FISH CONSUMPTION AND KNOWLEDGE OF FISH FARMING AMONG INHABITANTS OF DUTSIN-MA LOCAL GOVERNMENT AREA, KATSINA STATE, NIGERIA

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ABSTRACT
The study investigated the pattern of fish consumption and knowledge of fish farming in Dutsin-ma Local Government Area, Katsina State. One hundred and twenty households were randomly selected for the study. Structured questionnaire and informal interview were used for data collection. Simple descriptive statistics and multiple regressions were used to analyze the data. Majority of respondents (87.5%) were males, 84.2% were married, 60% were within the age range of 20 - 40 years and 40.8% of them had a small household size of 1- 5 persons. Majority of the respondents (36.7%) had Arabic education. The area was dominated by civil servants (33.3%). Monthly income of majority of the households were low (< ₦20,000). However, all these socio-economic characteristics except area of residence did not affect fish consumption pattern, according to the multiple regression analysis (R^2 = 10.7%), so also for knowledge of fish farming (R^2 =14.2%). Despite 90% of respondents claimed they know that fish can be cultured, 69.2% do not know how to culture fish. A vast majority (91.7%) indicated their willingness to be trained on fish farming. Many respondents (64.2%) identified lack of finance as a constraint. Consumption of fish is significantly low in Dutsin-ma due to low availability of fish and inadequate knowledge of fish farming.
Keywords: aquaculture, fish distribution, animal protein

INTRODUCTION

Fish is known worldwide as a very important component of human diet because of its high nutritive value and significance in improving human health (Ladu, 2001). It contributes significantly to the survival and well being of a large number of the people around the world. Fish is an important source of essential nutrients which includes; protein, lipids, vitamins and minerals (Tsado *et al.*, 2012). Fish is known to be efficient converter of food for human consumption and saving children from kwashiorkor due to low protein intake and unbalanced diet and there is little or no religious restriction on its consumption (FAO, 1989). Fish is relatively cheaper and readily available, therefore making quality protein available to the poor people in most developing countries of the world including Nigeria (Akinbode and Dipeolu, 2012). FDF (2009) noted that almost half of the total animal protein consumed in Nigeria is from fish and fish products and this makes it to occupy a unique position being the cheapest source of animal protein. Fish production has contributed immensely to the economy as it employs 70% of the active labour force in the agricultural sector in the country. Though fish is very cheap and highly consumed in the country, yet, it is being consumed below the global average (FAOSTAT, 2005). Generally, fish demand in the country has been on the increase but the decline in capture fisheries as a result of overfishing and environmental degradation has left the hope of meeting the ever increasing fish demand with the development of aquaculture. Nigerian has abundant water resources of over 12.5 million-hectare of inland water, which is capable of producing over 350,000 metric tonnes of fish per year (Amao *et al*., 2006) therefore there is large room for the development of aquaculture. Fish consumption in Nigeria is averaged at 9.8kg/caput and total fish demand is 1.4 mMT, while aquaculture has been growing at 20% per annum since 2003 contributing 143,207 MT of the 684,575 MT of Fish produced (FDF, 2008). The growth in aquaculture production in Nigeria does not seem to be even and the growth is tending to be more prominent in southern part of the country (NBS, 2012).

NBS (2012) reported that household expenditure in Nigeria was more on sea foods (including fish and fish products) compared to meats (beef, mutton, pork and goat) especially in the rural areas. However, the expenditure statistics in south-east, south-west and south-south zones made the

difference in this report because the northern zones individually recorded higher expenditure on meats than fish. According to Tsado, *et al*. (2012), Fish consumption is low in Kaduna, a State in Northern Nigeria, compared to beef and that was associated with constraints identified as availability of fish, distribution difficulty, quality of fish, price, seasonality, harvest , processing and storage methods. This study therefore investigates the pattern of fish consumption as well as knowledge of fish farming among the inhabitants of Dutsin-ma local government area of Katsina state.

STUDY AREA

The study was conducted in Dutsin-ma local government area, Katsina State. The local government was created in 1976 with the Old Kaduna State, it is one of the local government areas that were divided further to have the thirty-four local government areas in the present Katsina State after her formation in 1987. It is located on latitude 12° 27' 18'' N and longitude 7° 29' 29'' E and have its headquarters in the town of Dutsin-ma. It has an area of 527 km^2 (203 sq. miles) and a population of 169,671 at the 2006 census. The popular Zobe dam is in the southern part of the local government (Isah, 2009).The inhabitants are predominantly Hausa and Fulani by tribe and their main occupation is farming and animal rearing. The population and activities in the local government area have increased in the last two years mostly due to the establishment of the new Federal University at Dutsin-ma. Only one fish farm has been virtually established in Dutsin-ma LGA despite the presence of a defunct Fisheries School at Makera village near Zobe dam which was meant to train people on fish farming.

