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Assessment of the Organochlorine Pesticides (OCPs) Status of Oyese Wetland Ogume Delta State for Cage Aquaculture in Secondary Schools as a Tool for Regiging Education in Nigeria

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ABSTRACT: This is an ex-post facto research that investigated the OCPs content of Oyese wetlands. The study answered 4 research questions and tested a hypothesis. To achieve these objectives, Oyese wetland was mapped out into 5 research cells and from each of the research cells, water samples were collected from 10 spots bulked and composites drawn and stored in ice cooled boxes for analysis. The analytical standards adopted were CEAM and ASTM and the instrument deployed for determination of the OCPs was Agilent GC 7890A and Agilent GC 8081. The mean results obtained are; DDT 1.65 µg/l, DDD; 1.72 µg/l; DDE 1.36 µg/l, endrin; 1.72 µg/l and diedrin 0.87 µg/l. The result of the OCPs investigated were subjected to test of significance with ANOVA using SPSS model 21 at 0.05. The p-value is 0.41 thus rejecting Ho. The study recommends that cage aquaculture should not be implemented in Oyese wetland, the pollution source should be identified and plugged, decontamination and remediation should be mandated, this will allow for the deployment of cage aquaculture for pollution free fish product for the produce to meet local and international consumer standards.

KEYWORDS: Cage aquaculture, Organochlorine pesticides, Pollution, Remediation

INTRODUCTION

Nations all over the world strive to achieve economic growth and development by consistently regigging its economic policies and programmes. Regiging according to Samson (2016), Rapheal, (2018) is to rearrange something differently from its old order for better efficiency. It is to reorganize, to reshuffle something to a more acceptable form to the consumers (Terry, 2017, Jones, 2018). Regigging as opined by Osborn (2018), Hasford, (2019) in an organization are changes in processes or procedures for an increased efficiency and for better product acceptability. Pearson (2018) review regigging as efforts made to improve an organization's production process or service by manipulating, reordering and rearranging human and capital resources for an enhanced organizational efficiency. It is revamping, redistributing and reequipping factors of production for more acceptability and profitability (Harry, 2017, Spencer, 2017, Shaw, (2018). Sanders, (2019), Maximillian, (2020) defined organizational or system regigging as efforts made by the management to overhaul and reposition the organization for the achievement of its objectives. It is all effort directed at adjusting organizational procedures to rejuvenate the ailing segment and improve the performance rating of performing section of the organization. Every organizational proceedures and national policies require regigging to be in tone within global trend.

Adegoke (2018), Tondo (2019) believed that Nigeria education curriculum require regigging for better product output. Succinctly put by Odinkalu (2018), Ojobor, (2019), Nigeria with its current emphasis on scholarship may not have a positive growth trajectory in science and technology, thus, the curriculum requires regigging to vocational and technical focused curriculum. This was reiterated by Shaibu (2019), Ogidigbo (2020), Okpako (2020) that too much emphasis on scholarship is the bane of Nigeria educational system and poor product output, that more attention should be directed towards technical and vocational education for youths empowerment and job creation. Ibrahim (2018) states that youths unemployment in Nigeria has reached crisis point due to employable skills deficiency of the graduates of our secondary school system. Restructuring and regiging our secondary to tertiary school curricular is emperative to ward off impending social crisis in Nigeria due to youths unemployment.

Youths unemployment in Nigeria according to National Bureau of Statistics (2021) is 3.3 percent, International Labour Organisation (ILO) (2019) put the rate of youths unemployment in Nigeria at 38.31 percent while World Bank (2021) stated that in Nigeria 35.34

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percent of the youths are without jobs. Ogwu et al., (2021), Ogwu and Okonji, (2020), Ogwu et al., (2021) advised that secondary schools students should be empowered with skills in aquaculture for job and wealth creation and for security.

