



Organochlorine Pesticide Analysis of Atuh Wetland Ugiliamai for Cage Aquaculture in Schools: A Tool for Reshaping Education in Nigeria

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This study investigated the organochlorine pesticides content of Atuh wetland for its suitability for cage aquaculture in schools as a tool for reshaping education in Nigeria. The study answered 3 research questions and tested a hypothesis. To achieve these, the research area Atuh wetland Ugiliamai was mapped 5 research blocks. From each of the research blocks water samples were collected from 10 spots bulked, a composite drawn and fixed with HNO_3 and kept in ice cooled box for analysis. The analytical standards adopted were APHA and CHEM and the analytical instrument of determination deployed was Agilent 6100 series single Quadrupole LC/MS. The mean results obtained were; endrin $3.19 \pm 0.14 \mu\text{g/l}$ DDE, $3.07 \pm 0.18 \mu\text{g/l}$ endosulfan II $1.48 \pm 0.09 \mu\text{g/l}$ DDD, $1.54 \pm 0.26 \mu\text{g/l}$ and dieldrin $0.58 \pm 0.44 \mu\text{g/l}$. The mean result obtained were further subjected to test of significance with ANOVA with numerator 4 and denominator 20 at 0.05 level of significance. The F ratio calculated value was 6.42 while the F ratio critical value is 2.31 thus rejecting H_0 . The study recommends that cage aquaculture should not be implemented in Atuh wetlands in its pollution state, the pollution source point should be identified and discontinued and remediation should be carried out in Atuh wetland to restore it to its original health status

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INTRODUCTION

Economies all over the world require constant reshaping of their programmes and policies to keep pace with global trends and remain relevant in comity of nations. Reshaping according Rowland (2017), Clarkson (2019) is to change the operational structural strategies of an organization or policy implementation modules of a country. It is to reorganize, remodel or to change the way a thing is done to a new or better way (Oliver 2018, Vickson 2018) Reshaping means to change to a different form, to change a known process of doing a thing (Damel 2017 Pedro 2017) Its changing a structure of a thing or its orientation, to a new one for greater efficiency (Patrick 2016, Christian 2017). John (2018) Jackson (2017) surmised that reshaping is remodeling, reconfiguration, a change in pattern of doing a thing to a newer and more efficient method or process. Reshaping is changing from

old ways to a more enhanced method for higher divided or profit maximization (Dickson 2016)

Organizational goals or national policies are only actualized through constant restructuring and reshaping of its operational methods (Gregory 2016, Harry 2018) Simeon (2019) Campbell (2017) declared that no organization achieves remarkable progress without reshaping its operational processes. Adeyeye (2012) Imam (2017) opined that Nigeria economy has been stagnated due to failure of the operators to reshape it modes of operation. This standpoint was corroborated by Muiyiwa (2013) Odachi (2012) that for Nigeria to experience appreciable economic growth, the educational curricular require total over hauling and reshaping to technical and vocational curricular which is the global trend. Achibong (2012) Gumi (2011) admonished the federal government to reshape the education system in



Nigeria by making technical and vocational education compulsory in secondary schools to create jobs, check youth's restiveness curb insecurity and engender food security. Succinctly put by Odagwe (2012) reshaping Nigeria education by inclusion of technical and vocation education will eradicate poverty and hunger and ensure human security.

In apparent response to calls for reshaping Nigeria education curricular, the federal government in 2013 through its agency Nigeria Educational Research and Curriculum Development Council (NERDC) introduced trade/entrepreneurship curricular in 34 skills areas including aquaculture. The rationale of the trade curricular is that at graduation the recipients would have been fully equipped for higher education as well as have gained enough skills and competencies to enable to earn living as fish farmers. (Nigeria Educational Research and Development Council (NERDC) 2013).

Fish is an important human food component. It contains all classes of food; protein, carbohydrate, good fat, mineral and vitamins (Obodoukwu, 2018, Babalola 2018) Fish provides the rural poor the opportunity of meeting their daily protein requirement of 56g for Male and 46g for female as recommended by World Health Organization (Ige 2018, Taiwo 2019). Nigeria annual fish demand is 2.7 million metric tonnes but the local production is 850,000 metric tonnes. The difference between supply and demand is bridged through importation. (Adeosun 2018). According to Food and Agricultural Organization (FAO) (2019) Nigeria is the fourth greatest importer of fish after China, Japan and the United States of America. United State Agency for International Development (USAID 2019) disclosed that Nigeria spends 956 million USD importing fish while Oteriba (2018), Adeosun (2018) put the volume of fish importation in Nigeria at 120 billion Naira. Fish importation leads to unemployment (Ruwani 2019).

