

## ASSESSMENT OF POST-HARVEST LOSSES AND PRESERVATION TECHNIQUES AMONG ARTISANAL FISHER-FOLKS IN OYAN DAM, OGUN STATE

### Abstract

This study was carried out to assess the post-harvest losses among fisher-folks in Oyan dam. Purposive and random sampling techniques were used to select Ninety (90) respondents from the fishing communities. Data were collected using a well-structured questionnaire, and the collected data were subjected to descriptive and multiple regression analysis. The result revealed 53.30% of the fisher-folks were between the age of 40-59years, 80% of the fisherfolks interviewed were married, while 41.11% and 37.78% had primary and no formal education respectively. 64.44% of the fisher-folks had alternative jobs and their average total catch/effort is 30kg. The result also revealed that 48.89% and 35.56 experienced 10-20% and <10% post-harvest losses. Theft (83.33%), weather condition (56.67%) and lack of cold storage facilities (51.11%) were the major factors contributing to postharvest losses in the fishing communities. Furthermore, the regression analysis revealed that gender and experience are statistically significant ( $p < 0.05$ ) with postharvest losses. In conclusion, there's a need for reduction in the postharvest losses in these fishing communities in order to enhance food security and sustain the environment.

**Keywords:** Artisanal, fisher-folks, food security, post-harvest losses

### Introduction

Fishes has excellent nutritive value, which provides high quality protein, fats, vitamins and minerals like magnesium and phosphorus (FAO, 1998). Fish as a protein food needs proper handling. This is because fish spoils easily after capture due to the high tropical temperature which increases the activities of bacteria, enzymes and chemical oxidation of fat in the fish. In Nigeria, about 30 –50% of fish harvested are wasted due to poor handling (Bate and Bendall, 2010). Post-harvest losses is one of the many challenges facing small scales fisheries these days (FAO, 2016). A post- harvest loss is of a great concern because it is a loss of an essential animal protein that should be consumed or sold in a good price. This also causes a great economic loss to fisher-folk globally (Diei-Ouadi and Mgawe, 2011). Among many reasons previously

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highlighted for post-harvest losses are; high environmental temperature, extended storage without preservatives, predators, insect infestation, increased production and lack of market (TesfayandTeferi, 2017). The inadequate fish supply in Nigeria is worsened by the massive spoilage of what is produced due to poor post-harvest technology comprising handling, processing and preservation. These losses accounts for substantial proportion of the total supply. The production of low quality fish is a cause for concern to food security in the country. When it borders in economy loss and threatens the livelihoods of the fishermen, then it has become a threat to life. This study therefore aims to assess the post-harvest losses among fisher-folks in Oyan dam, methods used in preventing these losses and their effectiveness.

The objectives are:

- i. To know the demographic characteristics of the respondent.
- ii. To assess post-harvest fish losses in the communities.
- iii. To identify the ideal strategies used to minimize post-harvest losses.
- iv. To identify other practices used to preserve fish by fishers and their effectiveness
- v. To evaluate some of the challenges contributing to post-harvest fish losses.

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Hypothesis

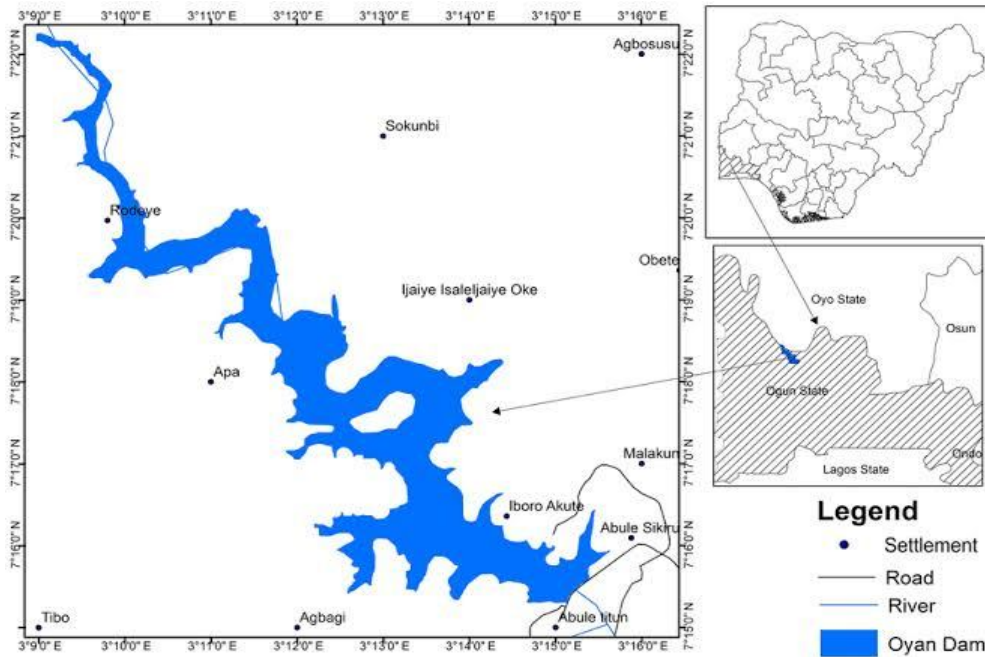
H<sub>0</sub>: there is no significant relationship between the socio-demographic characteristics of the respondents and their postharvest losses.

