ORGANOCHLORINE PESTICIDES ANALYSIS OF ABAM WETLAND FOR PEN AQUACULTURE IN SCHOOLS: A RECIPE FOR RETOOLING EDUCATION IN NIGERIA

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Abstract: This study investigated the organochlorine pesticides content of Abam Wetland for its suitability for pen aquaculture in schools. It was an ex-post facto research with 3 research questions answered and a hypothesis tested. The research area Abam Wetland was mapped out into 5 research cells, from each of the research cells water samples were collected from 5 sampling spots, bulked, a composite drawn and fixed with HNO_3. The analytical standards adopted were USEPA and CAEM and the analytical instrument deployed for determination is EPA 805 with ECD. The mean results obtained were; endosultan II 0.39±0.31ug/l, trans-chlordane, 0.44±0.13ug/l, endrin ketone 1.40±0.56ug/l, methoxychlor, 0.68±0.24 and DDT, 2.69±0.1ug/l. The mean results of the parameters investigated 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 was 6.14 while F ratio critical value was 2.62, thus rejecting HO. The study recommends that pen aquaculture should not the practiced in Abam Wetland in its present polluted state, the source of pollution should be identified and plugged, and decontamination and remediation should be carried out to restore the health of the ecosystem.

Keywords: Retooling education, Pen aquaculture, organochlorinepesticides, bioaccumulation human health

Introduction

Economic growth and development of a nation is predicated on the frequency of its policies and programmesretooling. Retooling is modifying, or reorganizing, re-equipping for an increased efficiency (Shedrack 2018, Harry 2019). It is to reorganize something to assume a new structure, to reorder for an increased output (George 2020, Jalds 2020). Retooling according to Lucas (2019) Leo (2015) entails reorganization for the purpose of improved on the organizational services. It is the modification to bring up to date of a product, or process or service for a greater service satisfaction. (Larry 2019) succinctly put by Jackson (2019) Adern (2019) retooling is reshaping, reordering, rearranging a process for enhanced product or services delivery. Jonah (2019) surmised that retooling as changing the already known strategy or methods of doing something by injecting new and improved ideas for the turnaround of the organization. Noah (2019) Elija (2020) declared that retooling policies is the only means througha country can keep pace with ever changing global trends. A country cannot achieve exponential growth without carrying out constant restructuring and retooling of its programmes and policies (Yussuf, 2010). Obute (2017) opined that Nigeria economy has remained stunted because of the failure of various governments to remodel and retool its education curricular.As emphasis is still more on scholarship rather than technical and vocational education. Sarumi (2012) advised the federal government to restructure the educational system to a more functional and productive curricular to equip the youths with technical and vocational skills. This position was reiterated by Obogwu (2012) that Nigeria education should deemphasize scholarship for productive and manipulative skills through training in technical and vocational education for job creation and food security. The viable solution toyouths unemployment in Nigeria is to retoolthe secondary school curriculum to inculcate vocational and technical training for job creation, engender wealth and eradicate poverty (Obekpe 2011, Ogwuche 2012).

The federal government in its seemingly response to clarion calls to retoolsecondary school curricular introduced trade/entrepreneurship curricular in 2013 in 34 skills area including Fishery (aquaculture). The rationale of the trade/ entrepreneurship curriculum is that on graduation in senior secondary school 3, the recipient of Fishery curriculum would have acquired enough skills to enable him function as entrepreneur in fish farming (aquaculture)for empowerment, job creation and hunger eradication (Nigeria Educational Research and Development Council (NERDC), 2013).

Fish is an important component of human diet; it contains protein, carbohydrate, vitamins, minerals and healthy fat. (Omega), (Abimbola 2018, Salisu, 2019). Fish is the only means the rural population can meet up with their daily World Health Organization recommended protein requirement of 56g for males and 45g for females (Sololuwe 2019, Okonkwo 2019). Nigeria fish demand is 2.7 million metric tonnes but produces only 850,000 metric tons (Adesina 2014, Audu 2016). Izuogwu (2018), Ruwani (2020) disclosed that Nigeria spends over 120 billion dollars in fish importation. Nigeria is the 4th greatest importer of fish gblobally (Food and Agriculture organization (FAO), 2019).