Fish is in high demand in Nigeria. It is a more accessible protein source for the rural dwellers (Ogwu, 2022). Nigeria fish demand is 3.1 million metric tonnes while the local production from fisheries and aquaculture is 900,000 metric tonnes, the gap between demand and supply is bridged through importation (Adeosun, 2015, Nanono, 2018, Abubarka, 2021). Fish importation results in export of employment, import of unemployment and depletion of foreign reserve (Ogbe, 2014). Adepite (2018), Osuqo (2019), admonished youths to embark on aquaculture for empowerment, job creation and food security. This position was also canvased by Osun (2019), Zulum (2021), Eromosele (2021) opined that youths involvement in aquaculture is a veritable solution to crisis of unemployment, youths restiveness, banditary, kidnaping, and cattle rustling plaguing Nigeria. Adeyanju (2020) corroborated this call and advised that youths should venture into aquaculture adopting cage aquaculture method, due to its low financial demand.

Cage aquaculture is the practice of building a cage and anchoring it in an existing body of water for the purpose of raising fishes (World Fish Centre, 2015), Ogwu (2020) advised that water analysis should be conducted before deployment of cage aquaculture for the presence of toxicants to avoid bioaccumulation and biomagnification. Possible water pollutants as highlighted by Afolabi (2018) Biobaku (2019) include microplastics, detergents, polyaromatic hydrocarbon (PAHs), heavy metals, pesticides such as organophosphate, carbamate and organochlorines. Organochlorines according to United States of America Environmental Protection Agency (USEPA) (2012), Agency for Toxic Substances and Disease Registry (ATSDR) (2012) are substances containing carbon and chlorine atoms that are utilized for the synthesis of pesticides. Bioaccumulation and biomagnification as explained by Atshana and Atshana (2013) is the tendency of toxicants available in an aquatic ecosystem to gain entry into tissues and cells of organisms while biomagnification is the propensity of the toxicants to increase in geometric progression from one trophic level to the next.

The consumption of organochlorine pesticides contaminated sea food will result in health implications as cancer, endometriosis, infertility in both male and female, osteoporosis (ATSDR, 2012, USEPA, 2012, World Health Organisation, 2015). The presence of pesticides in sea food in the concentration higher than that stipulated by WHO (2014) and European Union 1818 Regulation (2006) will result in the rejection of produce in the international market due to the failure to meet the Codex Alimentarius Commission (1963) standards for animal products. A wetland according to Ramsar Convention (1972) Ogwu (2021) is an ecosystem that has the capacity to hold water for 3-6 months in a year.

The central focus of this study is the determination of organochlorine pesticides content of Oyese wetland Ogume for its suitability for cage aquaculture in secondary schools as a means of regigging education in Nigeria.

The organochlorine pesticides to be investigated include: dichlorodiphynyltrichloroethene (DDT), dichlorodiphyldichloroethane (DDD), dichlorodiphenyldichloroethylene (DDE), edrin and diedrin.

The study is guided by research questions as follows:

1. What are the concentrations of DDT, DDD, DDE, endrin and diedrin pesticides in Oyese wetland.
2. Are the concentrations of the organochlorine pesticide within the level recommended by WHO (2014) and EU (2006).
3. Can cage aquaculture be deployed in Oyese wetlands
4. Can the produce from the wetlands meet Codex (1963) requirements.

The study is guided by a hypothesis as follows:

Ho: There is no significant difference between the concentrations of organochlorine pesticides investigated in Oyese wetland and WHO (2014) and EU (2006) maximum allowable concentrations for pesticides in water.