## **Materials and Methods**

### **Study Area**

#### **3.1.1 Oyandam**

Oyan dam is owned and operated by the Ogun-Osun River Basin Development Authority (O-ORBDA) and has a surface area of 4000ha. It is located 7°15' North latitude and 3°16' East longitude at an elevation of 43.3m above sea level on the confluence of Oyan and Ofiki rivers, both tributaries of Ogun River. It has a catchment area of approximately 9,000km<sup>2</sup> within the southern climatic belt of Nigeria. It is influenced by a rainy season which starts in the middle of March and till late October while the dry season is from November to February. The range of rainfall was between 1600mm and 2900mm. It was constructed for supply of water, for irrigation purposes and the generation of 9 megawatts of hydroelectric power which never materialized. The dam currently supports a thriving fishing industry which offers enormous opportunities for increasing freshwater fish production in the region.



**Map 1 :Map showing study location**

### **Sampling Technique and Data Collection**

Purposive and Random sampling techniques were used to select the respondents for this study. Three landing sites were selected using the purposive sampling method, while 30 fisher-folks were randomly selected from each landing sites to give a total of 90 fisher folks from the fishing communities. A well-structured questionnaire was administered to the respondents for data collection

### **Data Analysis**

The collective data was analyzed using descriptive and inferential statistics; multiple regression analysis.

## Results

**Table 1: Demographic Characteristics of the Respondents in the Study Area**

Variables	Frequency	Percentage
<b>Age</b>		
<20	-	-
20-39	31	34.00
40-59	48	53.30
60-79	11	12.20
80 and above	-	-
<b>Sex</b>		
Male	51	56.66
Female	39	43.33
<b>Marital Status</b>		
Married	72	80.00
Single	12	13.33
Divorced	2	2.22
Widowed	4	4.44
<b>Educational Background</b>		
None	34	37.78
Primary	37	41.11
Secondary	15	16.67
Tertiary	4	4.44
<b>Level of Operation</b>		
Full-time	37	41.11
Part-time	53	58.89
<b>Experience</b>		
<11 years	36	40.00
11-20 years	41	45.56
21-30 years	10	11.11
31-40 years	3	3.33
41-50 years	-	-

Source: Field Survey, 2023

Table 1 shows the distribution of Age, marital status, educational background, level of operation and experience of the interviewed women fisher-folks in Oyan dam. The table revealed that 53.30% of the fisher-folks were between the age of 40-59 years, followed by those who were in the age range of 20-39 years (34.00%), while only 12.20% were within 60-79 years.

80% of the fisherfolks interviewed were married, 13.33% were single, while 2.22% and 4.44% were divorced and widowed respectively. The results also showed that many of them are not well learned. Only 4.44% of the fisher-folks had tertiary education. 41.11% and 37.78% had primary and no formal education respectively. These two groups accounted for the major part of the population.

The result further revealed that 58.89% of the fisher-folks were involved in other business outside fisheries while 41.11% were into fisheries activities full time. Majority of them had between <11years (40%) and 11-20years (45.56%) years of experience. Only 3.33% had over 30years of experience.

**Table 2: Alternative jobs of the fisherfolks in the fishing communities**

<b>Alternative Job</b>	<b>Frequency</b>	<b>Percentage</b>
Government job	7	7.77
Farming	48	53.33
Business	2	2.22
Artisan	1	1.11
None	32	35.56

Source: Field Survey, 2023

The result shows the alternative jobs the fisher-folks in Oyan dam were involved in. As presented in the table, 53.33% of the fisherfolks are into crop farming, 7.77% are employed in government organizations, about 2.22% have other business while 35.56% do not have alternative job.