Ibrahim (2016) counseled the youths to venture into aquaculture to create jobs and save the country's foreign exchange depletion, while Ibrahim (2016) Famodu (2018) enjoined youths go into aquaculture adopting pen aquaculture due to its low investment capital outlay. Pan aquaculture is the practice of raising fish in an enclosure in an existing body of water with all the sides closed except the bottom (Kara 2015, Rufai 2017).Water analysis should be conducted before implementing pen aquaculture for the possible presence of pollutants to avoid bioaccumulation and biomagnifications. (Ngbede 2017, Ikemefuna 2018) Water pollutants include heavy metals poly aromatic hydrocarbons (PAHs), dioxins, furans polychlorinated biphenyls (PCBs) pesticides such as carbamate, organophosphate and organochlorines (Obe 2018, Abolaja, 2018).Organochlorines are compound containing chlorine and carbon atoms that are used in pesticides formulation (United State Environmental Protection Agency (USEPA) 2012).Bioaccumulation is the penetration of toxic in the aquatic environment pollutants into the tissues of organisms, while biomagnification is the tendency of the toxicant to multiply rapidly in the organisms tissue (USEPA 2016).Organochlorines result in health complications such as endometriosis, infertility cancer and so on (Agency for Toxic substance and Disease Registry (ATSDR) 2016).

A wetland is an ecosystem that holds water permanently or for a period of three to six months in a year (Bamgboye 2015, Abulu 2018). It is against this background that this study of the organochlorine pesticides content of Abam wetland became imperative. The purpose of this studyis to determine the organochlorine pesticide content of Abam wetlands for its suitability for pen-aquaculture in schools as a means of retooling education in Nigeriafor job creation and food security. The organochlorine pesticides investigated are endosulfan II, trans-chlordane, endrin ketone, methoxychlor and dichlorodiphenyltrichloroethane (DDT).

This study is guided by research questions as follows;

1. What are the concentrations of endosultan II, trans-chlordane, endrin ketone, methoxychlor and DDT in AbamWetlands?
2. Are the organochlorine pesticides concentrations within the maximum allowable concentrations of organochlorines in water as recommended by World Health Organization (2014)?
3. Can pen aquaculture be implemented in Abam wetlands by schools and the youths in Abam and environs?

The hypothesis that guided this study is as follows:

Ho: There is no significant difference between the concentrations of the organochlorine pesticides measured in Abam Wetland and WHO maximum allowable concentrations of organochlorines in water.

Study Area

Map of Utagba-uno showing Abam Source: www.nona.net (2021)

Abam is an agrarian settlement of Utagbe-uno in Ndokwa West Local Government Area of Delta State. It lies with the GPRS coordinated of $6^{0}833'$ N and $6^{0}.400'$E, with a population of 2,360 inhabitants (2016 National Population Commission estimate) though the people in Abam are mainly farmers, there exist some artisans and pretty traders. Abam wetland runs northeast of the settlement and receives agricultural wastes such as fertilizer and pesticides utilized in the farms through runoffs, flash floods and erosion.

Materials and Methods

This is an ex-post facto research with three research questions and a hypothesis. The research area Abam Wetland was mapped out into (5) research cells (Oduayo 2012, Iketua 2017). From each of the research cells water samples were collected from 5 spots at the depth of the 10cm with plastic sampling bottle. The samples were bulked, a composite drawn and fixed with nitric acid (HNO_3) and stored in ice cool box for laboratory analysis. The analytical standards adopted are United States Environmental Bacterial Agency (USEPA) and Chemical Analysis of Ecological Matters (CAEM). The instrument of determination deployed is EPA 8081 with electron capture detector (ECD).

Results

The results of the organochlorinepesticided content analysis of Abam Wetland are as in Table 1

Table 1 Results of the organochlorine pesticide content of Abam Wetlands and WHO maximum allowable concentrations for the pesticides measured in ug/l.

Parameter	A	B	C	D	E	$\bar{x}$	SD	WHO MAC
Endosulfan II	0.38	0.42	0.34	0.41	0.40	0.39	0.31	0.08
Trans-chlordane	0.67	0.38	0.47	0.36	0.34	0.44	0.13	0.01
Endrin ketone	1.47	1.33	1.42	1.36	1.44	1.40	0.58	0.01
Methoxychlor	0.26	0.74	0.82	0.77	0.83	0.68	0.24	0.1
DDT	2.82	2.73	2.72	2.62	2.54	2.69	0.10	1.10

The mean concentrations of the organochlorine pesticides investigate were presented graphically as in Figure 2.

