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## **Post-Harvest Management of Catch by Local Artisans for Prevention of Economic Loss**

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### **ABSTRACT**

Post-harvest loss is one limitation faced by fishery artisans because it is an undesirable waste of scarce natural resources. Post-harvest loss occurs as a result of poor handling or inadequate method of preservation, and can occur in various forms. Post-harvest losses of fish result in economic consequences as the spoilage of fish causes a decrease in value or increased cost of a finished fish product. Post-harvest loss to an extent can be considered a loss to human food security. Post-harvest loss of fish takes place at various stages of the distribution chain beginning from the moment it is captured to when it is consumed. This paper investigated Post-harvest management of catch by local Artisans for prevention of economic loss, it was a descriptive survey and data was gathered using questionnaire on 50 fishers' men. The result of this study concluded that poor handling of fish leads to great economic loss. Unfortunately only limited options are available for fishery artisans in Nigeria among which are smoking, drying, and salting. This study recommended some good practices that are essential in handling fishes without causing economic loss..

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**Keywords:** Post-harvest management, Artisans, Prevention of economic loss

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### **1 Introduction**

The importance of fishery to a country cannot be overemphasized given its benefits in terms of employment, trade, and food security (Dimuthu&Sivakumar, 2018). It also serves as an essential source of protein to both humans and animals alike, due to its significance to growth and health condition of animals in which the food given to them contains by products of raw fish. In a nation, food security is said to occur, when every individual at all times are able to physically and economically access basic food needs. To this end, fisheries are considered to be of importance to both developing and developed countries (Kumolu-Johnson &Ndimele, 2011). This implies that food security can be improved in a nation by putting fish produced to better use in order to minimize post-harvest losses encountered by local artisans as well as increase consumption by humans.

Post-harvest loss is one limitation faced by fishery artisans because it is an undesirable waste of scarce natural resources. Post-harvest loss occurs as a result of poor handling or inadequate method of preservation, and can occur in various forms. Post-harvest losses of fish result in economic consequences as the spoilage of fish causes a decrease in value or increased cost of a finished fish product. Post-harvest loss to an extent can be considered a loss to human food security (Kumolu-Johnson &Ndimele, 2011).

Post-harvest loss of fish takes place at various stages of the distribution chain beginning from the moment it is captured to when it is consumed. The loss encountered by fishery artisans is one of concern to development practitioners as their intent of improving the livelihood of fishers and their contribution to food security is hindered. In order to increase fish supply, the problem of post-harvest losses have to be addressed.

The concept of post-harvest encompasses the period from when the fish gets separated from its growth medium, while the term losses entails damages in terms of physical, market and quality. All of these losses have financial consequences for artisan fishers, traders and even the economy as a whole. Also given the increased demand for fish and the shortfall in fish supply, it is an indication that the demand for fish far outweighs its supply which is a gross imbalance. In order to reduce this imbalance, it is necessary to address the factors behind post-harvest losses so as to increase the amount of fish supplied and minimizes losses. Also given the characteristics of artisans of using traditional methods to

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carry out operations, it is important to enhance artisan's understanding of the basic economics of reducing post-harvest loss of fish in Nigeria (Ibengwe, 2010).

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## 2 Statement of research problem

A challenge facing the world is how to ensure the availability and accessibility of food to a growing population. FAO estimated that by the year 2050, food production will have to be increased by 70% to adequately feed the estimated world population of 9 billion. The study further revealed that the planet's resource is strained due to factors like lifestyle change, climate change, increasing population, and change in diet. Some of this contributes to massive loss of food from spoilage and infestations in the course of transportation to end users (Kiaya, 2014). The poor processing and management of fish causes huge losses running into billions annually (Kaminski, 2019). FAO identified four main causes of food insecurity to include; poor productivity level due to technological constraints, seasonal variability in food supply due to unreliable weather, low employment and income level; and post-harvest losses of agricultural produce. These factors were attributed mainly to lack of awareness on proper ways of handling, marketing and distribution. The production of low quality fish is a cause for concern to food security, however when it borders on economy loss and threatens the livelihoods of small scale fishermen, then it has become a threat to life. This is based on the fact that the livelihood of most coastal communities revolves around fishing and farming, and anything that causes them to encounter loss in any aspect of their trade directly or indirectly impacts on the economy. Given the traditional handling and processing method by which artisans operate in the fishery sector, which is inadequate given the huge demand for fish, they tend to have production losses especially post-harvest period. To this end, assessing the adequacy of the methods used is important to enable the development of modern methods that will limit loss and enhance post-harvest management. Thus this study seeks to examine the impact of Post-harvest management of catch by local Artisans in the prevention of economic loss.

