



Human Introduction of Pollution and Its Impacts on Fish Farming

Date of Submission: 14-01-2023

Date of Acceptance: 29-01-2023

Abstract

Human activities have been reported to be a major source of organic and inorganic contaminants in ecosystems. These contaminants include metals, plastics, pesticides, and pharmaceuticals, among others. This study, therefore, investigated the human introduction of pollution and its impacts on fish farming alongside three objectives using a questionnaire for data collection which was collected from 100 participants using snowballing. Descriptive statistics such as frequencies and percentages were adopted for data analysis. The result revealed the following sources of human pollution that affect fish farming: industrial activities, Agricultural operations, Sewage discharge, Industrial and vehicular emissions, Waste disposal, and Energy production, when these come in contact with sea or rivers where fishes live, it becomes a danger to their existence. This study also identifies ways by which the ways pollution challenges fish farming activities among which are: Pollution affects the health of other fish and aquatic creatures; it depletes oxygen in the water killing wild aquatic life; Fish feed and feces pollute the water around intensive fish farms leading to poor water and sediment quality; degradation of the water quality and leads to the spread of infectious diseases, Chemicals and pesticides contaminate the area and impact surrounding marine life. Finally, the study revealed some ways to eliminate pollution in fish farming. Among these are the Enforcement of strict fish farming regulations; Proper management of waste discharge, Introduction of more efficient and well-run fish farming operations, and educational programs to help enhance publicly owned fish farming operations.

Keywords: human pollution, fish farming.

I. Introduction

Human activities have been reported to be a major source of organic and inorganic contaminants in ecosystems. These contaminants include metals, plastics, pesticides, and pharmaceuticals, among others (Jacquin, Petitjean,

Côte, Laffaille & Jean, 2020). Aquaculture pollution is an identified side effect of a rapidly growing and under-regulated industry that has been a huge source of concern. The various pollutions caused as a result of human activities as well as emissions from marine animal waste from aquaculture facilities into the ecosystem negatively affect fish and result in nutrient pollution. An instance of harmful aquaculture systems is open net-cage farming, which is carried out by the coasts of large bodies of water, and done using large mesh fishing nets to keep in place, farmed fish, without provisions of how to prevent waste from escaping into the water. Such kind of waste may contain antibiotics, pesticides, and fish feces which when it comes in contact with open water, contaminates it and makes it unsafe for wildlife habitation, human consumption, and recreational use (Farmed and Dangerous, 2013). It has been observed that most aquaculture industries either do not have the necessary funding to address the contamination issue, or the applicable technology, thus causing pollution to be a growing issue. As more people are showing interest in fish farming, however, there are regulations enacted to guide their activities. This is based on the perception that the management and regulation of quality feed reduce nutrient discharges and pollution greatly (Miller, 2002).

Fish farming describes the breeding and rearing of aquatic animals in captivity with the objective of killing and eating them. It is an intensive practice that is synonymous with a whole host of serious welfare and environmental problems. White (2013) opined that the fishing environment can be negatively affected by overfeeding fish and marine life. This implies that the absence of regulation or ineffective implementation combined with a poor feed plan can have various negative effects on the environment. The ecosystem gets polluted when nutrients that were unabsorbed by marine life get released into the environment, forcing the adaptation of the ecosystem to the pollution (White, 2013). The entire process involved in the fish farming process generates waste, which could be derived from the feces of the fish and from uneaten or



spilled feed. These pollutants reduce the water quality of the specific system leading to an influx of disease-carrying fish. This implies that having a system with healthy water quality requires the discharge of waste alongside effluent water (Amirkolaie, 2011).

In Nigeria, the regulation of aquaculture is so poor with a negative impact on the natural environment. Getting rid of pollution is a matter of concern as it is affecting aquaculture negatively, as well as the health of the fish. Fish farming is significant in its capability of meeting the fishing demands of humans, and to this end cannot be eliminated as a means of checkmating the activities of humans which cause pollution. It is against this background that this paper examines human introduction to pollution and its impacts on fish farming.