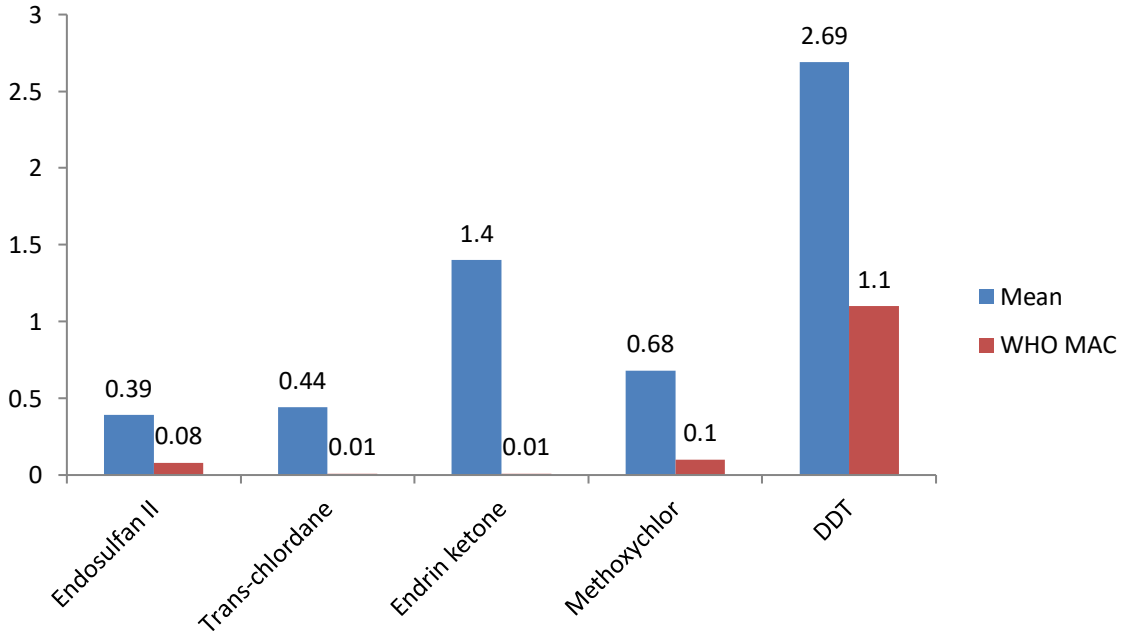

Figure 2: Mean results of the organochlorine pesticides in Abam Wetland and WHO MAC in µg/l

The mean results of the pesticides investigated were subjected to test of significance with analysis of variance (ANOVA) deploying SPSS with denominator 20 and numerator 4 at 0.05 level of significance. The F ratio calculated value was 6.14 while F ratio critical value was 2.62, thus rejecting HO. This shows that there is

significance difference between the concentrations of the organochlorine pesticides investigated and WHO maximum allowable concentrations of the pesticide in water.

Discussion of Finding

Policy retooling is very pertinent for a country to be in line with global changes. Nigeria government in attempt at retooling secondary education to make it functional for job creation to eradicate poverty and hunger introduced Fishery trade curriculum. Good quality water is a major factor in aquaculture especially pen aquaculture and that made this study on the analysis of the organochlorine pesticide content of Abam Wetland a necessity. The analysis of Abam Wetland disclosed varying concentrations of the pesticides investigated. The mean concentration of endosultan II in Abamwetland the analysis revealed is 0.39µg/l. The WHO maximum allowable concentration of endosultan II in water is 0.08µg/l. The mean concentration of endosultan in Abamwetland is higher than the recommended limit. This report is similar to the reports of Ogwu (2020) who recorded low endosultan II in Balagbe wetland Ughelli Delta State, it is however dissimilar to with the reports of Oweh&Igbudu (2016) who reported high endosultan II concentration in Bateren River Warri South Delta Nigeria. The mean concentration of trans-chlordane in Abam Wetlands the analysis revealed is 0.44ug/l, while the WHO maximum allowable concentration of trans-chlordane in water is 0.01µg/l. The trans-chlordane mean concentration in Abam Wetland is higher than the acceptable level. Increased concentration of transchlordane in water has been reported by Adebutu&Omole (2018) in Olomoge Lagoon Badagry Lagos. Alani& Coker (2011) also reported high concentration of endosultan II in Lagos Lagoon at Bonny camp Lagos. The analysis of Abam Wetland also revealed that the mean concentration of endrin ketone is 0.40µg/l and the WHO maximum allowable concentration for endrin ketone in water is 0.01µg/l. The concentration of endrin ketone in Abam Wetland is higher than recommended. This result is in agreement with the report of Musa &Aminu (2018) in Sokoto River. It is also in agreement with the report of Osagie&Eguavoen (2017) in Okhuaihe River Benin OkhuaiheCity Edo State.