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## 3 Research objectives

1. Identify the factors responsible for post-harvest loss of fish by local artisans.
2. Examine existing fish handling and processing practices.
3. Assess the impact of post-harvest management in preventing economic loss.

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## 4 Research questions

1. What are the factors responsible for post-harvest loss of fish by local artisans?
2. What are the existing fish handling and processing practices used by fishery artisans?
3. What is the impact of post-harvest management in preventing economic loss?

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## 5 LITERATURE REVIEW

Food security is improved when there is better use of fish produced by a reduction in post-harvest losses and an increase the percentage of fish used for directly consumed by humans. Fish loss occurs during, before or after harvesting though post-harvest losses center on the latter and are of serious concern because the losses occur after investments in the process of production. As captured fish moves along the value chain from the farm gate, through wholesalers, processors, transporters and retailers to household and final consumers (Olusegun& Matthew, 2016), and these losses may result from damage and noncompliance with standards that cause fish to be unwholesome and need discarding (Nukpezah et al, 2020). Post-harvest loss is a severe risk to the artisanal fisheries sector which occurs from the capture to the final stage of marketing the product to the consumers. Artisanal fisheries are known as small-scale fisheries because they use old-fashioned traditional fishing equipment, they require low cost of operation, they involve low capital expenses and low innovation (Adelaja, Kamaruddin& Lee, 2017).

Types of post-harvest fish loss

There are four types of losses in the fish supply chain (COCMEC, 2016) which are:

- Physical loss: this type of loss occurs as a result of produce being thrown away, spoiled, or consumed by animals or insects during processing and storage. This loss can occur at different stages, such as the fishing stage due to disposal of unwanted catch or due to market mechanisms like oversupply or lack of market. This loss is expressed in terms of weight reduction and/or monetary value of the produce. Physical losses could

either be complete loss or loss resulting from poor handling and processing of fish.

- **Quality loss:** this is mostly expressed in monetary terms as this symbolizes the difference between the potential values of fish at finest quality and its present value after quality degradation. Fish that have deteriorated in quality can be sold for other purposes in the same or different markets at lesser prices as downgraded products.
- **Market loss:** refers to diverse losses applicable to market behaviour or management that may result to price reduction below an ideal price or a monetary loss due to high marketing and production costs. This loss happens when the fish supply is greater than and is the difference between the expected price and the actual price.
- **Nutritional loss:** this results from spoilage or processing causing biochemical changes within fish flesh. So such as heat processing leading to a loss of vitamins and/or proteins. Also, loss of nutritional value occurs when fish spoils. How fish is handled, processed and stored can affect its nutritional value (Getu, Misganaw&Bazezew, 2015).

Quality loss: this has to do with fish undergoing changes that reduces its quality as a result of physical damage or spoilage. It is a common post-harvest fish loss (Getu, Misganaw&Bazezew, 2015).

Causes of post-harvest fish loss include spoilage, time, lack of infrastructural facilities such as storage facilities and ice for preservation (Adelaja, Kamaruddin& Lee, 2017).

To reduce post-harvest fish loss in artisanal fishing sector, it is important that the methods used in handling fish are done carefully to retard spoilage, reduce loss and improve quality. The quality and safety of fish which can be achieved through hygienic practices among fishermen and processors are determined by the handling methods used during landing, processing, packaging, transportation and storage (Adelaja, Kamaruddin& Lee, 2017). In addition, reducing fishing time to at least 12 hours will help keep caught fish in good condition as well as good fish handling practices while on board such as washing, gutting and storage in containers that are clean to reduce loss (Olusegun& Matthew, 2016).

