

Consumers' willingness to pay for certified and hygienically handled smoked catfish in Ibadan North local government area, Oyo state, Nigeria

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Abstract

Value addition in agrifood systems is required to enhance livelihood, nutrition, and sustainability outcomes. In Nigeria, aquaculture production has become an important subsector in the agrifood system, with opportunities for meeting many individuals' food security and employment needs. The process of smoking catfish is a popular value-addition method in Nigeria, however, there are concerns about the health risks due to reported unhygienic handling and contamination. This research investigated how much consumers in Ibadan North Local Government Area, Nigeria, were willing to pay for hygienically handled and certified smoked catfish using a Contingency Valuation method. A multi-stage sampling technique was used to obtain data from 130 respondents through a multistage sampling process. While a significant number (73.85 %) were aware of proper hygiene practices for handling and smoking catfish, only 47.69 % were aware of certified smoked catfish being available. The mean willingness to pay was ₦399.99 and ₦905.36 per pack of 145 grams of certified and hygienically handled smoked catfish, respectively. The Heckman model employed revealed that the purchase frequency; monthly income, education, occupation, and sales point proximity influence consumers' willingness to pay for hygienically handled fish. Determinants of average premium for certification included quality perception and purchase frequency. The study recommends that improving hygiene standards and consumer awareness could significantly increase the market value of smoked catfish; thus, enhancing both livelihood and nutritional outcomes in the country.

Keywords: Certification, hygienically handled, smoked catfish, willingness to pay, Heckman model.

1.0. Introduction

African catfish (*Clarias gariepinus*) holds significant commercial value in Nigeria, contributing substantially to the nation's aquaculture sector, which has seen rapid growth since 2010 (Ogunji & Wuertz, 2023). Despite being the leading producer of African catfish, Nigeria's domestic production only meets one-third of its annual fish demand, with the remaining shortfall addressed through imports (Okelola, 2022). Catfish accounts for over 90% of the nation's fish cultivation, playing a critical role in food security and income generation, particularly in rural communities (Igoni-Egweke, 2018). However, the hygienic handling of smoked catfish remains a significant concern, especially in regions like Ibadan North Local Government Area (LGA) where consumption is high. Food safety, including proper handling and processing of fish, is paramount to prevent contamination and spoilage, which can significantly impact consumer preferences and willingness to pay (WTP) for smoked catfish (Bedane *et al.*, 2022). The traditional smoking

methods commonly used in Nigeria, while widely practiced, often do not meet optimal hygiene standards, posing health risks to consumers (Omeje *et al.*, 2022). As a result, there is increasing consumer sensitivity towards the hygienic handling of fish products, which can influence purchasing decisions (Amao & Ayantoye, 2014). Certification programs promoting safe processing methods are crucial for consumer awareness and market incentives (Belton *et al.*, 2011; Washington and Ababouch, 2011; Roheim *et al.*, 2012). Challenges include health risks from imported fish and traditional smoking methods, which may involve contaminants like polycyclic aromatic hydrocarbons and heavy metals. Alternative methods, such as air-drying, are being explored (Omeje *et al.*, 2022).

This study aimed to investigate consumers' WTP for certified and hygienically handled smoked catfish in Ibadan North LGA. The findings provide insights into consumer behavior, highlighting the importance of certification and hygienic processing in mitigating foodborne illnesses and enhancing public health. By exploring the economic feasibility of food safety interventions, this research will inform policy development and contribute to the broader literature on food safety and consumer behavior in developing countries. The study also addresses a gap in existing research by focusing on food safety attributes, separate from environmental sustainability, to better understand consumer WTP for certified smoked catfish (Tran *et al.*, 2022).

2.0. Theoretic framework

2.1. Theory of consumer behavior

The economic theory of consumer behavior, a cornerstone of microeconomics, elucidates how consumers make purchasing decisions and allocate their budgets among various goods and services. Central to this theory is analyzing consumer preferences, budget constraints, and income, which collectively influence purchasing behavior. Utility maximization, a key principle, posits that consumers aim to achieve the highest satisfaction from their choices, selecting combinations of goods that maximize their utility within budgetary limits. This principle underscores the notion that the price consumers are willing to pay approximates the maximum utility derived from a product (Zhang and Chang, 2021). Budget constraints, depicted through graphs or equations, illustrate the feasible consumption options given a fixed income, aiding in efficient budget allocation and understanding trade-offs (Massachusetts Institute of Technology, n.d.). The theory also emphasizes the significance of consumer preferences, shaped by personal tastes, income levels, and product prices, in determining purchasing decisions. In willingness-to-pay analyses, this theory is vital for businesses and policymakers, as it informs pricing strategies, market demand, and consumer welfare by revealing how consumers evaluate and assign value to products and services.