The organochlorine pesticides content determination of Abam Wetland equally showed that the mean concentration of methoxychlor in Abam Wetland is 0.68 µg/l. The WHO maximum allowable concentration formethoxychlor in water is 0.1ug/l. The Abammethoxychlor mean concentration is higher than the maximum allowable limit of methoxychlor in water. Elevated methoxychlor in water has been reported by Udeze&Ugboma (2016) in Adoine River Ebonyi State Nigeria. Abam Wetland organochlorine pesticide analysis showed that DDT mean concentration is 2.69 µg/l. The WHO maximum allowable concentration for DDT in water in 1.10 µg/l. The DDT mean concentration in Abam Wetland is higher than the acceptable limits for DDT in water. This report corresponds with the reports of Okegbemi (2019) in Ose River Ondo State. Omidiran (2018) also reported similar result of increased DDT in water in Erinle River Osun State. Economic growth and development can only be sustained with consistent retooling of the state policies.

Conclusion

No country can remain relevant within comity of nations when its educational policies are not reengineered to meet with global trends. Nigeria federal government in attempt at retooling its education to global best practices introduced trade curriculum in 34 skill areas including Fishery. Aquaculture programmes such as pen aquaculture require good quality water for its implementation hence this study. The results of this investigation show that Abam Wetlands is polluted to an unacceptable level with the organochlorine pesticides investigated and implementing pen aquaculture may be antithesis to the aims and objective of retooling education through aquaculture deploying pen aquaculture in Nigeria, it is therefore not advised.

Recommendations

Consequent upon this result of the investigation, it is recommended that;

1. Pen aquaculture should not be practiced in Abam Wetlands due to the high levels of organochlorine pesticides contamination.
2. The sources of the pollution should be identified and stopped.
3. Remediation of the wetland is necessary to restore it to its hitherto pristine ecosystem.

REFERENCES

1. Abolaji B.A. (2018) *The Characterization of Polychlorinated Biphenylsis in Olomoije Lagoon*, Lagos.
2. Abulu O.S. (2018) Theeco-services of Ikorodu wetland Lagos.*Journal of Environmental Management Pollution* 18 (3), 142-149
3. Adebutu B.N. &Omole SP (2018) Microplastics and pesticides contamination of Olomoge Lagoon Lagos.*Journal of Pollution and Toxicology18* (4), 103-110.
4. Aden O.A (2019) Dehmhun or retooling. www.lexicon.com.defimhez refolRetrieved January 2021
5. Adesina A. (2014) Nigeria fish demand and production.A ministerial briefing.Federal Ministry of Agriculture Abuja Nigeria.
6. Agency for Toxic Substance and Disease Registry (ATSDR) (2016) The effect of orgenochlorines on the environment. An ATSDR Publication Atlanta Georgia USA.
7. Alani N.C. & Cooker B. (2011) Organochlorine pesticide content of Lagos Lagoon at Bonny Camp.*Secientia16* (3), 194-206.
8. Audu O. (2016) Nigeria fish production and demand.A Ministerial briefing.Federal Ministry of Agriculture Abuja Nigeria.
9. Bamboye E.M.A.C. (2011) The wetland chemistry of Igborosu Wetland Badagry Lagos. *Journal of Environmental Pollution18* (3), 142-149.
10. Elijah O.A (2020) Definition of retooling by Merriam Webster www.merean.webster.com
11. Famodu E. (2018) The place pen aquaculture in fish farming. A case of Ilaje people of Ondo State.*Journal of Agricultural Extension5*(2), 7-13.
12. Food and Agriculture Organization (FAO) (2019) Fish and global economy.A food publication Rome Italy.
13. George S.N (2020) what does retooling mean. www.definition.retoolingRetrieved January 2021
14. Hary C.A (2019) Meaning of retooling www.idocemtine.com.dietoarehoeRetrieved January 2021
15. Ibrahim T.F. (2016) Youths and pen aquaculture adoption rate in Taraba State.*Sahel Journal of Education 10*(2), 202-208
16. Ikemefuna N.C. (2018) The pollutant in Omambala River, Anambra State. *Journal of Chemical Society of Nigeria 14* (30), 90-98.
17. Iketua O.A. (2017) *Sampling and Samples Treatment in Hydrobiology*.Lagos; Solape Book Ltd.
18. Izuogwu FAO (2018) Fish importation and youths employment in Nigeria.A review.*Journal of Social Sciences 18*(3) 48-53.
19. Jackson AP (2019) Retooling www. En retooling.com
20. Jacob M.N (2020) Retooling definition and meaning wordnicwww.orardmic.comwords >retooling Retrieved January 2021
21. Jonah N.D. (2019) Retooling meaning and types www.retooling meaning.types.com
22. Kara M.O. (2018) Fish farming and pen culture adoption in Plateau State. *Journal of Extension 14*(3)9-15.
23. Larry A.N (2019) What is the meaning of retooling. www.retooling meaning.comRetrieved January 2021
24. Leo S.A (2017) Retool, definition and synonyms. www.macnucien. Diet.com >AbrakaRetrieved January 2021
25. Lucans J.E (2019) definition vocabulary retooling.www.vocabulary.com, retoolRetrieved January 2021
26. Musa S.O. &Aminu J.A (2018) Polybrominated content of Sokoto River. *Journal of Total Environment 30* (3) 251-258.
27. Ngbede J.J. (2017) Pollution chemistry of Benue River in Adamawa.*Journal of Pollution and Toxicology 16* (3), 124-132
28. Nigeria Educational Research and Development Council (NERDC) (2013) Nigeria trade/entrepreneurship curricular for senior secondary schools. A NERDC Publication, Abuja Nigeria.
29. Noah M.C (2019) Definition A retooling www.the freedietm.com.retooling
30. Oba F.O. (2018) The pollution status of Erinle River Osun State. *Journal of Environmental Monitoring 12* (4), 104-111.
31. Obekpe C.C. (2011) Addressing the challenges of youths unemployment using technical and vocational education. A key note address Association of Vocation and Technical Education Teachers Enugu 2011
32. Obogwu O.C. (2012 9 August) Skills acquisition in school, the viable solution to youth unemployment in Nigeria.Guardian News pp 52-Education.
33. Obute S.P. (2011 14 September) Federal government should retool education through the introduction of vocation and technical education Punch News pp 45-Education.