Statement of research problem

Fish farming is not a solution to overfishing the oceans, given that wild fish are still used to feed farmed fish. Ocean fishing has been reported to be bad for the environment, and so is farming fish, in view of the pollution emitted damaging natural waterways and killing wild animal populations. Fish farming practices, according to Grant (2019) is not limited to the killing of billions of fish yearly, but includes poisoning people and local ecosystems. Fish farming can negatively impact its local environment in a number of ways; hence the fight by environmentalists to ensure that fish farming operations take a more eco-friendly approach of doing business. Grant (2019) pointed out that like most farm raised animals, the treatment and conditions of fish are far from decent, and made worse by the lack of regulations. Fish farmers, in the bid to maximize profit tend to cram together as much fish as possible, which increases the potential of spreading disease and causing injury. Furthermore, the process of fish farming requires the use of various chemicals in the production process. This could be found in the combination of fertilizers, pesticides, chemicals added to fishmeal and water, and antibiotics, contributing to creating a toxic environment for the fish. Even more worrisome is the fact that when not careful, the runoff water could trickle into local waterways and eventually back into the ocean. The implication of this is that beyond the pollution of the local marine ecosystems, this runoff can find its way into the local water supply meant for human consumption, thereby increasing the pollution effects. The activities that happen on fish farms could have long-lasting and detrimental impacts on wild populations

of marine life. This emphasizes the importance of checkmating human activities causing pollution, as well as examining and minimizing its impact on fish farming activities which is the focus of this study.

Research aim and objectives

The aim of this research is to examine human introduction of pollution and its impacts on fish farming. Specifically, the study seeks to:

- Identify the sources of human pollution affecting fish farming.
- Investigate the ways in which pollution challenge fish farming activities.
- Determine the ways of reducing/eliminating the pollution in fish farming.

Research question

- What are the sources of human pollution affecting fish farming?
- In what ways does pollution challenge fish farming activities?
- What are the ways of reducing/eliminating the pollution in fish farming?

II. Literature review

Fish farming

Fish farming describes the industrial practice of aquaculture in which large quantities of fish are bred in enclosed, unnatural conditions, with the intent of being slaughtered in a commercial setting and sold as food (Grant, 2019). Most fish consumed globally are derived from industrial fish farms typically grown in large tanks, small ponds, industrial enclosures, net pens or sea cages, with the goal of producing high yields of fish within a specified period.

Regulation of fish appears to be a source of concern due to the cases of fishery failure and weak institutions in developing countries. Cultivation entails the use of fish cages, which can directly input waste in the water and enrich exogenous nutrients. The discharge of nitrogen and phosphorous derived mainly from fish feed in the aquatic system have severe impact as it restricts oxygen and cause anoxic conditions, which threatens the ecosystem, and eventually lead to eutrophication (Wisnu, et al.,2019).

Sources of Pollutants

Pollutants describe unpleasant substances capable of producing injury in living organisms. Pollution leads to a deviation from normal functioning of the system (White, 2017). There are different types of pollutants such as the chemical



pollutants which acts on the ecosystem via three pathways: depletion of oxygen that can lead to death of the organism; settling on the substrate and smothering life; and severe toxicity leading to death of organisms. Thus chemical pollution of water tend to alter the biota and affect the ecosystem (White, 2017)

Human activities such as sewage discharge, agricultural operations, mining, refining, energy production, industrial and vehicular emissions, smelting, and waste disposal have been reported as responsible for the increased level of environmental pollution. Pollutants have the tendency of being carried to places far away from their source of origin in gaseous and particulate forms. In agriculture, a wide range of pesticides and herbicides, such as atrazine, dichlorobenzyl, 2,4-D, and glyphosate, are widely used. This has been found to threaten fish and fisheries. The presence of these toxic substances in the food chain of fishes at sufficient levels threaten aquatic ecosystem and human health. Also household wastewater which contains organic compounds, detergents, and other materials used in modern society poses ecotoxicological risks and health hazards to fish and aquatic invertebrates (Wisnu, et al 2019).

Jacquin et al., (2020) examined the effects of pollution on fish behavior, personality, and cognition, with the perceptive that pollutants, and are a neglected source of behavioral and cognitive variations in wild populations. The study found that

pollutants could lead to syndrome disruption, and affect the evolutionary trajectories of exposed populations. Another finding of the study revealed that exposure to chronic pollution causes could lead to local adaptation leading to high intraspecific variability of sensitivity among wild populations.