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## 6 Empirical review

Maulu et al., (2020) carried out a research that assessed post-harvest fish losses and preservation practices in Siavonga district in Southern Zambia. Data was collected from aquaculture producers, commercial and artisanal fishers using structured and semi-structured questionnaires. Results revealed that all the fishers suffered post-harvest fish losses at different degrees with the majority being those losing up to 10% of the total catch. Aquaculture producers on the other hand did not report any post-harvest fish losses as most generally used chilling as preservation practice as opposed to commercial and artisanal fishers who generally used sun-drying and smoking respectively. Furthermore, lack of cold storage facilities and unstable weather conditions were the major issues affecting fish post-harvest activities.

Adelaja, Kamaruddin& Lee (2018) carried out a study to assess post-harvest fish losses amid three dominant marine fish species (Croaker, Catfish and Shrimp) along coastal areas of OndoState, Nigeria. Questionnaires were used to collect data from 100 fishermen selected randomly from five viable fishing communities. From the results of the analysis, it was shown that the fishermen suffered losses of 8.15% for croaker, 7.76% for catfish and 7.57% for shrimp correspondingly and that causes of post-harvest fish losses included lengthy duration of fishing cycle, lack of covering facilities, poor handling practices, lack of storage facilities, ice and good transportation means in the area of study.

Sivakumar, Saravanamuttu&Dimuthu (2018). investigated the quality loss and estimated the economy loss of three fish species (*Katsuwonuspelamis*, *Decapterusrusseli* and *Auxisthazard*) from one-day fishing boats. Samples (both physically damage and non-damage fish) were collected from the catching point and the landing place from 24 one-day fishing boats and analyzed for proteolytic bacterial count. Research revealed 2-6% damages with 10-50% economic loss in *Katsuwonuspelamis*, 8-18% damages with 13-45% economic loss in *Decapterusrusseli* and 13-23% damages with 39-51% economic loss in *Auxisthazard*.

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## 7 Theoretical framework: Theory of Planned Behaviour (TPB)

The theory anchors this study and explains that the drivers of human behaviors and actions are shaped by their perceptions. The theory was proposed by Ajzen (1991) and argues that human behaviour/actions are ordinarily intentional and are determined by attitude towards the behaviour (an individual's beliefs and values about the outcome of the behaviour), subjective norms (the beliefs about what other "important" people think that the individual should do) and behavioral control beliefs (the individual's beliefs about the ability to perform the behaviour). Post-harvest loss results from the fishermen's practices or behaviours which conform with their norms and beliefs in their capabilities to reduce loss among other things (Ssebagala et al., 2017). Based on this theory, the fishermen who believe that post-harvest loss will affect their income

and food availability will be intent on taking up new knowledge and technologies to reduce losses (Seline et al., 2015) while those who think otherwise will not change the state of things. The belief that one can effectively undertake measures to reduce post-harvest loss indicates readiness to change behavior and reduce loss.

## 8 Methodology

The paper adopted the research survey method in carrying out this study. The population of the study consisted of fishery artisans in Lagos state, Nigeria. Purposive sampling method was used in selecting Epe local government area in Lagos state, based on the fact that it is a coastal region housing a lot of fishery artisans. Using the random sampling method, fifty fishermen were selected as respondents for the study. The instrument used in data collection was the questionnaire, which was structured on a five scale likert format. Given that most of them are semi-literate, the researcher enlisted the assistance of research assistants in distributing the questionnaire to the fishermen, which involved reading and interpreting the contents of the questionnaire while they answered orally and it was filled by the research assistants. The data collected was descriptively analyzed using mean and standard deviation with a benchmark for acceptance being  $\geq 2.5$

### Data presentation, analysis and discussion

**Table 1: Factors responsible for post-harvest loss of fish by local artisans**

Statement	$\bar{x}$	$\sigma^2$	Decision accept if $\bar{x} \geq 2.5$
Insufficient skills	4.00	0.87	Accept
Reoccurrence of natural disaster	4.16	0.75	Accept
Unskilled workers	4.15	0.72	Accept
Lack of regular monitoring	3.51	1.21	Accept
Poor infrastructure and logistics	3.89	0.90	Accept
Knowledge and management capacity of supply chain actors	4.02	0.91	Accept
Unreliable markets	3.88	1.04	Accept
<b>Average</b>	3.94	0.91	

