ADOPTION OF SMOKING CHOKOR FOR FISH PROCESSING IN KWARA STATE

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ABSTRACT
This research investigated the adoption of smoking *chokor* among fish processors in Kwara state, Nigeria. The study made use of structured questionnaire along with interview schedule to a sample size of one hundred and seventy (170) processors randomly selected through a two-stage random sampling technique. The data were analyzed with descriptive and inferential statistics and the Regression Analysis. The results obtained through the analysis revealed that 43.7% of the respondents adopted the improved technology (smoking *chokor*). A higher percentage of respondents preferred the improved technology for the golden brown colour, fine texture, good smell and delicacy in the taste. The significant determinants of adoption include sex (female), income from fish processing activities ($p<0.05$) and the trust worthiness of the source of the technology ($p<0.1$). Perceived benefits associated with technology adoption include wastage reduction, employment generation and the reduction of smoke, while the technicalities associated with the use constitute a major constraint limiting its adoption. The study concludes that fish processors prefer the smoking *chokor* but its adoption is marred with various constraints. It therefore recommends the need for creating more awareness of the smoking *chokor* as well as reducing the perceived constraints limiting its adoption by training extension agents and other verifiable sources to educate farmers as they disseminate the technology.

KEY WORDS
Adoption; Value addition; Fish processing; Smoking chokor; Technology.

Fish is a critical source of dietary protein and micronutrients for many isolated communities in rural areas Alamu (2000). Fish may also be the sole accessible and/or affordable source of animal protein for poor households in urban or peri-urban areas. Nutritionally, fish is one extremely important direct source of protein and micronutrients for millions of people in Africa, it contribute indirectly to national food self-sufficiency through trade and exports (Al- Jufaili and Opara, 2006).

Fish is, however, highly susceptible to deterioration without any preservative or processing measures (Clucas *et.al.*, 2002). Al-Jufaili and Opara (2006) reported high incidence of fish losses as a major impediment to the realization of government goal towards increasing the contribution of the sector to the overall national economy. Appropriate processing of fish enables maximal use of raw material and production of value-added products which is obviously the basis of processing profitability. Freshwater fish processing, like the processing of the other food raw materials should: assure best possible market quality, provide a proper form of semi-processed final product, assure health safety of products, apply the most appropriate processing method and reduce wastes to the barest possible extent. Therefore, the development of appropriate fishing machinery and techniques that employed effective production, handling, harvesting, processing and storage, cannot be over-emphasized (Akinneye *et al.*, 2007; Davies, 2005).

One of the major techniques introduced is Smoking *Chokor*. Smoking *Chokor* is an improved smoking technology over indigenous method of smoking fish. In 1969, an improved indigenous fish smoking oven - the Smoking *Chokor* - was introduced into the country. It was developed by FAO and Ghana's Food Research Institute of the Council of Scientific and Industrial Research (CSIR), the *Chokor* has numerous distinct advantages: it is easy to use,

has a high capacity, uses little fuel wood, results in shorter smoking time and produces high-quality smoked fish.

Given these salient features, the objectives of the present research were to:

- identify the indigenous fish processing technologies available in the study area;
- estimate the factors influencing adoption of smoking-*chokor* fish processing technology;
- identify the perceived benefits derived from adoption of the improved processing technology;
- investigate possible constraints to adoption of *chokor* technologies practices.

MATERIALS AND METHODS

The survey on adoption of smoking *chokor* by fish processors in Kwara State was carried out using combination of structured questionnaire and interview schedule. Purposive sampling was used to select Edu and Patigi local government in the study area because of the close proximity of their close proximity to river and a high concentration of fishing activities as a livelihood activity of the communities. A -two stage random sampling was employed in the selection of respondents for this study. The first stage involved a simple random selection of 5 villages in each local government and the second stage involved the selection of 17 fish processors from the 10 villages in the study area. A total of 170 respondents were sampled for the study.

Some of parameters investigated by the questionnaire included the socio economics characteristics of fish processors, indigenous technology available in the study area, the benefit and constraints of the technology and the factors influencing adoption of the technology. The data obtained were subjected to descriptive statistics, kruskal-wallis one-way ANOVA, logistic regression and Pearson Product Moment Correlation (PPMC) statistical analysis.

