International Scholars Journals

International Journal of Agricultural Sciences ISSN 2167-0447 Vol. 6 (2), pp. 927-930, February, 2016. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Technical assessment of catfish effluents management in Lagos State, Nigeria

Omofunmi O.E.,[1] J. .K[2]. Adewumi., A.F[2]. Adisa., and S.O[3] Alegbeleye

[1]Department of Agricultural and Bio-Environmental Engineering, YABATECH, Lagos, Nigeria
[2]Department of Agricultural Engineering, Federal University of Agriculture Abeokuta, Nigeria.
[3]Department of Fisheries and Aquaculture, Federal University of Agriculture, Abeokuta, Nigeria.

Accepted 03 January, 2016

Catfish is one of the major source of dietary protein in Nigeria. Lagos State in particular is one of culturing area with abundant fresh water and marine environments. The aim of the study was to evaluate the catfish rearing industry and its effluents management and make appropriate recommendations. Forty fish farms were randomly selected in Lagos State. Questionnaire and in-depth interview were used for data collection on water sources, equipment operations, and waste management. Data were analyzed using descriptive statistics. Results indicated that over 80% of water for fish rearing was from shallow well and 95% of the waste water generated was not treated before disposal into environment (land, river, streams). Effluents disposals employed were open pit, 12.5%; drainage canal, 32.5%; bared-land, 10.0%; stream, 22.5% and re-used on farm, 12.5%. Only few farmers carried out simple treatment before disposal namely; infiltration, 2.5% and sedimentation, 2.5%. If the effluent management conditions were not improved, it could pose treat to environment in the studied areas. Pond effluent must be treated before disposed into environment and waste water from fish pond effluent should be reused as soil amendment (solid) as irrigation water and impoundment for newly established pond with little treatments.

Key words: Assessment, catfish, data collection, effluents, Lagos State, management.

INTRODUCTION

Agriculture is the mainstay of the Nigerian economy employing over 70% of the active labour force (FDF, 2009). The deplorable state of the sector after the discovery of oil has made unemployment soared, however aquaculture though just emerging sector stands a better chance to reverse this trend and complement other sources of protein which is the major problem of the Nigeria teeming population. Protein from animal sources is in short supply in Nigeria due to the rapid increase in human population and there is decrease in livestock population due to several factors including diseases, inadequate grazing lands and high cost of exotic animal feeds. The catfish industry play very important role in Nigeria aquaculture industry as the largest segment of aquaculture in the Nigeria. Most catfish are grown in the southern part of Nigeria, and the industry is economically important to several others states. The most popular species that have proved desirable for culture in Nigeria are the Clarias gariepimus, Heteroclarias sp, and Heterobranchus species (Adekoya et al, 2006). Faturoti 1999; Ajana 2002;Adamu,2007 noted that this trends is experienced worldwide though mostly in developing country that protein production is on the decline in Nigeria and global in general. The natural freshwater ability to sustain aquatic animals is on the decrease as a result of anthropogenic pollutants, oxygen- demanding wastes and thermal pollution For example, the metabolic activities of catfish doubles for each 10^{o}C increase in temperature for over 0^{o}C to 35^{o}C also known as the $Q_{10.}$ (Huner and Dupree, 1984). Other factors are specific heat of water, density, viscosity, transparency ,turbidity ,dissolves oxygen, temperature etc. are germane water quality parameters in assessing the efficiency of fish pond and yield without which the profitability will be in doubt. The release of hot waste water to receiving streams causes ecological imbalance in the aquatic systems that impaired and water quality negatively and leads to low yield in fish production. There was an increased participation of the private sector in fishing activities with the establishment of viable and functional commercial fish farms. Today, there are several fish farms in Nigeria ranging from small domestic

Corresponding author. E-mail: address:omofunmieric@yahoo.com. 08033046416; 08076510369.

fish ponds either in plastic and concrete tanks or earthen ponds to mention few. Omofunmi, (2010); Omitoyin (2007) suggested that public-private partnership should be encouraged to assist individual farmers with fish farming inputs such as feed biomass, fingerlings, animal feeds ,access to fund but little has been reported about the technical factors which are core to any aquaculture systems. Low yield in the industry is not surprising because no technical input is given to materials for construction (earthen, concrete and plastics, wood, masonry, steel to mention few.) and pond locations (Miller *et al.,* 2006; Omofunmi, 2010). Discharge of untreated wastewater pollutes the soil and surface water and this could be heightening during flooding which is still a menace in Lagos State (Omofunmi, 2010). This is not only causing impairment to surface water but also escape of fish which was a greater loss to fishery industry. This has led to many pond failures, a great loss to fish farmers. For example uncovered pond has wastewater that is highly concentrated with salts and toxic chemicals and odourous compounds as a result of long exposure to sunlight through evaporation. However, wastewater from standing water contains such as nutrients, nitrogen, phosphorous and potassium that might be reuse when biologically converted into compost as soil amendment or direct use as irrigation water for farm land. On the other hand, discharging high organic loading waste to surface water encourages eutrophication (Boyd, 1990, 2003, 2005; Boyd et-al., 2008).The goal of environmental management is to minimize, prevent or mitigate adverse environment effects of human activities to sustainable use of world resources. For environmental management to be effective, possible adverse environmental impacts of human activities must be identified. Standards must be formulated to specify amounts of change in environmental variables that are permissible without causing unacceptable environmental effects. In many developing nations such as Nigeria, regulations and laws are insufficient to provide adequate protection of the environment and natural resources. In additional to, laws and regulations may be adequate, but be un-enforced because of the lack of funds and manpower. In big commercial fish farms only few farms have sedimentation device (Boyd et al., 2008). Boyd, (2003); Boyd et-al., 2008 and Boyd and Hulcher (2001) reported that the farmers often are reluctant to invest in treatments to prevent or mitigate effects unless they benefit directly. However, the farmers may not want to treat the effluent because it passes downstream, and treatment will be an added expense that does not contribute to catfish production. This study was to evaluate the catfish rearing industry and its effluent management and make appropriate recommendations to improve its production with less environmental negative impact in Lagos State and Nigeria.