III. Methodology

The descriptive research survey method was adopted in examining human introduction of pollution and its impacts on fish farming in Nigeria. Random sampling method was deployed in the selection of fish farmers in Ikorodu area of Lagos state. Using the random sampling method, 100 respondents for the study comprised of fish pond owners, most of whom can be located in the open market. Questionnaire was adopted in deriving data from the respondents, which was designed using a five scale likert format. Assistance of research assistants was sought in questionnaire distribution to the respondents. The data collected was descriptively analyzed using frequency and percentages.

Data presentation and analysis

100 questionnaires were distributed and retrieved in this study, however, three were discarded because they were not properly answered. The analysis therefore is based on the 97 questionnaire that were duly answered. This is as presented subsequently.

Table 1: Demographic information

Gender	Frequency	Percentage
Female	7	7.2
Male	90	92.8
Age group		
18-30	48	49.5
31-40	35	36.1
41-50	11	11.3
50 and above	3	3.1
Highest educational Qualification		
SSCE/GCE		
OND/ND	29	29.9
BSc and equivalent	21	21.6
Others	23	23.7
	24	24.7
Number of years as a fisherman		
1-5years	39	40.2
6-10 years	44	45.4
More than 10years	14	14.4

Field survey (2023)



Table one above presents the demographic data of the respondents. According to the presentation, there is inequality in gender in fish farming as only 7.2% were female whereas the remaining 92.8% were male. The data also shows the Age group of the participants in the study. Accordingly, 49.5% were within the age range: 18-30years; 36.1% were from the age group 31-40 years; 11.2% were from between 41-50 years; were as 3.1% are from the age group 50 years and above.

This indicates that the ages of the participants vary. The participants had diverse levels of educational qualification. Among these are: SSCE/GCE (29.9%); OND/ND (21.6%); BSc and equivalent (23.7%); and Others(24.7%) respectively. Finally, it was observed that, these participants have varied years of experience. Among these are: 1-5years (40.2%); 6-10 years (45.5%); More than 10years (14.4%), respectively.

RQ1: What are the sources of human pollution affecting fish farming?

Table 2: Sources of human pollution affecting fish farming

statement	SA/A	UD	D/SD	Percentage in agreement
Agricultural operations				92.8
Sewage discharge				100.0
Industrial and vehicular emissions				97.9
Waste disposal				100.0
Energy production				81.4

Field survey (2023)

According to the result presented in table 2 above, the following are sources of human pollution affecting fish farming: Agricultural operations (92.8%); Sewage discharge (100.0%); Industrial and vehicular emissions (97.9%); Waste disposal (100.0%); and Energy production (81.4%).

RQ2 : In what ways does pollution challenge fish farming activities?

Table 3: Ways that pollution challenges fish farming production

Item	SA/A	UN	D/SD	Percentage in agreement
Pollution affects the health of other fish and aquatic creatures	97	0	0	100.0
Pollution deplete oxygen in the water killing wild aquatic life	97	0	0	100.0
Fish-feed and faeces pollute the water around intensive fish farms leading to poor water and sediment quality	93	3	1	95.9
Degradation of the water quality and leads to the spread of infectious diseases	96	1	0	99.0
Chemicals and pesticides contaminate the area and impact surrounding marine life	97	0	0	100.0

Field survey (2023)

According to the findings of this study, the following are the ways in which pollution challenges fish farming production: Pollution affects the health of other fish and aquatic creatures (100.0%); Pollution deplete oxygen in the water killing wild aquatic life (100.0%); Fish-feed and faeces pollute the water around intensive fish farms leading to poor water and sediment quality (95.9%); and Degradation of the water quality and leads to the spread of infectious diseases (99.0%); and Chemicals and pesticides contaminate the area and impact surrounding marine life (100.0%), respectively.

RQ3. What are the ways of reducing/eliminating pollution in fish farming?



Table 4: Ways to eliminate pollution in fish farming

Item	SA/A	UD	D/SD	Percentage in agreement
Enforcement of strict fish farming regulations	96	1	0	99.0
Proper management of waste discharge	93	2	2	95.9
Introduction of more efficient and well run fish farming operations	91	5	1	93.8
Educational program to help enhance publicly owned fish farming operations	94	0	3	96.9

Field survey (2023)

The result as presented in table 4 above shows the following as ways to eliminate, or at least reduce pollution in fish farming: Enforcement of strict fish farming regulations (99.0%); Proper management of waste discharge (95.9%); Introduction of more efficient and well run fish farming operations (93.8%); and Educational program to help enhance publicly owned fish farming operations (96.9%), respectively.