MATERIALS AND METHODS

Dutsin-ma LGA has 11 wards namely; Bagadadi, Shema, Makera, Karawa, Kutawa, Kuki 1 and 2, Karofi 1 and 2 and Dutsin-ma 1 and 2. Ten households were randomly sampled from each of these wards. Also, ten respondents were selected at random within the Federal University, being a big community on its own, making a total of One hundred and twenty respondents for the study. Primary data were collected using questionnaire as well as informal interview with the respondents.

Data were collected on socio-economic characteristics of respondents, households' pattern of fish consumption and frequency of consumption, knowledge of fish farming and constraints to fish farming. Simple descriptive statistics and multiple regression analysis were used to achieve the objectives of the study.

The implicit model of the regression is:

Y = f(X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, e)

Where; Y = Households' fish consumption pattern/knowledge of fish farming

X1= Sex of respondents
X2 = Age of respondents (Years)
X3 = Marital status
X4 = Household size (No of Persons)
X5 = Educational status
X6 = Occupation
X7 = Area of residence
X8 = Years spent in Dutsin-ma
X9 = Monthly income of respondent (₦)
X10 = Monthly income of spouse (₦)
e = Error term

RESULTS

Socio-economic characteristics

Results on socio-economic characteristics are presented in table 1, Large proportion 105(87.5%) of the respondents were males while 15(12.5%) were females .Based on age distribution, 31(25.8%) of the respondents fell between the age group of 20-30 years, 41(34.2%) belong to age bracket between 30-40 years, 30(25%) fell between age range of 40-50 years, 16(13.3%) were between the age group of 50-60 years and 2(1.7%) were above 60 years. Based on marital status of the respondents 15(12.5%) were single, larger proportion 101(84.2%) were married, 3(2.5%) were divorced and 1(0.8%) widow. 49 (40.8%) households had 1-5 persons , 35(29.2%) households had between 6-10 persons, 26 (21.7%) households had 11-15 persons, 9(7.5%) and 1(0.8%) households had between 16-20 persons and above 20 persons respectively. 7(5.8%) of the respondents had no formal education, 44(36.7%) acquired Arabic education, 10(8.3%) possess primary school certificates, 18(15%) acquired secondary school education and 41(34.2%) had tertiary education. A large proportion, 40(33.3%) of the respondents were civil servants, 21(17.5%) were traders, 37(30.8%) were farmers, 9(7.5%) were artisans and 13(10.8%) engaged in other forms of occupation. 15(12.5%) of the respondents reported that they had been living in the area between 0-10 years, 11(9.2%) had been living in the area between 11-20 years, 7(5.8%) between 21-30 years, 5(4.2%) reported above 30 years while most respondents, 82(68.3%) had been living in the area since birth. 36(30%) of the respondents reported earnings below 10,000 naira per month, 34(28.3%) earned between 10,000-20,000 naira monthly, 17(14.2%) earned between 20,000-40,000 naira, 13(10.8%) earned between 40,000-50,000 naira and 20(16.7%) earned above 60,000 naira monthly. 104(86.7%) of the respondents

spouse earned below 10,000 naira per month, 8(6.7%) earned between 10,000-20,000 naira monthly, 3(2.5%) earned between 20,000-40,000 naira, 2(1.7%) earned between 40,000-50,000 and 3(2.5%) earned above 60,000 monthly.

Table 1: Socio-economic characteristics of the respondents

Background Characteristics	Frequency	Percentage
Sex		
Male	105	87.5
Female	15	12.5
Age group		
20-30	31	25.8
30-40	41	34.2
40-50	30	25.0
50-60	16	13.3
above 60	2	1.7
Marital status		
Single	15	12.5
Married	101	84.2
Divorced	3	2.5
Widow	1	0.8
Household size		
1-5	49	40.8
6-10	35	29.2
11-15	26	21.7
16-20	9	7.5
above 20	1	0.8
Educational status		
Non formal education	7	5.8
Arabic education	44	36.7
Primary school	10	8.3
Secondary school	18	15.0
Tertiary	41	34.2
Occupation		
Civil servant	40	33.3
Trading	21	17.5
Farmer	37	30.8
Artisan	9	7.5
Others	13	10.8
Years spent in Dutsin-ma LG		
0-10	15	12.5
11-20	11	9.2
21-30	7	5.8
above 30	5	4.2
Since birth	82	68.3
Monthly income of respondent		
Below 10,000	36	30.0
10,000-20,000	34	28.3
20,000-40,0000	17	14.2
40,000-60,000	13	10.8
above 60,000	20	16.7
Monthly income of spouse		
Below 10,000	104	86.7
10,000-20,000	8	6.7
20,000-40,0000	3	2.5
40,000-60,000	2	1.7
above 60,000	3	2.5
Total	**120**	**100**