Analytical Technique. *Kruscal Wallis one way Analysis of Variance (ANOVA) by ranks.* This involved assigning of priorities to perceived benefits and constraint. The equation for extracting the rank is outlined as:

$$H = \frac{12}{N+1} \Sigma^{1}/ni\,[Ri - ni\,\frac{(N+1)}{2}]2 \ldots\ldots\ldots\ldots\ldots\ldots (1),$$

where **Ri** is the sum of the ranks assigned to observations in the ith sample and $ni\,\frac{(N+1)}{2}$ is the expected sum of ranks for the ith treatment.

Logistic Regression:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6$$

where Y=Adoption of Smoking *chokor* (taking the value of 1 if respondent adopts and 0 if otherwise); X_1 = Experience in Fish Processing; X_2 = sex of respondent; X_3 = marital status; X_4 = Highest educational attainment of respondent; X_5 = household size; X_6 = income.

RESULTS AND DISCUSSION

Socio-economic Distribution of Respondents. The result of the distribution of respondents' socio-economic characteristics is presented in Table 1. As revealed in Table 1, 56.3% of the respondents were females while 43.7% were males. The highest number of female respondent suggests that processing in this area is mostly practice by females. This is in line with Hibbeln (1995) who stated in his report that majority of the farmers are women and this dominance of women is often attributed to the fact that women continue to bear primary responsibility for household sustenance and well being.

Furthermore, results on Table 1 showed the modal age of the processors to be 31-40years while the mean age is 34. Majority of the processors 74.8% are married, while very few 16.8% were single, 6.6% divorced and1.8% widowed.

Table 1. Distribution of respondents according to their socio-economic characteristics

Characteristics	Frequency	Percentage%
Sex		
male	73	43.7
female	94	56.3
Age		
20-30	55	33
31-40	84	50.4
41-50	26	15.6
51-60	2	1.0
Marital status		
single	28	16.8
Married	125	74.8
Divorced	11	6.6
widowed	3	1.8
Education Status		
No education	75	44.9
Adult education	16	9.6
Primary education	50	30.0
Secondary education	24	14.3
Higher education	2	1.2
Household size		
1-5	57	34.1
6-10	107	64.1
11-15	3	1.8
Secondary occupation		
Farming	94	56.2
Trading	45	27.0
sowing	18	10.8
others	10	6.0

Source: Field Survey, 2012

This reveal that majority of the processors in the study area are married and have children within the range of 6-10(64.1%). The Tables also revealed that majority of the processors 44.9% are illiterate (with no formal education) while 30% are literate having primary education and 14.3% having secondary education. This implies that present day farmers dispossess some forms of formal education more than half 94% of the respondents were farmers along with the facts that they are fish processors, while few others trade alongside.

Distribution of the Respondents according to the Use of Indigenous and Improved Method of Fish Processing. The result of the distribution of Respondents based on fish processing techniques adopted is presented in Table 2.

Table 2. Distribution of Respondent According to Fish-Processing Technology Adopted

Characteristics	Frequency	Percentage%
Traditional method		
Salting	49	29.3
Sun drying	60	35.9
Oil drum smoking	130	77.8
Cooking	18	10.8
Roasting	25	15.0
Improved method used		
Smoking *chokor* adoption	73	43.7
Smoking *chokor* non adoption	94	56.3
Traditional outcome method preference		
Taste	51	30.5
Colour	28	16.8
Texture	17	10.2
Smell	24	14.4
Improved outcome method preference		
Taste	68	40.7
Colour	73	43.7
Texture	65	40.0
Smell	71	42.5

Source: Field Survey, 2012

Table 2 showed that out of the indigenous methods practiced by the processors, 77.8% of the respondent used smoking drums, 35.9% sun drying, 29.3% use salting, 10.8% cooking and 15.0% roasting. It was observed that 43.7% of the respondents adopted the improved technology (smoking *chokor*) while majority have not adopted it. The outcome of fish preference viewed by the respondents, higher percentage of respondents preferred the improved technology and out of the listed preferences, 43.7% preferred it for the golden brown colour, 40.7% for the taste, while 40.0 % preferred it for its texture and smell.

