EFFECT OF TECHNOLOGY TRANSFER ON FISHERMEN IN OGUTA SOUTH EASTERN NIGERIA

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Abstract
The study investigated the effect of technology transfer on artisanal fishermen in Oguta Lake, Imo State, Nigeria. Despite abundant discoveries and breakthroughs in technologies, fishermen production remains very low while the demand for fish continues to increase in alarming rate. This gap that exist calls for the investigation into the effect of technology transfer on the productivity of fishermen in Oguta South Eastern Nigeria, Imo State.
Specific objectives included; to examine the socio-economic characteristics of the fishermen, to identify the different types of technologies utilized or transferred to fishermen and to determine the effect of technology transfer on the productivity of fishermen using traditional and modern technologies in the area.
This area was purposively selected because; its inhabitants appreciate the importance of inland fishing coupled with the riverine nature of the area. Structured Questionnaire and oral interviews were used in data collection. The study populations consist of all the registered fishermen in the area.
Sample size of 34 respondents were randomly selected from the (200) two hundred registered fishermen. Data were analyzed using descriptive statistics and such as mean, frequencies and percentages to achieve objectives. Objectives I and II, were analyzed using mean frequencies and percentages. While Gross margin analysis was used to determine the effect of type of technologies transferred and utilized by fishermen in Oguta. Findings showed ₦11,486.56 net profit, using traditional technologies and ₦17,819.47, using modern technologies. The socio-economic characteristics of fishermen indicated a high degree of socio-economic effect on fishermen by technology transfer. Result also revealed that majority of fishermen were males, married, illiterates, middle aged and experienced. The study recommended that awareness creation, enlightenment and training on artisanal fishing should be given to the fishermen in the study area. That fisherman should be assisted in the provision of preservation and marketing facilities to reduce post-harvest loses.
Keywords: Technology transfer, fishermen, Oguta, Lake.

Introduction
Nigeria is the highest fish production in the West Coast of Africa with an average annual fish production of 3,459,219 metric tonnes (Njoku, 2000), Miller (2003) is of the opinion that artisanal fishing was introduced in Nigeria more than 50 years ago and today fishermen still face the same problems, they faced 40 years ago, due to inadequate necessary utilization of improve fishing technologies. Njoku (2005) asserted that artisanal fishermen still use traditional fishing implements to catch the bulk of fish consumed by Imo State people. He added that the advert of white collar jobs, gave birth to use of modern capture fishing technologies such as fishing boats, trawlers and fishing nets to replace the traditional ones.

Artisanal fishing is one categories of Nigeria fishery, which forms the basis of this work. Inland fishery is the management and exploitation of fishery resources within the shallow inland waters (Njoku, 2000). The characteristics of Inland artisanal fisheries are; small dispersed, and fragmented with fishermen using simple fishing tools such as hooks, lines, canoes, traps, baskets, earthworms and nets. The rest are poor handling and processing techniques and consequently suffer from post harvest losses.

Technology transfer is a complex and multi-faceted process or framework emphasizing the sustainable development perspective, transfer of technologies must meet the needs and priorities of specific local circumstances (Bertz, Metz, 2001). Technology transfer is one-time transaction that maintains the dependency of the receiver that is, why technology transfer can be referred to as technology cooperation or technology diffusion (Bertz, Metz 2001), technology transfer is a two-way learning process or technology communication, IPCC (2009), describe "technology transfer encompasses the broadest of processes that cover the flows of knowledge, experience and equipment. However if technology transfer is to bring about economic and social benefit, local capacities to handle, operates, replicate and improve the technology on a continuous

basis must be taken into account, as well as the institutional and organizational circumstances (Bertz, Metz, 2001).

Ifenkwe (2013) defined technology as the systematic application of scientific and other organized knowledge to practical purposes and it include new ideas, inventions, innovations, technique, methods and materials. Fishing Technologies therefore include all the materials, techniques, practices and innovations used to maximize fish production, processing storage and marketing. Technology Transfer is the absorption of technological knowledge and skills based on experience of others through the systematic study of device or specific methods of approach as to the resolution of problems with the single purpose of using the result and acquired knowledge for replication of similar devices and methods in different location (Emovon, 1986).