Fish consumption pattern

Table 2, shows that most respondents 49(40.8%) preferred consuming beef, 18(15%), 14(11.7%) and 39(32.5%) preferred mutton, chicken and fish respectively. 22(18.3%) reported that they eat fish daily, 41(34.2%) eat fish weekly, 15(12.5%) reported eating fish monthly, 41(34.2%) eat fish occasionally and 1(0.8%) do not eat fish at all. Larger proportion 46(38.3%) reported that they preferred fresh fish, 29(24.2%) preferred frozen fish, 34(28.3%) preferred fried fish, 8(6.7%) preferred smoked fish and 3(2.5%) preferred dried fish. Majority of the respondents 87(72.5%) reported that fish is more nutritious and safer than beef, mutton and chicken, 13(10.8%) disagreed and 20(16.7%) were not sure that fish is more nutritious and safer than beef, mutton and chicken. 39(32.5%) of the respondents noted that fish is more expensive than meat in their area, majority 76(63.3%) disagreed and 5(4.2%) were not sure. 68(56.7%) of the respondents reported that fish is easily available in their area, 47(39.2%) reported that fish is not easily available and 5(4.2%) were not sure. Large proportion 109(90.8%) of the respondents reported that they will eat more fish if it becomes cheaper, 7(5.8%) disagreed while 4(3.3%) were not sure about eating more fish if it becomes cheaper. Most of the respondents 108(90%) reported that they will eat fish more if it becomes available, 4(3.3%) disagreed and 8(6.7%) were not sure.

Multiple regression analysis (Table 3), was done to determine the factors affecting fish consumption, based on the statistical significance of the coefficients and the economic theory that support consumption concept, the linear function was chosen as the lead equation. The linear function was chosen also because it has the highest R^2 value (0.107) and f-ratio (1.310). The coefficient of multiple determinations (R^2) was found to be 10.7% and was statistically not significant at 1% level. This implies that the explanatory variables had no significant influence on the fish consumption pattern in the study area. This is an indication that only 11% of the variation in the fish consumption pattern by the households is explained by the explanatory variables (age of respondents, marital status, household size, educational status, occupation, area of residence, years spent in Dutsin-ma LGA, monthly income of respondents and monthly income of the spouse). The F-ratio which determines the overall significance of the regression was not significant at the 1% level implying that the regression has no high explanatory power.

The logarithmic regression table 4 reveals that the area in which the respondents live (wald= 4.072; $p<0.05$) significantly predict fish consumption pattern while sex (wald= 3.76; $p>0.05$), age (wald =1.05; $p>0.05$), marital status (wald= 1.56; $p>0.05$), household size (wald =.60; $p>0.05$), education status (wald =1.59; $p>0.05$), occupation (wald =1.74; $p>0.05$), years spent in the area (wald =2.11; $p>0.05$), monthly income (wald =1.00; $p>0.05$) and monthly income spouse (wald= 3.22; $p>0.05$) are not significant predictors of fish consumption pattern in Dutsin-ma LGA.

Knowledge of fish farming

Table 5 reveals the respondents' knowledge of fish farming. Larger proportion 108(90%) of the respondents were aware that fish can be cultured, 7(5.8%) were not aware and 5(4.2%) not sure. 34(28.3%) of the respondents reported that they know how to culture fish, majority of the respondents 83(69.2%) do not know how to culture fish and 3(2.5%) were not sure. Majority of the respondents 78(65%) reported that fish culture is highly lucrative, 16(13.3%) disagreed and 26(6.7%) were not sure. Most of the respondents 110(91.7%) reported that they will love to be trained on how to culture fish, 8(6.7%) disagreed and 2(1.7%) were not sure. 77(64.2%) of the respondents reported that finance is their constraint, 8(6.7%) reported land, 29(24.2%) reported water, 6(5%) reported other factors as constraints to fish culture. Larger proportion 106(88.3%) of the respondents reported that they were ready to start fish culture, if there is support financially and other wise, 4(3.3%) disagreed and 10(8.3%) were not sure.