Nigeria unemployment rate according to National Bureau of Statistics (NBS) (2019) is 21.5 percent, trading economics.com (2019) puts the rate of unemployment in Nigeria at 30.1 percent. For International Monetary Fund (IMF) (2019), International Labour Organization (ILO)

(2019) 27.2 percent of Nigerians are without jobs. Aluya (2018) Ezeoba (2019) suggest that youth should take to aquaculture to reduce unemployment and save the Nigerian foreign reserve depletion from importation. This opinion was equally canvassed by Makpado (2019) that youths aquaculture will create jobs, create wealth, and reduce insecurity.

Obadami (2018) counselled youths to go into aquaculture adopting cage aquaculture because of its low capital involvement. Cage culture is the practice of raising of fish in cage placed in a natural body of water (Ijewoda 2018) Ogodo (2015) advised that water analysis be conducted in the body of water to be used for cage aquaculture for the presence of pollutants to avoid bioaccumulation and biomagnification. The possible water pollutants as enumerated by Okwara (2016) and Obiye (2017) include polybrominated diphenyls, (PBDs) micro plastics, detergents, polychlorinated biphenyls (PCBs) pesticides such as organochlorines. Bioaccumulation as defined by United States Environmental Protection Agency (USEPA) (2016) is the penetration of toxic substances in aquatic environment into the tissues of organisms while biomagnification is the tendency of these substances to multiply in rapidity in the tissue of the organisms. Organochlorines are compounds containing carbon and chlorine atoms that are used in the formulation of pesticides (Gibemudu, 2019; Abolade, 2019). The effect of organochlorine in human are low fertility, reproductive disorders, cancer endometriosis (Agency for Toxic Substances and Diseases Registry (ATSDR) 2016). Wetland is an ecosystem that harbours water all through the year or for three to six month in a year (Ibrahim 2015; Kwaghe 2013). It is against this backwash that this study on the organochlorine pesticides content of Atuh wetland Ugiliamai for its suitability for cage aquaculture became inevitable. The organochlorine pesticides investigated are endrin, dichlorodiphenyldichloro-ethylene (DDE) endosulfan II, dichlorodiphenyldichloro-ethane (DDD) and dieldrin

The purpose of this study therefore is to determine the concentrations of the organochlorine pesticides in Atuh Wetland for its

suitability for cage aquaculture in schools as a tool for reshaping education in Nigeria.

This study is guided by research questions as follows:

1. What are the concentration of endrin DDE, endosulfan II, DDD and diedrin in Atuh wetlands Ugiliamai?
2. Are the concentrations of these organochlorines within the maximum allowable concentrations for the organochlorines pesticides in water as stipulated by WHO (2014)

3. Can cage aquaculture be implemented in Atuh wetland

The hypothesis that guided this study is

as follows:

HO: There is no significant difference between the concentrations of the organochlorine pesticides investigated in Atuh wetland and World Health Organization maximum allowable concentration for organochlorine pesticides in water.