IV. Discussion of findings

Fish farming does not only remain a source of food for man but also a source of income for many. However, some of human activities have greater impact on the live of the fishes which to a large extent affect its sustainability and quality. This study essentially examines the impact of pollution on fish farming. Pollution, in the form of dangerous chemicals and materials, such as pesticides, metals, and hydrocarbons, find their way into the water supply. When this happens, especially in a large-scale, it results in rapid mortality of aquatic animals, such as fishes. In the event of reduced discharge, contaminants may become concentrated in fish and other aquatic life. Immunosuppression slowed metabolism, and damage to gills and epithelia are some potential outcomes that may manifest years after the contaminants have left the environment (Jan, Shah, & Nissa, 2022). This study identified the following sources of human pollution that affect fish farming: industrial activities, Agricultural operations, Sewage discharge, Industrial and vehicular emissions, and Waste disposal, and Energy production, when these come in contact with sea or rivers where fishes live, it becomes a danger to their existence. The finding in this study agrees with Jan et al (2022) whose results also indicated similar findings. This study also identifies ways by which the ways pollution challenges fish farming activities among which are: Pollution affects the health of other fish and aquatic creatures; it depletes oxygen in the water killing wild aquatic life; Fish

feed and feces pollute the water around intensive fish farms leading to poor water and sediment quality; degradation of the water quality and leads to the spread of infectious diseases, Chemicals and pesticides contaminate the area and impact surrounding marine life. This result is in consonance with Austin (1999) established in his experimental study that chemical substances released in the ocean or sea, or any aquatic habitat causes harm to the fishes. Finally, the study revealed some ways to eliminate pollution in fish farming. Among these are the Enforcement of strict fish farming regulations; Proper management of waste discharge, Introduction of more efficient and well-run fish farming operations, and educational programs to help enhance publicly owned fish farming operations.

V. Conclusions and recommendations

The findings of this study have led to the conclusion that pollution is harmful to fish life and could lead to their extinction. For the purpose of sustainability in fish farming, there is a need for human to be mindful of what substances to release into the water. T

Based on the result of this study, the following recommendations are made:

- There should be enforcement of strict fish farming regulations
- There should be proper management of waste discharge
- The fish farmers should be introduced to more efficient and well-run fish farming operations
- The government and other elite part should arrange an educational program to help enhance publicly-owned fish farming operations

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Appendix

REQUEST FOR INFORMATION

Dear Respondent,

I am carrying out a study on “human introduction of pollution and its impacts on fish farming.”, 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

Please tick () where appropriate

1. Gender: Female () Male ()
2. Age group: 18-30 () 31-40 () 41-50 () 50 and above ()
3. Highest Educational Qualification: SSCE/GCE () OND/ND () B.SC. () Others ()
4. Number of years as a fisherman: 1-5 (), 5-10 (), more than 10 years ()

SECTION B:

Instructions: Please tick (√) as appropriate where

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

SN	Item	SA	A	UD	D	SD
RQ1	What are the sources of human pollution affecting fish farming?					
1	Agricultural operations					
2	Sewage discharge					
3	Industrial and vehicular emissions					
4	Waste disposal					
5	Energy production					
RQ2	In what ways does pollution challenge fish farming activities?					
6	Pollution affects the health of other fish and aquatic creatures					



7	Pollution deplete oxygen in the water killing wild aquatic life					
8	Fish-feed and faeces pollute the water around intensive fish farms leading to poor water and sediment quality					
9	Degradation of the water quality and leads to the spread of infectious diseases					
10	Chemicals and pesticides contaminate the area and impact surrounding marine life					
RQ3	What are the ways of reducing/eliminating the pollution in fish farming?					
11	Enforcement of strict fish farming regulations					
12	Proper management of waste discharge					
13	Introduction of more efficient and well run fish farming operations					
14	Educational program to help enhance publicly owned fish farming operations					