Table 2: Frequency distribution base on fish consumption

Variables	Frequency	Percentage
Which one do you eat most?		
Beef	49	40.8
Mutton	18	15.0
Chicken	14	11.7
Fish	39	32.5
How often do you eat fish?		
Daily	22	18.3
Weekly	41	34.2
Monthly	15	12.5
Occasionally	41	34.2
not at all	1	0.8
What form of fish do you prefer?		
Fresh	46	38.3
Frozen	29	24.2
Fried	34	28.3
Smoked	8	6.7
Dried	3	2.5
Fish is more nutritious and safe than beef, mutton and chicken		
Yes	87	72.5
No	13	10.8
Not sure	20	16.7
Fish is more expensive than meat in your area		
Yes	39	32.5
No	76	63.3
Not sure	5	4.2
Fish is easily available in your area		
Yes	68	56.7
No	47	39.2
Not sure	5	4.2
You will eat more fish if it becomes cheaper		
Yes	109	90.8
No	7	5.8
Not sure	4	3.3
You will eat more fish if it becomes more available		
Yes	108	90.0
No	4	3.3
Not sure	8	6.7

Table 3: Multiple regression estimates of factors affecting fish consumption pattern in Dutsin-ma LGA

Variable	Coefficient	T-ratio
Constant	15.022	6.939
Sex	-0.045	-0.063
Age	-0.212	-0.707
Marital status	-0.349	-0.551
Household size	0.522	1.766
Educational Status	-0.006	-0.027
Occupation	0.094	0.446
Area of residence	0.056	0.736
Years spent in Dutsinma L.G	-0.299	-1.818
Monthly income of respondent	-0.240	-1.238
Monthly income of spouse	0.122	1.191
R^2	**0.107**	
F-Ratio	**1.310**	

Table 4: Logarithm regression analysis of factors affecting fish consumption pattern in Dutsin-ma LGA

	B	Wald	Sig.	Exp(B)
Sex	1.390	3.764	0.052	4.015
Age	0.307	1.047	0.306	1.359
Marital status	-0.792	1.557	0.212	0.453
Household size	-0.233	0.603	0.437	0.793
Educational status	0.278	1.595	0.207	1.321
Occupation	0.266	1.738	0.187	1.305
Area of residence	-0.150	4.072***	0.044	0.861
Years spent in Dutsin-ma	-0.233	2.113	0.146	0.793
Monthly income	0.204	1.003	0.317	1.227
Monthly Income spouse	0.543	3.221	0.073	1.722
Constant	-2.048	0.948	0.330	0.129

*** Significant at P<0.05

Table 5: Frequency distribution base on knowledge of fish farming

Variables	Frequency	Percentage
Fish is cultured		
Yes	108	90.0
No	7	5.8
Not sure	5	4.2
Can you culture fish		
Yes	34	28.3
No	83	69.2
Not sure	3	2.5
Types of Fish you can culture		
Catfish	29	85.3
Tilapia	2	5.9
Both	3	8.8
Fish culture is highly lucrative		
Yes	78	65.0
No	16	13.3
Not sure	26	21.7
loved to be trained on fish culture		
Yes	110	91.7
No	8	6.7
Not sure	2	1.7
Constraint to fish culture	7	5.8
Finance	77	64.2
Land	8	6.7
Water	29	24.2
Other	6	5.0
Ready to start fish culture, if there is support financially and otherwise		
Yes	106	88.3
No	4	3.3
Not sure	10	8.3

The factors affecting household knowledge of fish farming were subjected to regression analysis in four functional forms (linear, semi log, exponential and double log forms). The linear form was chosen as the lead function because it has the highest R^2 value (0.142) and the F-ratio value (1.806). The coefficient of multiple determination is shown in table 6, R^2 had a value of 0.142 (14.2%) indicating that the explanatory variable jointly explained 14.2% of the variation in Y. Consequently, the interpretation of the regression is as follows: sex of consumers (X1), age of consumers (X2), marital status (X3), household size (X4), educational status (X5), occupation (X6), years spent in Dutsin-ma LGA (X8), monthly income respondent (X9) and monthly income of spouse (X10) had no significant effect on knowledge of fish farming. Only respondents' areas of residence (X7) had significant effect on the knowledge of fish farming. This implies that area where respondents were living is the determinant of fish farming knowledge. The effect was significant at the 1% level of significance (Table 6).