34. Oduayo S.S. (2012) *Sampling in Marine Biology*. Lagos: Ozama Publisher Ltd.
35. Ogwu, C. (2020) Oranochlorine pesticides content of Balagbe wetland Ughelli for cage aquaculture in schools.Ambrose Alli University.*Journal of Education7* (3), 17-25
36. Ogwuche V.C. (2012 8 November) Technical and Vocational Education and Training; the only answer to youth unemployment.Vanguard News pp 48-Education.
37. Okegbemi J.C.N. (2019) Analysis of the pesticide content of Ose River OndoState.20 (4) 112-117.
38. Okonkwo T.A. (2019) The nutritive composition of *Hecterobracliusbidorsalis.Journal of Food Science14*(3), 58-64.
39. Oliver S.C (2019) Retool. www.efoultexan.com Retrieved January 2021
40. Omidiran A.O.A (2018) Pollution chemistry of Enrile River Osun State Nigeria.*Chemesphere48* (3), 95-107.
41. Osagie A.N. &Eguaveon C.C. (2018) Organochlorine pesticide content analysis of Okhae River Benin City.*Journal of Environmental17* (2), 38-44.
42. Oscar P.C (2017) Bliq – retool.retool.comRetrieved January 2021
43. Oweh J.N. &Igbudu U.A (2016) Organochlorine pesticide quantification of Bateren River Warri.*Chemosphere44* (3), 99-106.
44. Rufai D.N. (2017) Pen aquaculture adoption among youths in Yobe State.*Journal of Aquaculture and Marine Science 13*(2), 16-23.
45. Ruwani B. (2020) *Importation and Nigeria Economy*, Lagos: Financial Derivatives Ltd.
46. Salisu B.A. (2019) The Food values of snake head fish (Chanabscura). *Journal of Food Science 14*(3), 41-48
47. Sarumi A.O (2012, 6 July) Technical and Vocational Education and Training; the untapped gold mine in Nigeria.Vanguard News pp. 43-education.
48. Shedrack A.A (2017) meaning and definition www.columns.diet.comRetrieved January 2021
49. Sofoluwe A.S. (2019) Responses of Nile tilapia (Oreckroomsnoliticus) to copens blue crown and omega feeds. *Journal of Aquaculture 12*(3), 92-99
50. Udeze M.M. &Ugboma C.T. (2016) Organochlorine pesticides quantification of Adoine River Ebonyi State.*Journal of Marine Sciences and Toxicology 14* (2), 8-12
51. United States Environmental Protection Agency (USEPA) (2012). Bioaccumulation and bomagusfication of substance in aquatic ecosystem.USEPA Publication Washington DC USA.
52. United States Environmental Protection Agency (USEPA) (2012). The organochlorine (OCS).An USEPA Publication Washington DC USA.
53. World Health Organization (WHO) (2014) The maximum allowable limits of Organochlorines in waters. A WHO Publication Genève Switzerland
54. www.nona.net (2020). Map of Utagba-uno. www.nona.netRetrieved January 2021.
55. Yussuf S.O. (2011 9 April) Solve youths unemployment with skills acquisition in schools. Punch News pp 40-Education