**Table 3: Average Catch of the Fisherfolks in the Fishing Communities**

<b>Average Catch</b>	<b>Frequency</b>	<b>Percentage</b>
<20kg	30	33.33
21-30kg	39	43.33
31-40kg	19	21.11

41-50kg	1	1.11
51-100kg	1	1.11
<b>Total Average: 30kg</b>		

Source: Field Survey, 2023

Table 3 reveals the average catch of the fisher folks in the fishing communities (Oyan dam). The most frequent group average catch were 21-30kg (43.33%) and  $\leq 20$ kg(33.33%). The calculated average catch per effort of the fisherfolks in the fishing communities was 30kg

**Table 4: Postharvest losses of the Fisher-folks in the Fishing Communities**

Postharvest losses	Frequency	Percentage
<b>Do you experience PHL</b>		
Yes	78	86.67
No	2	22.22
<b>Loss/catch</b>		
<10%	31	35.56
10-20%	44	48.89
30-40%	14	15.56
Above 40%	-	
<b>Total Average: 20%</b>		

Source: Field Survey, 2023

Table 4 presents the postharvest losses of the fisher-folks in the fishing community. 86.67% of the fisher-folks affirmed that they do experience postharvest losses. 48.89% of them experience about 10-20% loss per catch, while 15.56% often experience 30-40% loss/catch.

**Table 5: Strategies Engaged by the Fisherfolks in Reducing Postharvest Losses**

Strategies	Frequency	Percentage
Quick processing	49	54.44
Quick preservation with ice or other preservatives	29	32.22

Quick selling while fresh	11	12.22
None		

Source: Field Survey, 2023

The various strategies were employed by the fisher-folks to minimize post-harvest fish losses in Oyan dam. As indicated in the table, 54.44% of the respondent employed quick processing, 32.22% of the fisher-folks uses quick preservation with ice, and 12.22% of the fisherfolks sell their fish quickly while still fresh.

**Table 6: Postharvest Fish Preservation Practices and their Effectiveness**

Preservation/Processing Practices	VE	E	NE	Weighted Mean
Smoking	78	3	-	2.66
Chilling	-	5	15	0.28
Sun drying	4	28	2	0.77
Freezing	2	-	-	0.06
Others				

Source: Field Survey, 2023

Postharvest fish preservation practices and their effectiveness is presented in table 6. Fishing smoking had the highest weighted mean of 2.66 of 3.00 scale. 78 respondents out of 90 chose smoking as a very effective method of fish preservation. Sun drying had a weighted mean of 0.77 while chilling and freezing had 0.28 and 0.06 respectively.

**Table 7: Challenges Contributing to Postharvest Losses in the Fishing Communities of Oyan dam**

Challenges	frequency	Percentage
Fish losses due to theft	75	83.33
Poor road network to the market	21	23.33
Lack of cold storage facilities	46	51.11
Competitors on the market	34	37.78
Strict government regulations	-	

Weather condition	51	56.67
Others		

Source: Field Survey, 2023

The result shows the challenges contributing to postharvest losses in the fishing communities. 83.33% of the respondents mentioned fish losses due to theft as a major challenge, followed by weather conditions (56.67%) and lack of cold storage facilities (51.11%).

**Table 8: Regression Analysis of the Relationship between the Respondents' Demographic Characteristics and Postharvest Losses in the Fishing Communities of Oyan dam.**

Variables	Coefficients	t	Level of sig
Age	0.112	0.695	0.505
Sex	0.405	2.283	0.048**
Experience	-0.461	-7.919	0.016**
Level of education	0.329	0.767	0.463

\*\* Sig at  $p < 0.05$

Regression analysis for demographic variables and postharvest loss/catch by the fisher-folks indicated that the coefficient of multiple determination ( $R^2$ ) gave a value of 0.782. This implies that the demographic variables explained 78.2% of variations of average Postharvest loss/ Catch in the fishing communities of Oyan dam. As revealed in Table 8, the analysis revealed that Sex/gender and experience have significant relationship ( $p < 0.05$ ) with the postharvest losses of the fisher-folks in Oyan dam.