2.2. Empirical Review

Studies underscore significant hygiene and safety concerns associated with traditional catfish processing in Nigeria. Research by Adeyeye *et al.* (2016) and, Salaudeen and Osibona (2018) reveals that traditionally smoked *Clarias gariepinus* in Lagos and Maiduguri markets often harbors pathogenic bacteria and fungi, necessitating further heat treatment to ensure safety. Onwukwe *et al.* (2022) found that consumer preferences in Umuahia strongly favor smoked catfish (85.0%), followed by barbecued and fried varieties. Ordered probit regression analysis attributed over half of this preference variation to factors such as age, education, and income, with price and health benefits being pivotal determinants. Adeola *et al.* (2016) highlighted a robust market for smoked catfish in Southwestern Nigeria, with consumption positively correlated to income and household

size, although higher education levels showed a negative relationship. Male-headed households exhibited higher consumption rates, potentially due to cultural norms. High-income consumers are willing to pay premiums for hygienically handled smoked catfish, with Tran *et al.* (2022) noting a 3.1% to 18.8% price premium for safety-certified fish. Ogunbambo *et al.* (2023) emphasized that the type of kiln used in processing affects nutritional content and profitability, with traditional drum kilns offering high protein content and economic viability. Adeyeye and Oyewole (2016) pointed out substantial post-capture losses (30-50%) due to improper handling, although smoking remains the dominant preservation method despite microbial contamination concerns. Modern drying technologies, while potentially superior, face practical challenges due to limited electricity access. Oyebamiji *et al.* (2021) identified inadequate power supply, high fish costs, and low income as primary constraints to fish consumption, with a positive correlation between income and consumption patterns. Dipeolu *et al.* (2009) and Nedombeloni (2017) found that gender, age, education, health benefits, and sensory attributes positively influence willingness to pay for hygienically processed fish, highlighting the critical role of perceived safety and quality in consumer decision-making.

3.0. Methodology

The study was conducted in Ibadan North Local Government Area (LGA), Oyo State, due to its diverse socioeconomic population and smoked catfish consumers. Ibadan North, an urban center with a population of 856,988, is characterized by a tropical climate (Obi-Egbedi *et al.*, 2017; Kehinde & Bolanle, 2022). This study utilized primary data collected through semi-structured questionnaires, segmented into socio-economic characteristics, consumer awareness, willingness to pay, and quality attributes of hygienically smoked catfish. A multi-staged sampling technique was employed in Ibadan North LGA, stratifying wards into three income categories and selecting 130 respondents using systematic and simple random sampling. Analytical methods included descriptive statistics, contingent valuation method, and Heckman model to assess the determinants and willingness to pay for certified and hygienically handled smoked catfish.

4.0. Results and Discussion

The study's findings on the socio-demographic characteristics and awareness levels of smoked catfish consumers in Ibadan North reveal significant insights. The mean age of respondents was 33 years (± 12.1), predominantly female (88.5%), indicating women, especially those aged 21-40 (75.4%), as primary purchasers. Most respondents were married (54.6%) with an average household size of four (± 1.82). Most consumers are well educated, with 86.2% having attained tertiary education. The Yoruba ethnic group dominated (71.5%), followed by Igbo (14.6%), indicating a cross-cultural appeal. Income distribution showed most respondents were middle-income earners, with monthly household incomes between ₦50,000 and ₦300,000 (53.8%), and 27.7% earning over ₦300,000. Awareness of hygienically handled smoked catfish was high (73.85%), linked to educational attainment, but 19.23% were unaware, and 6.92% were uncertain due to traditional seller reliance and limited food safety information. Awareness regarding processing environment hygiene was lower (33.85% unaware, 30.77% uncertain), and awareness of certified smoked catfish was also limited (40% unaware, 12.31% uncertain). Additionally, 70% were unaware of existing regulations or standards for smoking catfish. Primary awareness sources included family and friends (9.23%), fish sellers (13.08%), and the Internet (12.31%). Health awareness was high, with 76.92% aware of health risks, and 80.77% interested in more hygiene knowledge. The willingness to pay for hygienically handled smoked catfish was high (90.77%),

while 76.92% were willing to pay a premium for certified smoked catfish. This result indicated consumers' limited understanding of the regulatory frameworks that have been put in place for aquaculture products, indicating a potential knowledge gap regarding the roles of standards in safeguarding product safety. This has implications for marketers in local markets as well as for export opportunities.