Web-Ster (1996), defines technology transfer as the transfer of technical knowledge skills generated in one place to another in order to achieve some practical end. Technology transfer is a multidimensional and continuous process by which technical knowledge moves within or between persons, organizations, governments and nations (Chinaka, 2007).

However, technologies that can be transfer are in form of physical plants, animals, services and people, codified in blue prints.

Technology transfer is the process by which science and technology are diffused throughout human activity (Njoku, 2014). Technology transfer can be classified into vertical and horizontal technology. Technology transfer also called transfer of technology (TOT) and technology commercialization is the process of transferring skills, knowledge, technologies and methods of manufacturing among governments to ensure that scientific and technological development are accessible to a wider range of users who can use the new technologies into products, processes applications and services. (Wikipedia, the free encyclopedia; navigation search, 2012).

Despite the fact that Oguta Lake is the highest natural standing fresh watch in South East Nigeria with a surface area o 1.80Km^2 and mean depth of 5.5 metres (ADP, 1990).Inspite that Oguta Lake is supplied by Njaba and Obana Rivers and empties into Niger System through River Orasi which makes it the most favoured aquatic life habitat.

More importantly, Oguta had the earliest contact with white men in West Africa through the Royal Niger Company, who came with abundant inventions, innovation discoveries and breakthroughs in modern technologies. Sadden by this, the demand for fish continuous to increase while short supply with recurrent decimals in low productivity. This wide gap that exist calls for the urgent investigation into affect of technology transfer on fishermen in Oguta, in Imo State. Specific Objectives were to: examine the socio-economic characteristics of the fishermen in the study area, to identify the different types of technologies transferred and utilized by fishermen, and to determine the effect of technology transfer on the output of fishermen using traditional and modern technologies. The study assumed that there is a positive relationship in cost and return margin between the traditional and modern fishing technologies.

Materials and Methods
Study Area
The research study was conducted in Oguta in Imo State, Nigeria. Oguta Local Government Area was created in 1992, Oguta LGA, was carved out from former Ohaji/Egbema/Oguta LGAs, of Imo State. Oguta is one of the earliest commercial centres between 1912 and 1920 founded by Royal Niger Company now UAC. GB Olivant SCOA, John Holt and Miller Brothers established their post which serve as their links with the Igbo heartland at the Beach of Oguta Lake from which they operated prosperous commercial enterprise. (Directorate of Information and Culture, Imo State, 1992).

Oguta lies in South-Western part of Imo State and shares boundaries with Owerri-West, Oru, Mbaitoli and Ohaji/Egbema Local Government Area of Imo State, and Ihiala, Local Government area of Anambra State. It covers an area of about 590 square kilometers and has a projected population of 181, 878 persons, based on an annual population growth

rate of 2.5 percent of census, figure (NPC, 1991). Oguta LGA has a population of 191,066,1 persons (NPC, 2006).

The autonomous communities in Oguta LGA, consist of Oguta, Egbema, Egwe, Orsu, Obodo, Eze Orsu, Nnebukwu and Mgbelle.The rest are; Nkwesi, Awa, Izombe, Obudi, Agwa, Uwa Orie-Agwa. The major towns are Oguta, Izombe, Orsu Obodo Ejemekwuru and Egwe. Oguta is located in Owerri agricultural zone of Imo State. Oguta is blessed with good fertile soil that favours crop and timber production as well as artisanal fisheries production,(MANR, 2008 and ADP, 2008).

Oguta Lake produced about 600 tonnes of fish caught from Oguta annually (Igwe, 2004). Oguta is endowed with minerals such as petroleum, Kaolin, Limestone etc. (Microsoft, 2012). Oguta is an in land area blessed with manyrivers; beach, flood plains and body sites of water (Igwe, 2004). Oguta lies between latitude 5^0 45' N and 6^0 35'E of Green Wich Meridian (ISMISUP, 1990). The area has average annual temperature of 28^0c and annual relative humidity of 80 percent, annual rainfall of 1800mm to 2500mm and an altitude of about 100m above sea level (Imo ADP 2001).