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AREA OF STUDY

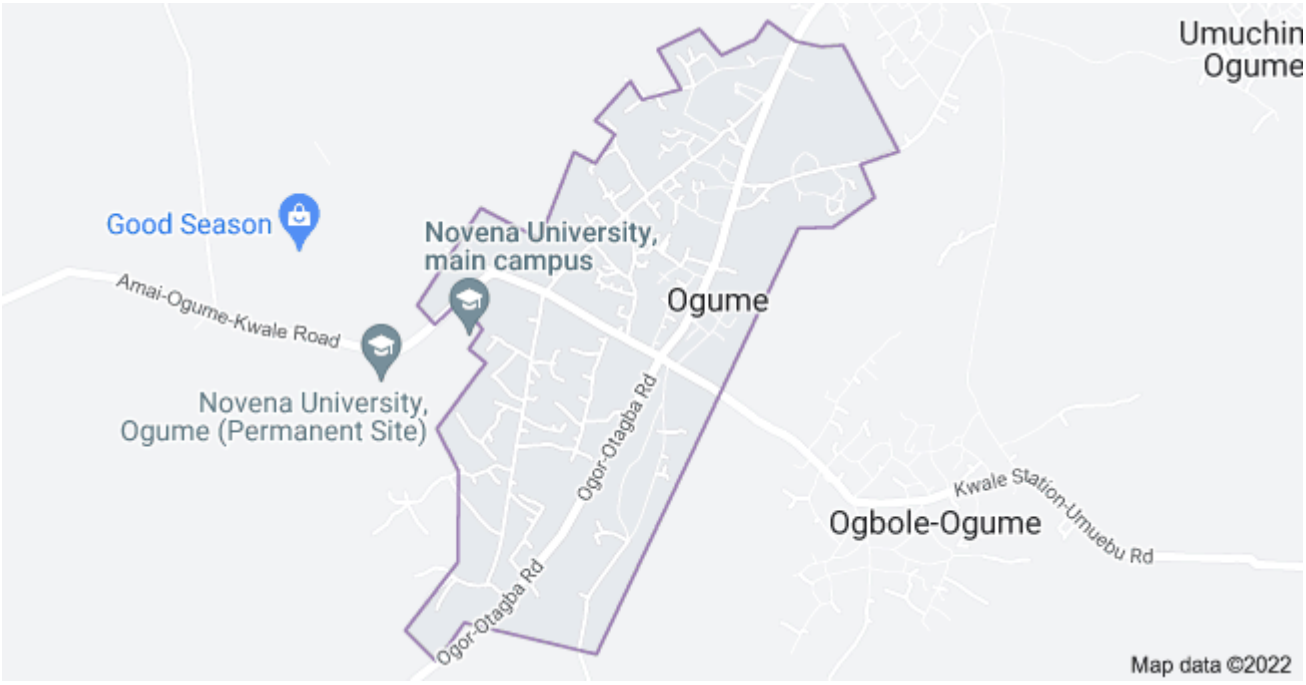

Figure 1: Map of the study area
Source: Google map (2021)

Ogume clan is in Ndokwa West local government area delta and it is located at geographical coordinates of 5°.756N and 6°331E and has a population of 25,360 (National Population Commission (NPC), 2006). Ogume people are predominantly farmers of arable and cash crops with a few of them as civil servants teaching in primary and secondary schools, Some are artisans. Ogume is a very ow land settlement bounded by wetlands. Oyese wetland is at the centre of town demarcating Ogbe Ogume from Ogbe Ole with a motorable bridge connection. Ogume farmers adopt chemical pests control in their agronomic practices and this is evident in the popularity of backpack sprayers in almost every household. The wetland is the recipient of the wastes through runoffs and flash floods.

MATERIALS AND METHODS

Oyese wetland was mapped out into 5 research compactment assigned: A, B, C, D, E (Abdulawheed, 2012, Uyimadu, 2009). From each of the compartments water samples were collected with the use of plastic sampling bottle with a graduated string from 10 spots at the depth of 10 cm and covered subsurface. The samples from the 10 spots in each sampling compartment were bulked composites drawn and fixed with nitric acid and stored in ice cooled boxes for laboratory analysis.

The analytical standards adopted were Chemical Analysis of Ecological Matters (CEAM) and American Society for Testing and Material (ASTM). The instrument for the pesticide determination adopted for this study is Agilent gas chromatography (GC) 7890A, and Agilent gas chromatography (GC) 8081.