Study Area

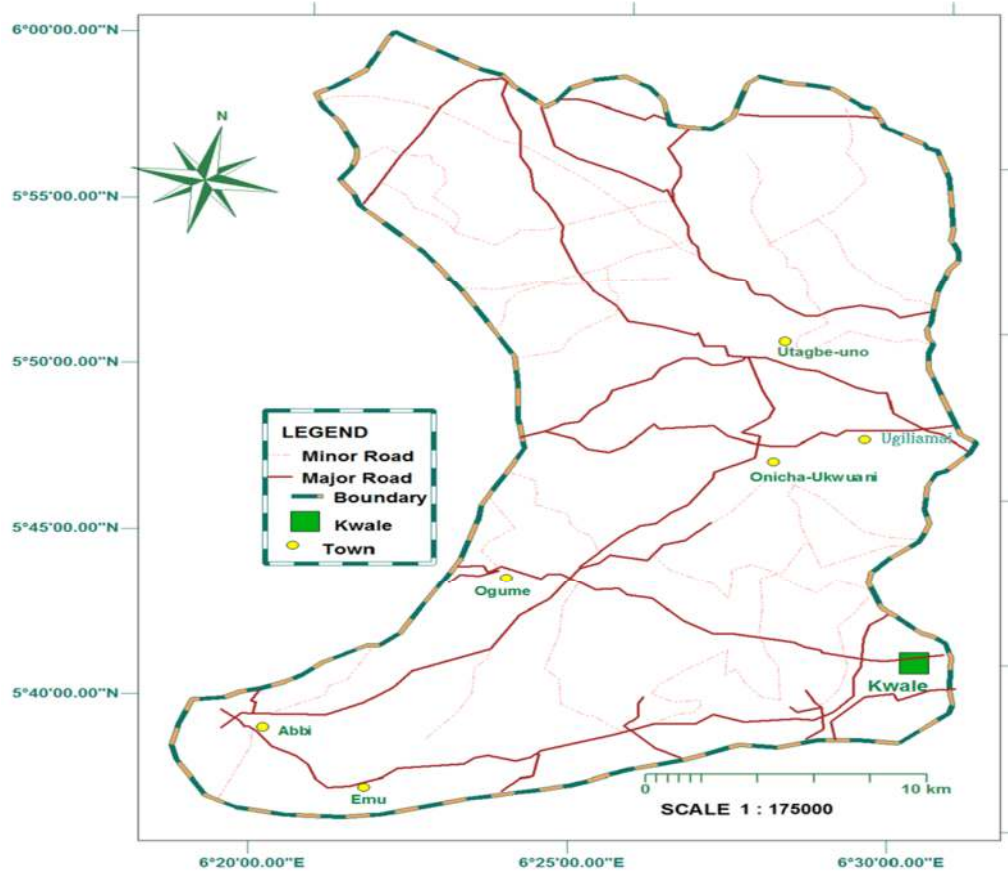


Figure 1: Map of Ndokwa West showing Ugiliamai
 Source: Ezeomede & Egbare, (2018).

Ugiliamai is an agrarian community in Ndokwa West L.G.A. It is a component part of Onicha Ukwani clan. Ugiliamai lies within latitude

5°.87' N and longitude 6°.25' E. It has a population of 4,060 inhabitants (National Population Commission estimate, 2016). Atuh

wetland is at the southeast of Ugiliamai, between Ugiliamai and Utagba-uno. It is the recipient of wastes from agricultural activities mainly fertilizers and pesticides through erosion and runoffs.

MATERIALS AND METHODS

The study employed an ex-post facto research design. The research area Ugiliamai wetland was mapped out into research blocks (Abdulwasheed 2012; Obakpolo 2015). From each of the research blocks water samples were collected with clean plastic sampling bottle from 10 sampling spots at the depth of 10cm. The samples from each block were bulked, a

composite drawn and fixed with nitric acid (HNO₃) and stored in ice cooled box for analysis.

The analytical standards adopted for the study are Chemical Analysis of Ecological Matter (CAEM) and United State of American Environmental Protection Agency (USEPA) standards. The analytical instrument deployed for determination of the organochlorine pesticides is Agilent 6100 series single Quadrupole Liquid chromatography (LC) Mass Spectroscopy (MS).

RESULTS

The results of the organochlorine pesticides measured in Atuh wetland are as in Table 1.

Table 1: Results of the organochlorine pesticides in Atuh wetland Ugiliamai and WHO maximum allowable concentrations for the pesticides in water in ug/l

Parameter	A	B	C	D	E	\bar{x}	SD	WHO MAC $\mu\text{g/l}$
Endrin	3.41	3.09	3.05	3.21	3.22	3.19	0.14	0.002
DDE	3.42	3.19	3.26	3.08	2.44	3.07	0.38	0.01
Endosulfan II	1.42	1.38	1.62	1.53	1.47	1.48	0.09	0.08
DDD	1.38	1.97	1.42	1.33	1.62	1.54	0.26	0.01
Dieldrin	0.78	0.07	0.48	0.51	0.44	0.58	0.14	0.005

The mean concentration of the organochlorine pesticides in Atuh wetlands were presented in a graph as in Figure 2.