Table 6: **Multiple regression estimates of factors affecting knowledge of fish farming in Dutsin-ma LGA**

Variable	Coefficient	T-ratio
Constant	9.511	3.457
Sex(X1)	-0.443	-0.489
Age(X2)	-0.362	-0.952
Marital status(X3)	-1.113	-1.382
Household size(X4)	0.173	0.460
Educational Status(X5)	0.048	0.174
Occupation(X6)	-0.128	-0.477
Area of residence(X7)	0.304	3.140***
Years spent in Dutsinma L.G(X8)	0.103	0.491
Monthly income of respondent (X9)	0.330	1.342
Monthly income of spouse(X10)	0.011	0.088
R^2	**0.142**	
F-Ratio	**1.806**	

******* Significant at 1% level

DISCUSSION

The distributions of respondents by sex showed that majority of them were males. This was because men are believed to be the heads of households besides, the gender effects and religion influence which does not allow male strangers to interact with the married women is more significant in northern part of Nigeria and thereby reducing the proportion of women as respondents. This is in line with result of Chianu and Tsujii (2007) where 99.7% of the surveyed household were male headed. Analysis indicated that young aged respondents were more in proportion, most of who were married. This could explain why small numbers of persons were recorded for most households during the study. Similarly Dalhatu and Ala (2012) reported that 60 percent of the respondents have less than nine household members.

Majority of the respondents had Arabic education, this is establishing the low numbers of people with Western education in the region compared to Southern region of the country which seems to have significant effect on knowledge of fish farming; since major trainings and workshops on fish farming is done in English Language or in a system that is more conformed to Western education.

Though majority of the respondents were aware of high nutritious value of fish, they still ate more beef than fish, this is in line with findings of Dalhatu and Ala (2010) and NBS (2012). On the contrary, Robert and Juan (2012) reported that more fish is consumed than beef in Imo State, Southern Nigeria. In the present study, reduced fish consumption could be associated with low availability of fish in the region as stated by many of the respondents since a very large proportion of the respondents signified their willingness to eat more fish when its availability increases.

Furthermore, the study showed that beef and other meat types were more expensive than fish. However the consumption fish is low, except in Makera and Dutsin-ma areas that are very close to the Zobe dam. Hence cost is certainly not a factor affecting fish consumption, though some respondents indicated high poverty level as a factor during the informal interview.

The distribution of respondents based on knowledge of fish farming showed that many of them do not know how to culture fish, despite their awareness of the fact that fish can be cultured. The area of residence of respondents affected the fish consumption pattern as well as knowledge of fish farming. This may be due to the presence of Zobe dam in Makera village where there is fishing activities and hence availability of fish which tend to encourage high consumption of fish. Also knowledge of farming is higher among inhabitants of Makera and this may be associated with the presence of defunct Fisheries school sited in the village and availability of water that may encourage practicing of fish farming. The areas far away from Zobe dam reported low level of fish consumption and have little or no knowledge of fish farming. This could be as a result of little access to fish as many of them did not have a major cold room and the few fish retailers with no storage facilities have to travel to dam site or buy in very low quantity from a single cold room located in Dutsin-ma. A similar report was given by

Tsado *et al*. (2012) who listed availability and distribution as part of the constraints to fish consumption. Therefore, even those who would like to eat fish and can afford it may not be able to get the fish to buy. Sometimes when the fish is available, the quality is bad due to poor storage. The distance travelled by the retailers from the buying point to their respective areas is also a deterrent.

Among the few respondents that indicated they could culture fish, catfish species was nominated as the most preferred fish for culture. The respondents exhibited little or no technical knowledge on how to grow fish under an absolutely controlled condition. The lack of finance and other resources were major constraint to fish culture among the inhabitants of the local government. None-the-less, majority of the respondents indicated their readiness to start farming fish as soon as they receive training and supports (financially and otherwise).

CONCLUSION

Generally, consumption of fish is significantly low in Dutsin-ma and this is strongly associated with the bereft of knowledge on fish as an animal. Since fish is believed to be cheaper than beef and other meat, it is expected that more of it should be consumed in any given area but this is not the case in the study area because the availability of fish is low in most areas. However, the insufficient knowledge of fish farming and lack of necessary facilities also affect establishment of fish farms which might have been the only hope to increase fish availability and hence consumption. The need for sensitization and subsequent improvement must become an issue of utmost priority. Incentives, grants or loans should be given to intending or already practicing farmers to boost their productions. Workshops and trainings should be organized using local language especially for the local people, on fish production, processing and storage.

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