Sample Size and Data Collection.

The research was conducted in Oguta Lake in Oguta Local Government Area, of Imo State. A list of 200 artisanal fishermen were collected from fisheries Department, Ministry of Agriculture and Natural Resources, Imo State, which formed the sampling frame.Random sampling was used to choose a sample of size 34 respondents. This limited sample size was to ensure efficient data collection. The researcher personally supervised the administration of the questionnaire.Data were collected using structural questionnaire and oral interview. Data were collected on socio-economic variables such as age, educational level, house hold size, marital status, occupation, income, output, and fishing experience. The data were analyzed using descriptive statistics such as percentages, frequencies and means. Objectives I and II, were analyzed using descriptive statistics while the assumed study was achieved using gross margin analysis. Cost effectiveness of the

technologies transferred using modern and traditional technologies on fishermen were determine using the net margin.

Model specification is as follows;

$$TC = VC + FC \quad -\ -\ \text{equation I}$$

Where TC = total cost

VC = Variable cost

FC = Fixed cost

$$P = TR-TC \quad -\ -\ \text{equation II}$$

Where P=profit/Net margin

TR = Total Revenue

TC = Total cost

Technology or technique bundle; where technique is any bundle of input which will yield a given level of output.

Where;

technology is the pool of those techniques which are currently available.

Each pair of technique

X(I), A(B) x (1) x (2) - - equation III

C(D) I x (2) x (3) ………. F(ii)

Defines a technology.

Results and Discussion

Socio-economic Characteristics of fishermen in Oguta in Imo State, Nigeria.

Table I: shows selected socio-economic characteristics of fishermen in the study area.The table revealed mean age of 44 years for the respondent.This means that young and vibrant persons are engaged in fishing. Result also showed a mean of 7 years as educational level of the respondents. In terms of house hold size, most of the respondents had 7 persons as household size. This means that majority of the fishermen were highly prolific and fecundity rates were also high. The table also suggests that many of the fishermen engage in fishing to complement there main income. The table indicated mean average of 1.5, of access to technologies of respondents.This low responses in occupation, indicated that majority of the respondents do not take fishing as their main occupation in the study area.Thetable indicated,mean annual income of N160,500 this means that majority

of the fishermen had low income from fishing. The table also showed mean/average output of N244.5kg per fishermen per season. This indicated low productivity by fishermen in the study area. Technology attribute and mode of technology in term of traditional and modern technologies indicated 2.8 and 2.5 respectively, these low mean indicated that fishermen in Oguta still make use of traditional technology in fishing activities.

Table 1: percentage Mean Distribution of selected socio-economic characteristics of fishermen in Oguta, Imo State, Nigeria.

Socio-economic Variables	Respondent Mean
Age (years)	44
Educational level (years)	7.0
Annual income	160,500
Access to credit (yes =1, N0=0)	2.1
Output (kg)	244.5
Household size (number)	7.0
Access to technology (yes=1, No=0)	1.5
Mode of technology attribute (traditional=1,modern=2)	2.8
Extension contact (number of visits),	2.5
Fishing occupation (yes=1, No=0)	1.0

Source: Field Survey Data, 2012

Different types of fishing technologies, methods, and equipments utilized/transferred to fishermen in Oguta, Imo State, Nigeria.

Table 2: It was observed that 44.12 percent of the respondents used trigger traps and 38.24 percent used basket traps. In the same vein 8.82 percent used cast nets in capturing fish and 2.94 percent, used gill nets. The same table showed that 5.88 percent of respondents used canoes in fish capturing.

The implications were that majority of fishermen in the study are still using traditional fishing methods which is responsible forlow productivity characteristic of artisanal fisheries. This is in line with what Njoku (2000) saw in his precious study on the problems and prospects of fish farming.

Table 2: Distribution of Respondents According to Different types of fishing technologies, methods and Equipments utilized by fishermen in Oguta, Imo State Nigeria.