RESULTS

The result of the organochlorine pesticides in Oyese wetland are as in Table 1.

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Table 1: Organochlorine pesticide content in Oyese wetland and WHO (2014) and EU (2006) maximum allowable concentration OCPs in µg/l

Parameters	Location					X	SD	WHO/EU µg/l
	A	B	C	D	E			
DDT	1.26	1.93	1.67	1.66	1.72	1.648	0.24	1
DDD	2.02	1.71	1.85	1.39	1.85	1.764	0.24	0.01
DDE	0.99	0.86	1.94	1.61	1.4	1.36	0.44	0.01
Endrin	1.82	1.61	1.71	1.58	1.84	1.712	0.12	0.002
Diedrin	0.89	0.99	0.94	0.82	0.61	0.85	0.15	0.005

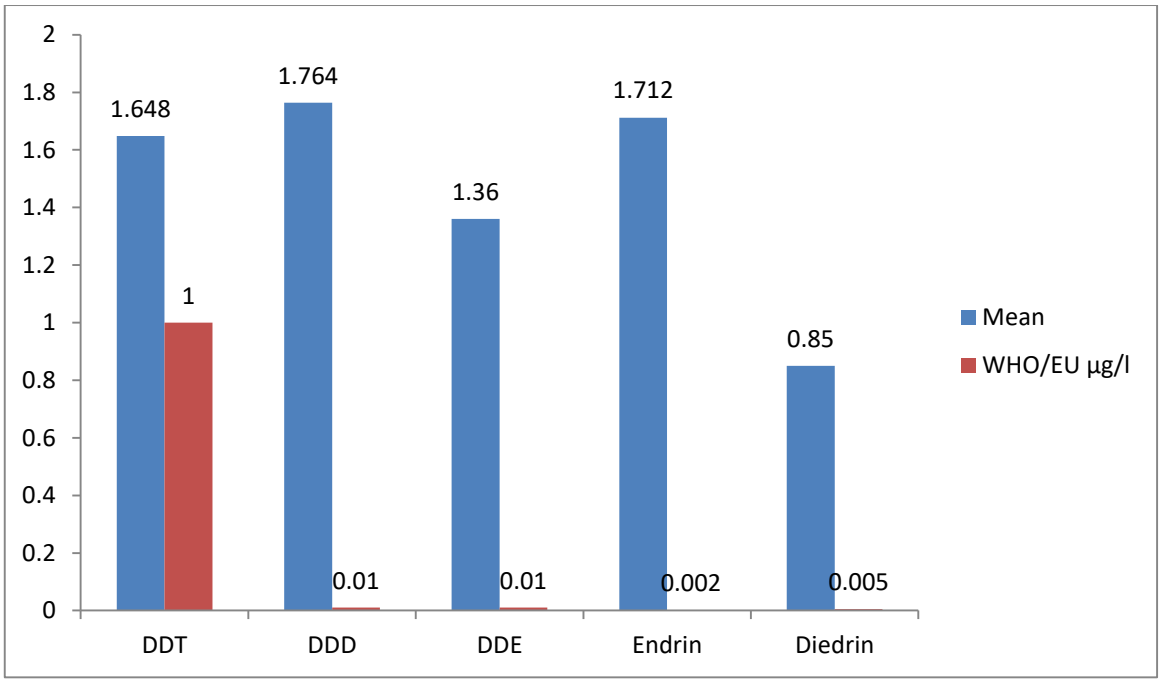

Figure 2: Organochlorine pesticide content in Oyese wetland and WHO (2014) and EU (2006) maximum allowable concentration OCPs in µg/l

The concentrations of the pesticides in descending order DDD = diedrin > DDT > DDE > **diedrin**
The mean concentrations of the OCPs in Oyese wetland were subjected to test of significance with analysis of variance (ANOVA) with special package for social sciences (SPSS) model 21 at 0.05 level of significance. The p-value is 0.42 thus rejecting H_o.

