**	**I**	**E**	**T**	**Ad**	**D**	**Total Respons**	**Mean (X)**	**Remark**
		(0)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**			
1	Recommended Mesh Size of 75cm	27 (20.9)	16 (12.4)	13 (10.1)	2 (1.6)	13 (10.1)	48 (37.2)	10 (7.8)	129 (100.0)	3.10	Ad
2	Catch sort and Drop Practices	49 (38.0)	51 (39.5)	10 (7.8)	11 (8.5)	2 (1.6)	3 (2.3)	3 (2.3)	129 (100.0)	1.12	Na
3	Close Area and Season Fishing	11 (8.5)	14 (10.8)	15 (11.6)	16 (12.4)	24 (18.6)	23 (25.6)	16 (12.4)	129 (100.0)	3.48	Ad
4	Use of Flood Plains	23	20	14	12	11	23	26	129	3.09	Ad

		(17.6)	(19.4)	(10.8)	(9.3)	(8.5)	(17.8)	(20.0)	(000)		
5	Use of Gilll and Clap net in the Flood Plains	15	20	13	10	20	28	23	129	3.36	Ad
		(11.6)	(15.5)	(10.1)	(7.8)	(15.5)	(21.7)	(17.8)	100.0		
6	Practicing Agriculture	29	30	18	13	18	10	11	129	2.27	Na
		(22.5)	(23.3)	(14.0)	(10.1)	(14.0)	(7.8)	(8.5)	(100.0)		
7	Practicing Water Tenure	18	36	19	14	8	21	13	129	2.56	Na
		(14.0)	(27.9)	(14.7)	(10.9)	(6.2)	(16.3)	(10.1)	(100.0)		
8	Registration/License	12	13	17	14	29	23	21	129	3.46	Ad
		(9.3)	(10.1)	(13.1)	(10.8)	(2.2)	(17.8)	(16.3)	100.0		
9	Quota Restriction	17	33	20	1.5	9	24	11	129	2.64	Na
		(13.2)	(25.6)	(15.6)	(11.6)	(7.0)	(18.6)	(8.5)	(100.0)		
10	Avoiding Dynamited Poison	12	14	10	25	26	32	10	129	3.36	Ad
		(9.3)	(10.8)	(7.8)	(19.4)	(20.1)	(24.8)	(7.8)	(100.0)		

Source Field Survey 2011. Note: Na means that the technique is not adopted and Ad means that it is adopted

Table 4: Adoption Potential/Intensity of Adopters of ESFT in Akwa Ibom State

Adopters Category	Adoption Potential Limits/ Boundries	Frequency	Relative (%) Frequency
Laggards/Never Adopters	0 - 8.0	19	14.7
Late Adopters	8.5 - 19.0	20	15.5
Late Majorities	19.5 - 30.0	50	38.8
Early Majorities	30.5 - 41.0	33	25.6
Innovators	41.5 - 60.0	7	5.4
Total	-	129	100.0
Mean	-	19.0	
Adoption Potential	19.0$\pm$11n		

Source: Field Survey Analysis 2011. Note that 'n' is the adoption potential Class intervals