Fishing Methods/technologies Utilizedtransferred	Frequency	percentage	
Gill nets	1	2.94	
Cast nets	3		8.82
Canoes	2	5.88	
Trigger traps	15		44.12
Basket traps/hooks	13		38.24
Total	**34**	**100.00**	

Source: Field Survey Data, 2012

Table 3: Indicated mean percentage of 29.4 percent of respondents for rate of fishing per week. This implies that fishing is not the major occupation in the study area. The table also revealed that 49.05 percent of the respondent had maximum catch per season.

This implies that a reasonable number of respondents had their fishing activities per season.

In the case of training, slightly above 50.5 percent of the respondents agreed that they had training on fishing activities/ production in the study area. In the same vein 26.47 percent of the respondents had enough fish per catch effort while 44.42 percent of respondents had cogent reasons for fishing while the remaining do not have enough reasons for fishing.These signifies, the reason why there were low productivity by the fishermen in the area.

However, the rate of fishing per week affected the production or output of fish. It was discovered that the maximum caught of fish varies from season to season but majority hinted that flood season gave the highest output. It was also discovered that majority of respondent's received insufficient training which gave rise to low productivity. Catch per effort refers to the number of fish caught in the net in a particular cast in the rivers (Njoku, 2005).

This catch per effort was low, this supports the assertion that artisanal fishing is seasonal and catch per effort was low in the study area.

In terms of reason for fishing it was observed that different respondents go into fishing because of different reasons.

Table 3: Determination of Respondent according to Productivity/Output by fishermen in Oguta in Imo State.

Output/Productivity Indicators (in number)	Mean/Percentage
Rate of fishing per week	29.4
Maximum catch per season	47.05
Training	50.5
Number of Fish caught per effort	26.47
Reason for fishing	44.12

Source: Field Survey Data, 2012

Tables 4a and 4bcombined revealed that at least five (5) different species of fish were caught in Oguta lake namely: Clarias, hetrobrachus, tilapia, momirid and citharinus, regardless of the methods, equipment or technologies utilized in fishing.It was also discovered that the return made from sales of fish showed that 43.02 percent of the fish caught were in favour of clarias using modern methods while the returns made from the sale of fish caught in the study are indicated 30.48 percent of the respondent in favour of traditional methods.

Similarly the table indicated that 26.51 percent of the respondents showed that total revenue or output came from hetrobrachus for those using traditional methods. While 33.68 percent came from hetrebrachus for those using modern methods.

These implies that majority of the fish caught in Oguta were ranked as follows clarias, tilapia, heterobrachus while momirid and citharinus were scarcely caught. The gross margin analysis revealed that 57.8 percent of the total costs were variable cost for modern methods while 48.45 percent of total costs were variable cost for traditional methods. It was noticed that 42.18 percent of total cost were incurred on fixed cost for traditional methods while 51.5 percent were incurred on fixed cost for modern methods

The tables, showed that amount incurred at the end gead production season were recorded as N8756.00 as variable cost and N6393.06 as fixed and totaling N15,150.06 for traditional methods while N6871.44 and N1983.05 for modern methods. Were observed.

The gross margin and benefit cost ratio analysis revealed that the gross margin (profit) amounted to N127.29 and the net profit of N11,486.56 and BCR 1.84 for traditional method. While net profit of N17,847.47 and BCR of 2.44 were realized, indicating highly feasible.

The implication of the result of analysis indicate, that modern fishing technologies is more feasible than traditional fishing technology. It was discovered that the modern fishing methods has a

higher BIR than traditional fishing methods. The implication of the results of analysis indicate that modern fishing technologies are preferable.

Table 4a: Determination of the cost and return using traditional fishing technologies/utilized by fishermen in Oguta, Imo State, Nigeria.