MATERIALS AND METHOD

Site Description

Lagos State is situated in the South Western part of Nigeria. It spans the Guinea Coast of the Atlantic Ocean for over 180km on the South, from the Republic of Benin on the West and shares boundary with Ogun State in the North and East of Nigeria. It fall within longitudes 030 50`E and 030 38`E and latitudes 060 20`N and 060 18`N.The total territorial area of 3,577sq km, about 787sq km or twenty-two percent (22%) flood plain and 4.6m above the sea level. Other information is as shown in Fig.1

Data collection

Information on the location of fish farms in Lagos State of Nigeria was collected from the Fisheries section of the Ministry of Agriculture, Lagos and other research institutions domiciled in Lagos. Fifteen fish farms were used as pre-testing and forty fish farms were randomly selected across the State for the study. The rationale for the choice of ponds for study was as follows: The ponds under investigation were site at Ikeja, Badagry, Ikorodu, Lagos Island and Epe divisions. After several trips to the ponds under study in dry and wet seasons, questionnaire and Schedules were administered to fish farmers. The information contained in the questionnaire covers; Years of establishment, Sources of water, pond water quality monitored, farm operations, and waste management practice adopted. The data were analyzed using descriptive statistics

RESULTS AND DISCUSSION

The sources of water for fish ponds were as contained in Table 1. Shallow well / Bore-hole and rainwater were primarily source of water supply. It was observed those ponds were situated very close to surface water. This is not surprising because of access to water and ease of means of waste water disposal. Shallow well / borehole prevents introduction of predators, diseases and pollutants into the fish farms

The analytical studies revealed that wastewater from fish ponds contained nutrients that can be used for irrigation with treatments such as aeration, sedimentation, to remove odour and suspended solid materials respectively, others are as presented in Table 2. The questionnaire revealed further that technical issues like pond development were still on trial by error method, handled with crude implement and unskilled workers. Problems identified were with lack of environmental monitoring, instrument for *in-situ* and *ex-situ* water pollution indicators and low income among fish farmers. Table 3 shows that farmers have turned storm drains and surface water into receptacle waste drainage canal and stream. Reasons are not far fetch, lack of awareness on the potential danger of untreated effluent to the environment and public health. The fish farmers like all industrialists are conservatives; provide little or no budget for waste management instead sort convenient means to avoid cost of waste managements.

Table 4. Indicated that over 80% of the respondents responded negatively to treatment facilities while less than 20% agreed to the need while some have started with simple treatments such as sedimentation and simple filtration.

Well/Borehole and rainwater were the primary source of water supply for the ponds /tanks in the study areas. This

Figure 1. Map of Lagos State showing the study area.

Table 1. Sources of water for pond / tank impoundment.

Sources of water	Percentage of occurrence
Stream	05
Well Borehole	80
Groundwater	25
Rainwater	100

Table 2. Frequency of environmental parameters monitored in the fish farms.

Environmental parameters	Percentage of occurrence			
A – Water	Daily	Weekly	Fortnight Monthly	Quarterly
Dissolved oxygen (mg/l)	12.5			
Transparency (cm)			12.5	

Table 3. Points of Discharge Catfish effluent.

Effluents discharge	Percentage of occurrence
Open pit	12.5
Drainage canal	32.5
Stream	22.5
Re-used on farm	12.5
Bared Land	10

was probably due to the following:

(a) Locations of most ponds / tanks were far from rivers, streams and canals.

(b) To meet water quantity needed for the farm operations and

(c) To avoid introduction of predators, diseases and pollutants into the fish farms

(d) Access and convenience period

The problems associated with lack of environmental monitoring operations, include the dearth of Aqua cultural Engineering / Aqua culturist, lack of instruments to determine the required parameters, high cost of instruments and some of the fish farms were not for commercial purposes, to purchase the instrument may not be cost justified.

Drainage canal and stream were the primary sources of effluents discharges in the study area. This was probably due to the following:

1. Some of the ponds were located near the stream for odour management.

Table 4. Catfish Effluents Treatment.