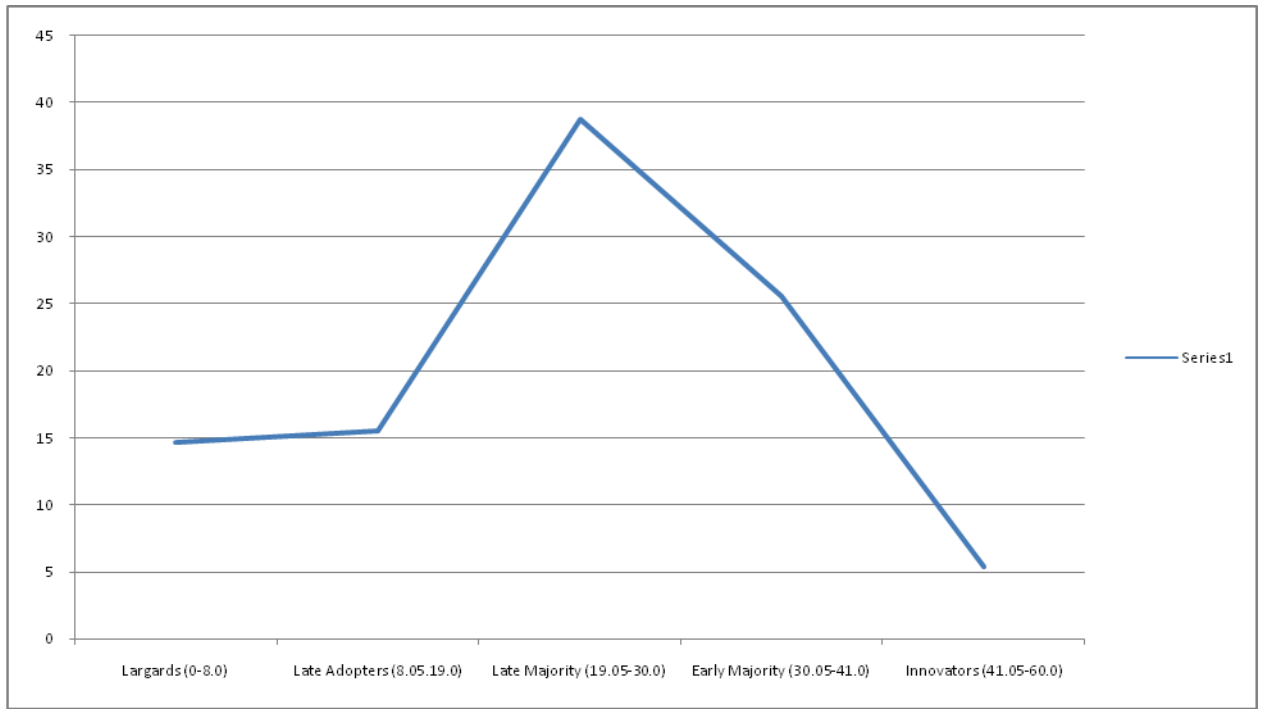

Figure 1: Distribution of Adopters Base on thier Adotion Potentials on ESFTin Akwa Ibom State

Variables	**Innovators**	**Early majority**	**Late Majority**	**Laggard**
Constant	3.76	-3.76	-1.98	2.18
(SE)	(2.48)	(1.72)	(2.03)	(1.91)
Marginal Effect	-	-	-	-
(SE)	-	-	-	-
Age	-0.80	-0.09	-0.022	0.08***
(SE)	(0.56)	(0.07)	(0.032)	(0.03)
Marginal Effect	-	-	-0.00054	0.0027
(SE)	-	-	(0.0058)	(0.026)
Experience	0.33*	-0.0008	0.045	0.045
(SE)	(0.18)	(0.12)	(0.059)	(0.05)
Marginal Effect	-	-	-0.0027	0.0909
(SE)	-	-	(0.0136)	(0.0677)
Househld Size	-18.33	-0.08	0.036	-0.32**
(SE)	(22.9)	(0.09)	(0.11)	(0.15)
Marginal Effect	-	-	-0.0208	-0.4953*
(SE)	-	-	(0.0272)	(0.26302)
Education	0.53	-0.06	-	0.079
(SE)/	(0.786)	(0.978)	(0.079)	(0.071)
Marginal Effect	-	-	-.0221	-0.01746
(SE)	-	-	(0.0204)	(0.09104)
Ext. Effectiveness	-11.27**	-5.22***	0.06	0.029
(SE)	(4.67)	(1.28)	(0.096)	(0.14)
Marginal Effect	-	-	-0.0020	-0.00008
(SE)	-	-	(0.0254)	(0.00045)
Tech. Pract	148.83***	$4.9X10^{-6}$	4.92***	1.33
(SE)	(20.4)	(0.684)	(0.046)	(0.043)
Marginal Effect	-	-	6.1369**	-20.335***
(SE)	-	-	(2.9208)	(7.5970)
Net Returns from Catch	0.006***	0.02***	$2.7X10^{-4}$***	$1.06X10^{-4}$
(SE)	(34.23)	(0.017)	(0.50)	(1.27)
Marginal Effect	-	-	$8.14 X 10^{-7}$	-0.00004
(SE)	-	-	(0.00001)	(0.00013)
Tech. Compatibility	-36.4*	1.15*	0.031	0.028
(SE)	(0.82)	(0.043)	(0.79)	(0.10)

Marginal Effect	-	-	0.0871	-1.6498
(SE)	-	-	(0.3573)	(2.1281)
Ext. Contacts	0.90*	0.042**	23.91	1.32
(SE)	(0.50)	(0.017)	(34.23)	(1.27)
Marginal Effect	-	-	0.0203	0.7457*
(SE)	-	-	(0.0624)	(0.3817)
Information Source	0.78	0.006	0.56	0.09
(SE)	(0.82)	(0.043)	(0.79)	(0.10)
Marginal Effect	-	-	-0.007	-9.983
(SE)	-	-	(20.089)	(110.56)
X^2	134.06***			
Log Likelihood	-103.569			
Pseudo R^2	0.393			

Table 5: Multinomial Regression Model for Adopters of Environmental Sustainable Fishing Techniques in Akwa Ibom State. **Source: Computer Print Out 2011**