### Field survey (2021)

The first research question investigated the factors responsible for post-harvest loss of fish by local artisans with above 2.5 acceptance rate the study indicated the following factors as responsible for post-harvest loss of fish by local artisans: Insufficient skills ( $\bar{x}=4.00$ ;  $\sigma^2=0.87$ ); Reoccurrence of natural disaster ( $\bar{x}=4.16$ ;  $\sigma^2=0.75$ ); Unskilled workers ( $\bar{x}=4.15$ ;  $\sigma^2=0.72$ ); Lack of regular monitoring ( $\bar{x}=3.51$ ;  $\sigma^2=1.21$ ); Poor infrastructure and logistics ( $\bar{x}=3.89$ ;  $\sigma^2=0.90$ ); Knowledge and management capacity of supply chain actors ( $\bar{x}=4.02$ ;  $\sigma^2=0.91$ ); Unreliable markets ( $\bar{x}=3.88$ ;  $\sigma^2=1.04$ ). This result is consistent with some earlier studies such as: Johnson and Ndimela (2011) whose study revealed that fishery artisans has limited knowledge on how best to deal with the post-harvest loss of fish. Likewise, the study agreed with Adelaja, Kamaruddin and Lee, (2017) and Dapaah and Samey (2015) respectively.

### RQ2: What are the existing fish handling and processing practices used by fishery artisans?

**Table 2: The existing fish handling and processing practices used by fishery artisans**

Statement	$\bar{x}$	$\sigma^2$	Decision accept if $\bar{x} \geq 2.5$
Smoking	4.03	0.98	Accept
Sun drying	4.13	0.76	Accept
Salting	4.09	0.77	Accept
<b>Average</b>	<b>4.08</b>	<b>0.84</b>	

### Field survey (2021)

The second research question investigated the existing fish handling and processing practices used by fishery artisans. The result indicated that all

the items exceed the benchmark of  $\bar{x} \geq 2.5$  with average mean of 4.08 and a standard deviation of 0.84. This shows that the existing fish handling and processing practices used by fishery artisans include: Smoking ( $\bar{x}=4.03$ ;  $\sigma^2=0.98$ ); Sun drying ( $\bar{x}=4.13$ ;  $\sigma^2=0.76$ ); and Salting ( $\bar{x}=4.09$ ;  $\sigma^2=0.77$ ). The result of this study indicates that fishery artisans used crude or local methods in preserving their fishes. The result is in support with Deepchill (2010) whose study revealed that there are fishery artisans have limited options on how best to preserve their fish. The most common being frying, drying and salting. In same vein, the study supports by Ananou et al., (2007) who identified salting, drying, and smoking. However, unlike this study, Ananou et al (2007) including freezing, and fish canning.

### RQ3: What is the impact of post-harvest management in preventing economic loss?

**Table 3: The impact of post-harvest management in preventing economic loss**

Statements	$\bar{x}$	$\sigma^2$	Decision accept if $\bar{x} \geq 2.5$
Reduction of processing waste	4.07	0.94	Accept
Improving the value of processed products	3.76	1.04	Accept
Reduces losses between harvest and consumption	4.25	0.86	Accept
Maintains quality (appearance, texture, flavor and nutritive value)	4.52	0.56	Accept
Protects food safety	3.88	1.01	Accept
Improves storage technologies such as controlled atmosphere storage to reduce postharvest food losses	4.20	0.81	Accept
Increases the amount of food available for consumption	3.97	0.42	Accept
Reduces pressure on natural resources	4.09	0.81	Accept
Eliminates hunger and improve farmers' livelihoods	4.25	0.86	Accept
<b>Average</b>	<b>4.11</b>	<b>0.81</b>	