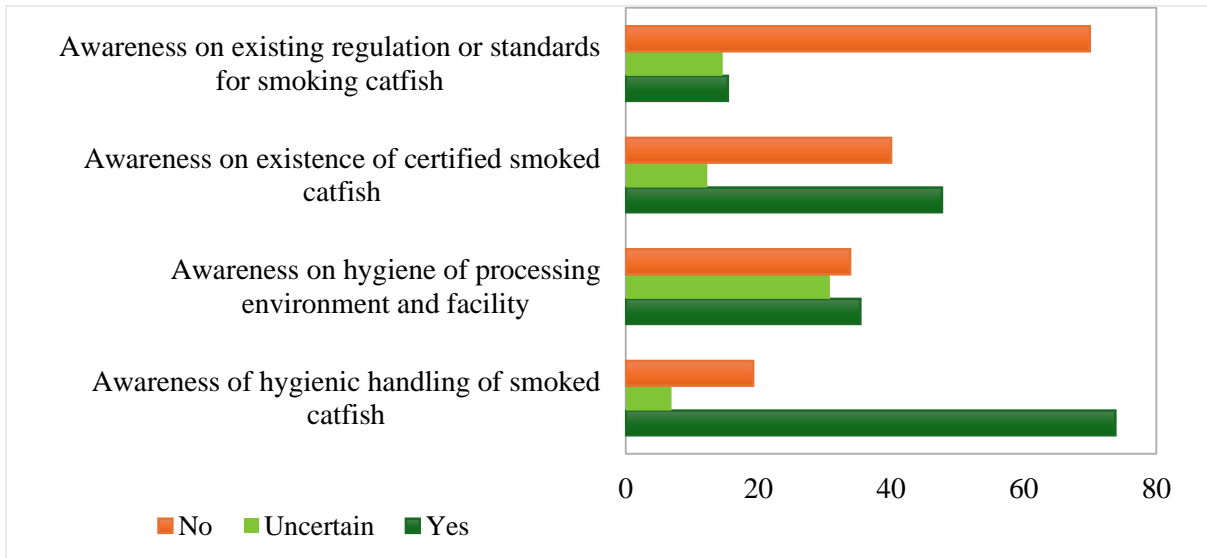


Figure 1: Distribution of consumers' level of awareness

The estimated mean willingness to pay was ₦2,905.39 for hygienically handled smoked catfish (45.3% increase) and ₦2,399.99 for certified smoked catfish (19.9% increase), indicating that hygiene-based attributes have a greater consumer valuation than certification. The probit regression analysis in the first stage of the Heckman model identifies key determinants influencing consumers' willingness to pay for hygienically handled smoked catfish. Education (coefficient: 1.208, $p \leq 0.01$) significantly increases the likelihood of consumers' willingness to pay for hygienically handled smoked catfish. Similarly, monthly household income (coefficient: 0.377, $p \leq 0.01$) positively affects willingness, reflecting enhanced purchasing power and health awareness. Proximity to sales points (coefficient: 1.477, $p \leq 0.01$), occupation status (coefficient: 0.366, $p \leq 0.01$), and awareness of the catfish source (coefficient: 0.528, $p \leq 0.01$) also contribute positively. Conversely, increased purchase frequency (coefficient: -0.251, $p \leq 0.01$) reduces willingness. For certified smoked catfish, marital status negatively impacts willingness (coefficient: -0.857, $p = 0.027$), while income (coefficient: 0.392, $p = 0.002$) and safety perception (coefficient: 0.512, $p \leq 0.01$) positively influence it. In the second stage, the OLS regression identifies the determinants of the premium consumers are willing to pay for hygienically handled smoked catfish. The *athrho* (ρ) coefficient of -0.365 ($p = 0.274$) and -16.06 ($p = 0.891$) respectively, suggests no significant selection bias, justifying the use of truncated OLS in the second stage. Marital status significantly increases the premium by ₦54.058 ($p \leq 0.01$), indicating that married individuals prioritize health and safety, likely due to combined resources and risk aversion. Age is also positively correlated, with a ₦6.402 increase per additional year ($p = 0.000$), reflecting enhanced health consciousness and stability among older consumers. Conversely, safety perception negatively impacts the premium by ₦216.135 ($p \leq 0.01$), suggesting skepticism towards paying extra if the product's safety is already assumed. For certified smoked catfish, purchase frequency decreases the premium

by ₦219.772 ($p \leq 0.05$), while quality perception significantly increases it by ₦1288.766 ($p = 0.016$).

5.0. Conclusion and Recommendation

The study reveals significant insights into the purchasing behavior and preferences of local consumers. The research findings underscore the need for targeted consumer education on the benefits of certified hygienic practices, as well as improvements in the certification and marketing of smoked catfish to better align with consumer preferences and safety concerns. The results can serve as a foundation for policymakers, stakeholders, and value chain actors to enhance food safety standards, improve consumer satisfaction, and promote sustainable market growth for smoked catfish in the region. Recommendations include increasing consumer education on standards, adopting modern processing techniques, and locating sales points closer to consumers by agripreneurs as well as organizing capacity-building workshops for marketers and small-scale producers, focusing on international trade standards, regulatory requirements, and market access strategies for aquaculture products. Regulatory bodies should ensure that marketers and producers undergo training on certification processes and adhere to standards, which would also boost export market opportunities.

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