## Discussion

Postharvest food losses remain a significant challenge affecting food production industries globally. In fisheries, these losses comprise of harvested fish resulting from spoilage, size breakage, by catch, discards and operational losses (Tesfay and Teferi, 2017). This study assessed the postharvest losses of the fisher-folks in the fishing Communities, and observed that postharvest losses by fisher-folks in the study area is between <10-20%. This is in line with the observation of Mauluet *al.*,(2020) who reported that majority of the fisherfolks in siavonga district were experiencing up to 10% fish losses per given total catch. However, many factors could be responsible for variations in postharvest losses. For example, the catching season, targeted species, assessment methods e.t.c. In the study, four fish preservation practices (smoking, sundrying, chilling and freezing) were revealed. Smoking was the most commonly used preservation practice among the artisanal fishers in Oyan dam. This was also observed by Fatoya *et al.* (2017) among small-scale fishers in Nigeria. According to Onyango *et al.* (2017), sun drying was deemed the easiest but it had higher risks of fish losses as it depended on weather conditions (sunshine) which is very unpredictable, especially during the rainy season.

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Several challenges contributing to postharvest losses in the fishing communities of Oyan dam were reported. Fish losses due to theft and lack of cold storage facilities were the major challenges reported. Similar findings were reported by FAO.(2018) and Kabahenda *et al.*, (2009). Regression analysis was used to assess the relationship between some selected socio-demographic characteristics and postharvest losses by the fisherfolks in Oyan dam. It was observed that gender and experience both have a significant relationship with the postharvest losses of the fisherfolks. The relationship of experience with postharvest losses was negative. This simply implies that as the years of experience of the fisherfolks increases, post-harvest

losses reduces. This can be expected as experience comes with bags of knowledge. Our results suggest that there are gendered differences in total losses. This could be because processors experience higher losses than other value chain actors (Kaminski *et al.*, 2020), and the processors are mostly female. This makes the female more at risk of losses than men.

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## Conclusion

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As post-harvest losses occur, more fish is been harvested to compensate for the loss in would-be revenues. Therefore, reducing post-harvest losses is a key strategy to enhance food security and environmental sustainability. The findings of this study showed that fisher-folks in Oyan dam experience post-harvest losses in various degrees, and they rely majorly on quick processing (smoking) and quick preservation with ice to reduce postharvest loss, but they still experience an average percentage loss of about 20%. These losses were mostly due to theft, weather condition and lack of cold storage facilities. These losses are gendered and experience related. In order to sustain the environment and improve food security, innovative and low-cost technology for post-harvest practices should be introduced. Effort by the government or interested private organizations should be geared towards making cold storage facilities available in these communities. Ensuring adherence to product safety and quality control measures will guaranteed safety and reduce post-harvest losses.

## References

**Comment [A6]:** The references are not sufficient and not recent

Diei-Ouadi Y, Mgawe Y.I (2011). Post-harvest fish loss assessment in small-scale fisheries: a guide for the extension officer. FAO Fisheries and Aquaculture Technical Paper. No. 559. Rome: FAO

- FAO, 2016. Aquaculture Summary: the State of World Fisheries and Aquaculture Report FAO 2016:1-8.
- FAO. The state of world fisheries and aquaculture 2018. Contributing to food security and nutrition for all, Rome, 2018.
- Food and Agriculture Organization of United Nation (1998), "Fisheries and food security from small-soft bone fish". *Journal of trace elements in medicine and biology*. 12:148-154
- Kabahenda M.K, Omony P, Husken S.M.C (2009). Post-harvest handling of low value fish products and threats to nutritional quality: a review of practices in the Lake Victoria region. *Regional Programme Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions*. The World Fish Center. Kampala: Department of Food Science and Technology, Makerere University.
- Kaminski, A.M., Kruijssen, F., Cole, S.M., Malcolm, C.M., Claire, D., Chadag V.M, Sharon, S., Manjurul, K., Oai, L.C, Michael, J.P., William, D., Weirowski, F., Genschick, S., Tran Nhung., Rogers, W and Little, D.C (2020). A review of inclusive business models and their application in aquaculture development. *Reviews in Aquaculture*. 12(3):1881-1902
- Maulu S, Munganga B.P, Hasimuna O.J, Haambiya LH, Seemani B (2019). A review of the science and technology developments in Zambia's aquaculture industry. *Journal of Aquatic Resources and Development*. 10:50-67.
- Onyango D.M (2017). Evaluation of fish processing and preservation systems along the shores of Lake Victoria towards enhancement of sun sun-drying technology. *International Journal of Food Science, Nutrition and Engineering*. 7(5):11-18.
- Tesfay, S. and Teferi, M., 2017. Assessment of fish post-harvest losses in Tekeze dam and Lake Hashenge fishery associations: Northern Ethiopia. *Agric. Food Security*. 6(1):1-12.