#### Field survey (2021)

The final research question investigated the impact of post-harvest management in preventing economic loss. With all items indicating a mean score of above 2.5 which imply that all the items are accepted as the impact of post-harvest management in preventing economic loss. Accordingly, the impact of post-harvest management in preventing economic loss include : Reduction of processing waste ( $\bar{x}=4.07$ ;  $\sigma^2=0.94$ ); Improving the value of processed products ( $\bar{x}=3.76$ ;  $\sigma^2=1.04$ ); Reduces losses between harvest and consumption ( $\bar{x}=4.25$ ;  $\sigma^2=0.86$ ); Maintains quality (appearance, texture, flavor and nutritive value ) ( $\bar{x}=4.52$ ;  $\sigma^2=0.56$ ); Protects food safety ( $\bar{x}=3.88$ ;  $\sigma^2=1.01$ ); Improves storage technologies such as controlled atmosphere storage to reduce postharvest food losses ( $\bar{x}=4.20$ ;  $\sigma^2=0.81$ ); Increases the amount of food available for consumption ( $\bar{x}=3.97$ ;  $\sigma^2=0.42$ ); Reduces pressure on natural resources ( $\bar{x}=4.09$ ;  $\sigma^2=0.81$ ); Eliminates hunger and improve farmers' livelihoods ( $\bar{x}=4.25$ ;  $\sigma^2=0.86$ ). The result is consistent with Adelaja, Kamaruddin & Lee (2018) and Sivakumar, Saravanamuttu & Dimuthu (2018) respectively.

## 9 Conclusions and Recommendations

The importance of fishery to a country cannot be overemphasized given its benefits in terms of employment, trade, and food security (Dimuthu & Sivakumar, 2018). It also serves as an essential source of protein to both humans and animals alike, due to its significance to growth and health condition of animals in which the food given to them contains by products of raw fish. It becomes imperative to properly maintain the quality of fish beginning from its harvesting, transportation, through its handling. If not properly done, the result of this study indicates that it will lead to economic loss. This is so because poor fish handling will result to decay, growing of bacteria and fungi which will affect not just the fish but also the health of the people. Therefore, when the harvested fishes are not well handled its hazard because it will lead to increase in microbial contamination, larger amount of spoilage, foul smell, which endanger both individual lives, health, and above all individual loss in economic. The result of this study concluded that poor handling of fish leads to great economic loss. Unfortunately only limited options are available for fishery artisans in Nigeria among which are smoking, drying, and salting. This study builds on the findings of literature to recommends the following good practices that are essential in handling fishes.

1. Always ensure that the temperature is well controlled to suit the fish
2. Fish that were caught at different times should be kept according to their varied time apart.
3. Separate the fishes according to their diverse sizes. Smaller fishes given that smaller fishes decay faster than bigger ones.
4. Always keep the place tidy to avoid flies, dirty and others.

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**POST-HARVEST MANAGEMENT OF CATCH BY LOCAL ARTISANS FOR PREVENTION OF ECONOMIC LOSS****REQUEST FOR INFORMATION**

Dear Respondent,

I am carrying out a study on “Post-harvest management of catch by local Artisans for prevention of economic loss”, and you have been chosen to be part of the study. This questionnaire is only for academic purposes. Kindly select the response which applies to you and all information will be kept confidential

**SECTION A:**

Instructions: Please tick (√) as appropriate where

SA = Strongly Agree (SA), A = Agree, D = Disagree (D), SD = Strongly Disagree (SD)

**Key: Strongly agree (4), Agree (3), Disagree (2), and strongly disagree (1).**

S/N	ITEMS	SA	A	UN	D	SD
<b>RQ1</b>	<b>What are the factors responsible for post-harvest loss of fish by local artisans?</b>					
1	Insufficient skills					
2	Reoccurrence of natural disaster					
3	Unskilled workers					
4	Lack of regular monitoring					
5	Poor infrastructure and logistics					
6	Knowledge and management capacity of supply chain actors					
7	Unreliable markets					
<b>RQ2</b>	<b>What are the existing fish handling and processing practices used by fishery artisans?</b>					
8	Smoking					
9	Sun drying					
10	Salting					
<b>RQ3</b>	<b>What is the impact of post-harvest management in preventing economic loss?</b>					
11	Reduction of processing waste					
12	Improving the value of processed products					
13	Reduces losses between harvest and consumption					
14	Maintains quality (appearance, texture, flavor and nutritive value)					
15	Protects food safety					
16	Improves storage technologies such as controlled atmosphere storage to reduce postharvest food losses					
17	Increases the amount of food available for consumption					
18	Reduces pressure on natural resources					
19	Eliminates hunger and improve farmers' livelihoods					