Fisheries and Aquaculture Journal
ISSN: 2150-3508

Dauda et al., Fish Aqua J 2018, 9:1
DOI: 10.4172/2150-3508.1000237

Review Article Open Access

African Catfish Aquaculture in Malaysia and Nigeria: Status, Trends and Prospects

Akeem Babatunde Dauda[1,2*], **Ikhsan Natrah**[1,3], **Murni Karim**[1,3], **Mohd Salleh Kamarudin**[1] **and Armaya'u Hamisu Bichi**[2]

[1]*Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

[2]*Department of Fisheries and Aquaculture, Federal University, Dutsinma PMB 5001, Dutsinma Katsina State, Nigeria*

[3]*Laboratory of Marine Biotechnology, Institute of Bioscience, Universiti Putra Malaysia, 43400 UPM Selangor*

***Corresponding author:** Akeem Babatunde Dauda, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia, Tel: +2348062085120; E-mail: tdabak@gmail.com

Received date: December 12, 2017; **Accepted date:** January 04, 2018; **Published date:** January 11, 2018

Abstract

Global aquaculture production continue growing in order to meet up with ever increasing fish demand, especially as fish from capture has levelled off and makes an increase in aquaculture production as the only hope to meet the demand for fish. Aquaculture industry involves culture of many fish species of either fresh or brackish water origin and among the important freshwater fish species is North African catfish which is also called African catfish (*Clarias gariepinus*). Its production is increasing as the total aquaculture production also increases and its culture is spread globally, with Nigeria officially reported as producing the highest annual amount of the fish. There is a substantial culture of the fish in Malaysia, though not a native fish species but its presence in Malaysia is getting closer to over three decades and for almost a decade now, it has been the highest finfish produced in either fresh or brackish water aquaculture in Malaysia. This review discussed African catfish aquaculture in Malaysia and Nigeria, compared the production and prospects of the industry in the two countries.

Keywords African catfish; Aquaculture; Malaysia; Nigeria; Prospects

Introduction

The world is presently occupied with over seven billion people and it has been projected to increase to above nine billion by 2050, therefore this presents challenges to continue feeding an ever-increasing population. Fish is an integral part of human diet but while the demand is increasing, the wild fish stocks have remained static over the past three decades (Figure 1) [1]. Therefore, aquaculture represents a potential sustainable solution to meeting up with the ever-increasing demands for fish and fish products [2]. On the other hand, global aquaculture production has been increasing over the past six decades, and the Food and Agricultural Organization (FAO) has designated aquaculture as the fastest growing food production sector [1,3]. While the aquaculture industry has experienced an average annual growth rate of 8.9% between 1970 and 2005, capture fisheries only had a 1.2% growth rate. Moreover, terrestrially farmed meat production has only grown at 2.8% within the same period [4]. In more recent times, between 2009 and 2014, the annual average increase in aquaculture stood at 6.6%, while that of capture fisheries further reduced to 0.71% [1]. Aquaculture has contributed a mere 7% of total fish consumed in 1974, but increased steadily to 26% in 1994, and a decade later was 31%. Currently, aquaculture contributes a total of 44.14%, which translates to 73.8 million tonnes of the total 167.2 million tonnes of fish produced globally [1].

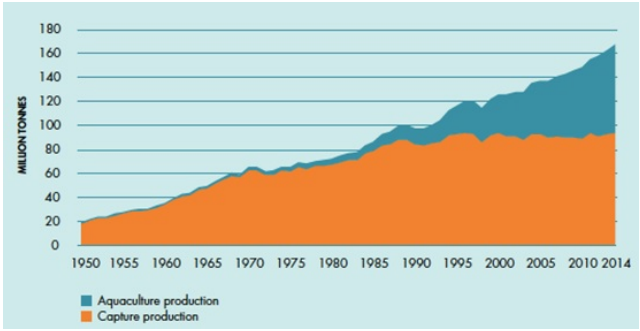

Figure 1: World capture fisheries and aquaculture production. Source: FAO [1].

The development of aquaculture is being globally increasing, except in Oceania which has seen a decline of less than 0.1% in the last three years. Generally aquaculture production in Oceania is very low and an all-time highest of 0.2 million tonnes was attained in 2012. China and Asia still remain the dominant country and region, respectively, in global aquaculture production. This growth encompasses all sectors, which includes finfish, aquatic plants, molluscs, crustaceans, and other aquatic animals including amphibians, in freshwater, brackish and marine environments. The number of species reportedly being farmed and once farmed globally is 580 and this is dominated by finfishes with a total of 362 out of 580 [1]. The most cultured finfish globally are carps, tilapia, salmon and catfish [5]. Among the catfishes the most cultured are Amur catfish (*Silurus asotus*), Channel catfish (*Ictalurus puncuatus*), Stripped catfish (*Pangasius hypophthalmus*) and African catfish (*Clarias gariepinus*) and their respective percentage

contribution to total aquaculture production at the end of 2014 were 0.62%, 0.53%, 0.52% and 0.33% [5]. This review discussed African catfish aquaculture in Malaysia and Nigeria, compared the production and future prospect of the industry in the two counties.