Factors influencing adoption of improved value added technology. Various factors were hypothesized as factors influencing fish processors adoption of improved technology. The result of the significant factors influencing the adoption of *chokor* technology by respondents in the study area is presented in Table 3.

Table 3. Logistic Regression Results indicating factors influencing adoption of Smoking *Chokor* fish processing technology

Variable	B	S.E	Df	Sig.	Exp β
Processing Experience	0.103	0.133	1	0.440	1.108
Gender (Female)	-1.132	0.386	1	0.003***	0.322
Marital status	0.920	0.604	1	0.128	2.509
Education	-0.068	0.199	1	0.734	0.934
Household size	-0.182	0.113	1	0.106	0.833
Income	0.000	0.000	1	0.014***	1.000
Source (Agency)	0.445	0.253	1	0.079*	1.560
Constant	-0.980	1.934	1	0.612	0.375

Model Chi-square: 35.224
2 log likelihood for the model: 196.138
Overall case corrected predicted: 70.1%
Note: single and triple astericks indicate significance of co-efficient at10 and 5 % p-value.

As revealed in the Table, being a female, Income from Fish processing and agent responsible for the provision of the fish processing technology were all significant variables explaining the variation in the level of adoption of the technology (Table 3).

Specifically at a p-value of 0.05, being a female and earning a relatively high income fom fish processing activities increase the chance of adopting the *chokor* fish processing technology. Furthermore, at a p-value of 0.1 the source of the technology positively influenced the probability of adoption of the *chokor* technology.

Perceived Benefits Derived from the Adoption of Improved Value Added Technology. Result of kruskal-wallis one-way analysis of variance (ANOVA), ranking the benefits derived from the adoption of the improved value added technology is presented in Table 4.

Table 4. Perceived Benefits derived from Adoption of *Chokor* fish processing technology

Benefits	Mean Rank	Rank
Lessening of drudgery of fish smoking activity	592.15	4
Better quality of fish smoked	619.75	6
Reduction of smoking nuisance	587.63	3
Increase in capacity of fish smoked	601.21	5
Increase in income from sales	625.78	7
Wastage reduction	526.06	1
Employment	542.42	2

Chi-square(x^2): 14.291; Df: 6; Asymp. Sig: 0.27
1-7 Lowest to highest.
Source: field source, 2012

Table 4 shows the ranking of benefits for the respondent. These results show that the respondents perceived benefits of the use of *chokor* technology do not differ significantly from the hypothesized values. (chi-square with six degrees of freedom = 14.29, p = .270). Specifically, respondents perceived benefits ranked highest were wastage reduction followed by employment generation and the reduction of smoke.

Constraints Militating against the Adoption of Improved Value Added Technology. The result of kruskal-wallis one-way analysis of variance (ANOVA), ranking the constraints militating against the adoption of improved value added technology is presented in Table 5.

Table 5. Rank of Perceived constraints against the Adoption of *Chokor* Technology

Constraints	Mean Rank	Rank
Ignorance of technical details	572.59	2
No interest	750.61.	6
Difficult to use	318.63	1
Problem of fishing season	685.31	4
Insufficient fish to process	706.71	5
Inadequate source of power	632.37	3
Problem of middle men	815.96	7
Inadequate marketing facilities	865.81	8

Chi-square(x^2): 247.206; Df: 7; Asymp. Sig: 0.000
1-7 Lowest to highest.
Source: field source, 2012

The data analysis on Table 5 shows the ranking of constraints militating against adoption of improved value added technology. All the respondents constraints were indicated as significantly different from the hypothesized values (chi^2 is 247.206; $p<0.005$).

CONCLUSION AND RECOMMENDATION

Conclusively, this study ascertained that about 43% of the fish processors in the study area adopted smoking *chokor* and some of the perceived benefits associated with its adoption include wastage reduction followed by employment generation and the reduction of smoke. Major perceived constraints identified as militating against the technology adoption were the difficulty in use and the technicalities involved in the use. The major determinants of the technology adoption variation among respondents include female gender, income from fish processing and the source of the fish processing technology.

In view of these, this study recommends that smoking *chokor* beneficiaries (respondents) should create awareness to non-beneficiaries so that every processors can have interest in using it and will also be aware of the benefits derived from using the technology. Provision of *chokor* technology through reliable and trust worthy agents to end-users.

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