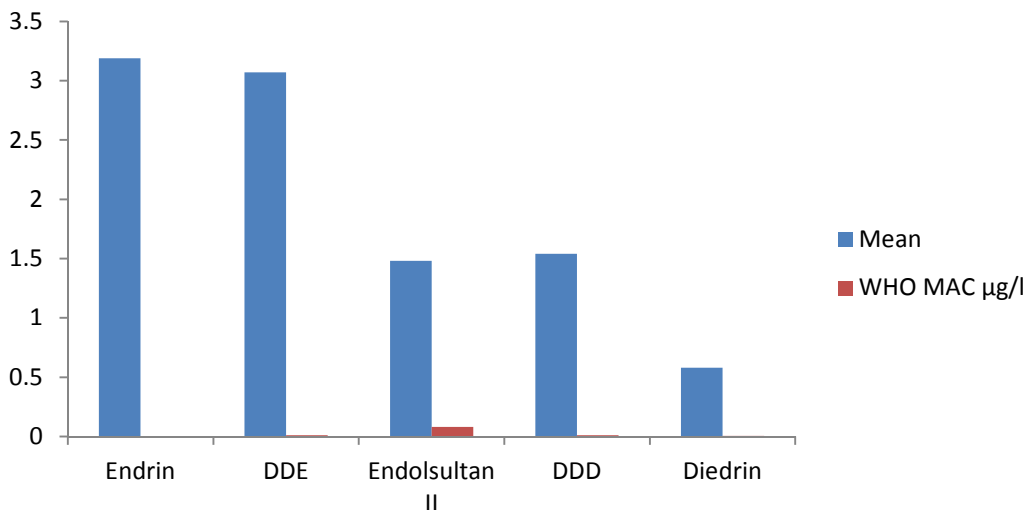


Figure 2: Mean concentrations of the organochlorine pesticides in Atuh wetlands and WHO MAC in ug/l.

The mean result of the organochlorine pesticides were then subjected to test of significance with analysis of variance with

numerator 4 and denominator 20 at 0.05 level of significance. The F ratio calculated value was



6.42 while F.ratio critical value was 2.31, thus rejecting HO

DISCUSSION OF FINDINGS

Reshaping educational policies of a country is imperative to keep pace with ever changing global trends. Nigeria educational curriculum has witnessed several changes, the most recent being the introduction of trade curriculum in Fishery (aquaculture) and 33 others trade subjects. Water free from intoxicants is a necessity in aquaculture especially cage aquaculture hence this study. The analysis of water in Atuh wetland revealed the pollution status. The mean concentration of endrin in Atuh wetland the analysis revealed in 3.19 ug/l. The WHO maximum allowable concentration for endrin in water is 0.002ug/l. The concentration of endrin is higher than the acceptable limit. This result is similar to the reports of Ogwu (2019) in Okumesi River Amai Delta State, it is however distinct from the reports of Nnamdi (2018) who reported low endrin concentration in Oji River Oji Enugu State Nigeria. The mean concentration of DDE in Atuh wetlands the analysis revealed as 3.07ug/l while the WHO maximum allowable concentration for DDE in water is 0.01ug/l. The DDE concentration in Atuh wetlands is higher than the recommend level of DDE in water by WHO (2014). High concentration of DDE in water was reported by Usman & Aminu in Rima River Sokoto Sokoto State. Akpe & Ugochukwu (2017) also reported high DDE content in Ashaka wetland Ashaka, Delta Nigeria. The analysis shows that the mean concentration of endosulfan II in Atuh wetland Ugilamai is 1.48ug/l. The maximum acceptable limit for endosulfan II in water is 0.08ug/l. This concentration is higher than recommended. Akinyele & Ojumu (2018) reported similar concentration of endosulfan in Erinle River Osun state. The mean concentration of DDD in Atuh wetland as the analysis unveiled is 1.54ug/l while the WHO maximum allowable concentration for DDD in water 0.01ug/l. The concentration of DDD in Atuh wetland is higher than the maximum allowable limit stimulated by World Health Organization. Osazuwa & Omodiagbe (2012) reported similar result in Ikpoba River Benin City. The analysis of water from Atuh wetland also disclosed that the mean

concentration of diedrin is 0.58ug/l. The WHO recommended maximum allowable concentration for diedrin in water is 0.005 ug/l. The concentration of diedrin is higher than the maximum allowable limit for diedrin in water. This report is in agreement with the reports of Oduwole (2018) who reported high concentration of diedrin in Ose River, Ondo State; the report is however at variance with the reports of Shehu & Mustapha (2019) who reported low diedrin in Kaduna River Kaduna Nigeria.

CONCLUSION

Youths unemployment crisis, food and human insecurity in Nigeria mandated the Federal Government to reshape the education curricular from emphasis in scholarship to technical and vocational oriented curricular through the introduction of trade/entrepreneurship curricular in Fishery and other trade subjects. Good quality water is obligatory in aquaculture and that made this study includable. The results of the laboratory analysis of water from Atuh wetland revealed that the ecosystem is polluted above the maximum acceptable limits with the organochlorine pesticides measured, it is therefore not advisable to encourage youths and schools to practice cage aquaculture in Atuh wetland in its present state until remediation is affected.

RECOMMENDATIONS

Against the backdrop of the result of this investigation, the study recommends as follows;

1. Cage aquaculture should not be implemented in Atuh wetlands because it is polluted with organochlorine pesticides
2. The source of the pollution should be identified urgently and plugged.
3. Remediation of Atuh wetlands is highly recommended.

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