Effluent treatment	Percentage of occurrence
Sedimentation	2.5
Filtration	2.5

2. The fish farmers find it easier and effective, using existing drainage canal for discharges
3. Very few fish farmers were practising integrated farming.

Almost all the fish farmers were not treating their effluents before discharging into the environment in the study area. This was due to the following:

1. To avoid additional cost of production
2. Lack of facility to treat the effluents
3. Some fish farmers were not aware of the negative effects of pond effluents to the environment
4. The fish farmers assumed that the effluents discharged into environment were very small especially for small scales (subsistence) farming and that the effects was minimized.

This findings support earlier researchers such as Boyd, (2003); Boyd et-al., 2008 and Boyd and Hulcher (2001) that the farmers often reluctant to invest in treatments to prevent or mitigate effects of catfish effluents on environment unless they benefit directly and their opined that added expense that does not contribute to catfish production.

CONCLUSIONS AND RECOMMENDATION

This study established a data base on catfish effluents management. Results from the study indicate that:

- Borehole was used as source of water supplemented by rainwater
- Only dissolved oxygen and turbidity for few fish ponds were monitored
- Most of the effluents were discharged untreated through the land disposal and dilution technique.
- There is low awareness of potential danger of discharging untreated waste water into soil and surface water as currently experienced in the Nigeria fish production Industry.
- The cost of making evaluations of activities to determine possible ecological impacts should be the responsibility of the farmers, but governments should provide guidelines describing how an acceptable evaluation is to be conducted, and they should approve the evaluation.
- The farmers should bear the costs of installing management techniques for preventing or mitigating adverse environmental effects, but again, the government should be responsible for approving the mitigating or treatment plan.
- The cost of monitoring on-site environmental variables should be the responsibility of the farmers, but the government should verify the validity of the monitoring effort and determine if compliance with standards is occurring.
- Charges and fines should be introduced to the farmers by waste regulatory agencies for waste water collection, transportation, storage, treatment and ultimate disposal including penal for defaulters.
- The impact of catfish effluent on environment (soil, water, stream, and river) should be investigated.

ACKNOWLEDGEMENTS

I am grateful to Dr. S.A Oke for his interest, valuable suggestions and contributions during the course of this work and I also express my profound gratitude to Mr. T. O. Sanusi the secretary of Agricultural and Bio-Environmental Engineering Department.

REFERENCES

Adamu B (2007). Trade and Investment opportunity in Agriculture. Paper presented at the India-Africa Agric. Food Submit in New Delhi. 7-8th March 2007**.**

Adekoya BB, Ayansanwo TO, Idowu AA, Kudoro OA, Salisu AA (2006). Inventory of Fish Hatcheries in Ogun State,Ogun State Agricultural development programme, Abeokuta.

Ajana, AM (2002). Overview of highlight and problems of fisheries extension in Nigeria Agriculture. Nigeria`s Pioneer Agriculture News Reporting and Trade Promotion Magazine vol.4 No.1 pp: 27-32

Boyd CE (1990). Water Quality in Ponds for Aquaculture. Auburn University/Alabama Agricultural Experimentation station.

Boyd CE (2003). Aquaculture effluent management at farm level. In:C.S. Lee and P. O'Bryen (Editors), Management of Aquaculture effluents. Aquaculture 226:101-112.

Boyd CE (2005). Aquaculture and water pollution. American Water Ressources. Summer Specialty Conference, Snowbird, Utah.

Boyd CE, H Pine, Boyd CA, Hulcher R (2008). Excess run of contribution to daily discharge frequency of channel catfish farms in Alabama. J. World Aquac. Soc. Vol. 39 pp. 490-499.

Boyd CE, RF Hulcher (2001). Best management practices for channel catfish farming in Alabama Agricultural Experiment Station, Auburn University, Alabama, Highlights of Agricultural Research, 48: 11-14.

FAO (2009). World review of fisheries and aquaculture, part 1. The state of world fisheries and aquaculture 2008. Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy.

Faturoti EO (1999). Fisheries potentials and investment opportunities in Nigeria. Paper presented at the Fisheries Society of Nigeria (FISON). Investors Workshop held at the Nigerian Institute for Oceanography and Marine Research.

Huner JV, Dupree HK (1984) in Singh and F.W Wheaton: Environmental Requirement in GIGR(1999) Animal Production and Aquacultural Engineering,America Society of Agricultural Engineering,Vol.2;pp 219-228. *Third report*

to the fish Farmers, fish and wildlife services, US Department of interior, Washington DC.
Miller J, Atanda T, Asala G, Chen W (2006). Integtated irrigation-aquaculture Opportunities in Nigeria;The special programme, D.C., USA.
Omitoyin BO (2007). Introduction to Fish Farming in Nigeria. University of Ibadan Press. Nigeria.
Omofunmi OE (2010). Technical Assessment of Fish Ponds in Lagos State, Nigeria. M.Phil Dissertation. University of Ibadan, Nigeria.
Tucker CS, Robinson EH (1990). Channel Catfish Farming Handbook. New York: Nostrand Reinhold.