DISCUSSION OF FINDINGS

The analysis of the water samples from Oyese wetlands revealed varying concentrations of the OCPs investigated. The concentration of DDT range between 1.26µg/l to 1.93 µg/l with a mean of 1.65 µg/l. The WHO (2014) and EU (2006) maximum allowable concentration for DDT in water is 1.00 µg/l. This increased concentration of DDT is a concomitant effect of chemical pests control method employed by the farmers. Increased DDT in water was reported by Otedola and Ajala (2016) in Olomoge lagoon Lagos. Adegoke (2018) also reported high DDT in Ogun River at Kara Bridge Lagos/Ogun boundary.

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The result of the analysis of DDD revealed that the content of DDD in Oyese wetland is between 1.39 µg/l to 2.02 µg/l with a mean concentration of 1.77 µg/l. The WHO/EU maximum allowable content for DDT in water is 0.01 µg/l. The increased concentration of DDD in Oyese weland is as a result of pest control mechanism adopted by farmers in Ogume. A similar report was recorded by Hassan and Ogundipe (2018) in Asa River Kwara state. Okonkwo and Nwafor (2018) also reported increased DDD in Omambala River in Anambra state. The results of the investigation of OCPs in Oyese wetlands showed that DDE has concentrations of 0.99 µg/l to 1.74 µg/l and a mean of 1.72 µg/l. The maximum allowable content of DDE in water by WHO/EU is 0.07 µg/l. Tando (2018) reported increased DDT in Katsina Ala River in Benue state. Akpati and Ojobor (2015) also reported increased DDE in Ase Creek at Beneku Delta state.

The content of endrin in Oyese wetland the analysis revealed is between 1.58 µg/l to 1.84 µg/l and having a mean of 1.72 µg/l. This concentration is higher than WHO (2014) and EU (2006) maximum allowable concentration for endrin of 0.002 µg/l in water. This report is similar to the report of Ibrahim and Kassim (2019) who recorded high endrin in Gamji River in Gombe, however, it is at variance with the reports of Lam and Lember (2020) in Tchada River Benue State. Also the investigation of the OCPs in Oyese wetland showed that the concentration of diedrin is between 0.69 µg/l to 0.99 µg/l with a mean of 0.87 µg/l. while the maximum allowable concentration for diedrin stipulated by WHO (2014) and EU (2006) is 0.005 µg/l. The content of diedrin is higher than the maximum allowable content. similar report has been recorded by Asuquo and Udeme (2015) in Njaaba River Imo State. Duruoma (2019) also reported high diedrin in Oguta Lake also in Imo state.

These results revealed that Codex (1963) cannot be met by the produce in Oyese wetland and so cannot be exported for international consumer and are not for local consumer too.

CONCLUSION

The dreams and aspirations of every nation is to engineer its economy to achieve growth and stability for good living standard of its people and thus requires consistent regigging of its education curriculum to achievement such economic blueprint. So may model have been suggested for proper regigging of Nigeria education for youth's empowerment and youth's aquaculture has remained highly favoured especially youth's aquaculture deploying cage aquaculture. Good quality water is a factor in cage aquaculture and thus underscores this study.

The results of the investigation of the OCPs content of fOyese wetland has revealed that the wetland is polluted with all the OCPs investigated making it unsuitable for cage aquaculture implementation.

RECOMMENDATIONS

Consequent upon the result garnered from investigation, the study thus recommends that:

1. Cage aquaculture should not be deployed in Oyese wetland due to OCPs pollution
2. The sources of OCP pollution should be identified and discontinued
3. Decontamination and remediation should be mandated to restore the health of the wetland for the deployment of cage aquaculture for youth's empowerment for job creation, food security and to meet the standard recommended by codex Alimentarius (1963) for export of animal products.

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