Particular\ Revenue	Qty	Price Unit	Depri. Cost	Value (N)	Percentage
Clarias	57.18	210.00		12,007.80	43.02
Heterobradas	45.23	163.63		7,400.98	26.51
Tilapia	73.63	108.64		8,000.25	28.66
Momirid	9.50	40.00		380.00	1.36
Citharinus	5.45	22.73		123.85	0.44
Total Revenue				27,912.91	
Variable cost					
Salt	10	708.00		7080.00	46.73
Fish baits	41,900kg	0.045		1676	11.06
TVC				8.756.00	57.79
Fixed cost					
Castnets	22	506.7	506.7	11147.40	3.34
Seine net	22	475.86	475.86	10,486.92	3.14
Canoe	21	1957.71	1957.71	41111.91	12.92
Lantern	22	103.25	103.25	2271.50	0.68
Cutlass	22	74.7	74.7	1643.40	0.49
Rain coat	22	123.54	123.54	2717.88	0.82
Hooks	126.14	248.60	248.60	31357.49	1.62
Smoking	9	2268.00	2268.00	18144.00	14.97
Basket trap	1855	1.86	1.86	3450.03	0.01
Fish fence	56	220.66	220.66	12,356.96	1.46
Head lamp	22	114.62	114.62	2521.64	0.76
Torch light	23	22.186	22.186	5102.78	0.15
Trigger trap	1415	273.436	273.44	386861.0	1.80
TFC		6394.06	6394.06	233035.35	42.18
Total cost		15150.06	15150.06	241791.35	99.92
Gross margin			12,762.85	213878	44
Contingency			12,76.29	21387.84	
Net profit			11486.56	235266.28	

Source: Field Survey Data, 2005

Table 4b: Determination of the cost and return using modern fishing technologies/utilized by fishermen in Oguta, Imo State, Nigeria.

Particular Revenue	Qty	Price Unit	Depri. Cost	Value (N)	Percentage
Clarias	47.88	212.5		10110.75	30.48
Heterobradas	61.5	181.66		11172.09	33.68
Tilapia	66.58	117.5		7823.15	23.50
Momirid	25.00	102.5		2562.50	7.73
Citharinus	15.00	100.00		1500.00	4.52
Total Revenue				33168.49	
Variable cost					
Salt	9	7.16.67		6450.03	48.36
Fish baits	18,230	0.9215		16.80	0.12

Fixed cost				
Casnets	12	4.71.15	5653.8	3.53
Set net	12	486.00	5832.00	3.64
Canoe	12	1965.00	23580.00	14.73
Lantern	12	107.32	1287.84	0.80
Cutlass	12	74.25	891.00	0.56
Rain coat	12	135.00	1620.00	1.01
Hooks	66.60	817.30	54432.18	6.13
Basket trap	50	9.00	450.00	0.07
Smoking klin	9	2180.00	19620.00	16.34
Fish hence	7	162.85	3239.95	3.47
Drag basket	50	18.00	900.00	0.13
Head lamp	12	109.35	1312.20	0.82
Torch light	12	31.35	376.15	0.24
Trigger trap	860	4.56	392.16	0.03
TFC		6871.14		
Total cost		13.337.97	129583.11	
Gross margin			19830.52	
10% Contingency			1983.05	
Net profit			17847.47	

Source:Field Survey Data, 2005

Conclusion and Recommendations

Some reasonable inclusive has been made from the results of the study, these includes.

Socio economic characteristics of fisherman affected that fish production in Oguta, Imo State Nigeria. It was observed that the mean age of fishermen (44 years) signifies that young adults and vibrant fishermen engage in fishing. The fishermen were mostly illiterate as testified by mean (7yrs) which signifies low level of education, low income standard indicating that majority of the fishermen use traditional fishing technologies for their fishing which accounted for the low productivity. The gross margin and profit margin analysis/revealed that modern fishing technologies are more profitable, changed and dependable that the traditional fishing technologies. There is a direct relationship between output and type of fishing technologies transferred and utilized by fishermen.

The study recommended that; artisanal fisheries is still new and neglected in Nigeria and most people are not aware of its prospects, there efforts should be geared towards creating awareness through seminars and extension service gear stepped up to enhanced its awareness.

That fishermen who are committed to make it a means of livelihood should be provided with initial take off grants needed to start off production and providing ready market for immediate sale of their products.

Government should assist fishermen by providing them with the necessary equipments needed to harness fish and fish products.

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