African catfish aquaculture

African catfish (Figure 2) is an important aquaculture species that is cultured in various regions in the world. The top producing country is Nigeria followed by the Netherlands, Brazil, Hungary, Kenya, Syrian Arab Republic, South African, Cameroon, and Mali [6]. The total production of African catfish officially reported by FAO is 246,476 tonnes during 2015 [7]. However, various Asian countries such as China, Indonesia, Thailand, and Malaysia also produce significant amounts of African catfish, but statistics are currently unavailable by the FAO. Therefore, the overall African catfish production could be substantially under-reported. For instance, production values from the Federal Department of Fisheries from 2001 to 2012 in Nigeria were much higher compared to the official FAO statistics [8]. This discrepancy was said to be due to farming of African catfish hybrids that occurs not only in Africa but also in most Asian countries. Therefore, it was difficult to separate the data for pure African catfish and that of hybrid and FAO did not capture the output under the name African catfish but were reported as *Clarias* sp. (Xiaowei Zhou, 2017, Aquaculture statistician, Food and Agriculture Organization of the United Nations, Pers.com 2nd May 2017).

According to Anetekhai [8], domestication of *C. gariepinus* can be traced to 1950's while adoption as an aquaculture candidate for culture trials in Nigeria can be traced to the 1970's [9]. The success in African catfish farming can be linked to the successful development of artificial propagation protocols in the 1980's and its substantial contribution to aquaculture development can be traced to mid-1990's as it is reflected on the FAO FishStat, (Figure 3) [6]. Increased production was supported by the acceptability of the fish by consumers as well as by farmers due to beneficial characteristics that included fast growth and high market demands.

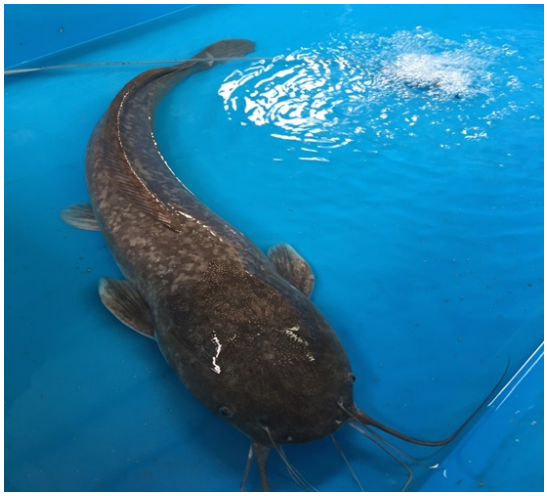

Figure 2: African catfish *Clarias gariepinus*.

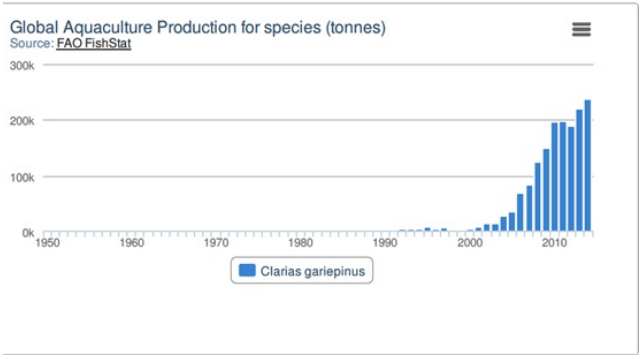

Figure 3: Global aquaculture production of *Clarias gariepinus*. Source: FAO [6].

African catfish aquaculture in Malaysia

The aquaculture industry in Malaysia is highly diversified consisting of farming both inland and marine fishes, diadromous fishes, crustaceans, molluscs and aquatic plants [7,10]. The history of aquaculture in Malaysia dates back to the 1920's with the extensive culture of Chinese carps in mining pools. However, by the 1950's, there was semi-intensive culture of cockles and freshwater fishes in ponds [11,12]. This industry has been growing gradually with a total production of 506,465.25 tonnes at the end of 2015, valued at a wholesale level of 3,296,463 Malaysia ringgit ($US 756,937). Aquaculture production in Malaysia has always been dominated by aquatic plants (seaweeds), which represent 51.5% of the total aquaculture production as of 2015 [10]. However, more than 30 finfish species are farmed, with the most coming from African catfish and lower amounts from red (hybrid) tilapia, sea bass, river catfish (*Pangasius* sp.), and red snapper (Figure 4) [10].

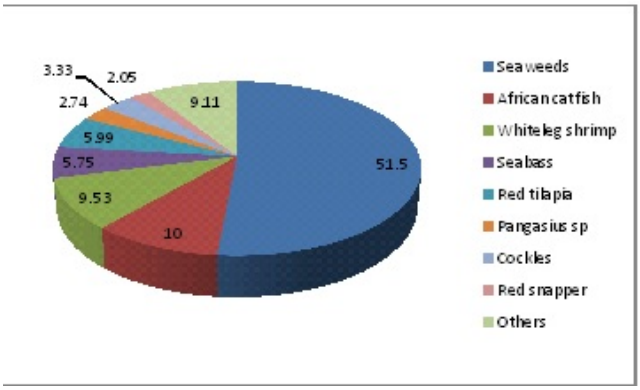

Figure 4: Percentage contribution of major aquaculture species in Malaysia, data sourced from Malaysia, annual fisheries statistics [10].

In Malaysia, *C. gariepinus* is a non-native fish species and was introduced through aquaculture from Thailand between 1986-1989 [13]. The first report of *C. gariepinus* culture in Malaysia can be traced back to 1987 with an annual output of 6.46 metric tonnes, and this has grown gradually since then. In the past two decades, this industry has

grown tremendously to become the highest produced finfish cultured in either fresh or brackish water, when it overtook (Figure 5) red tilapia (in 2008) which was previously most cultured. The total value is 223,056 Malaysia ringgit ($US 51,271) and contributes to 10% of total aquaculture production, with approximately 45.19% is from freshwater aquaculture production (Figure 6). This industry has seen some fluctuations over the years.

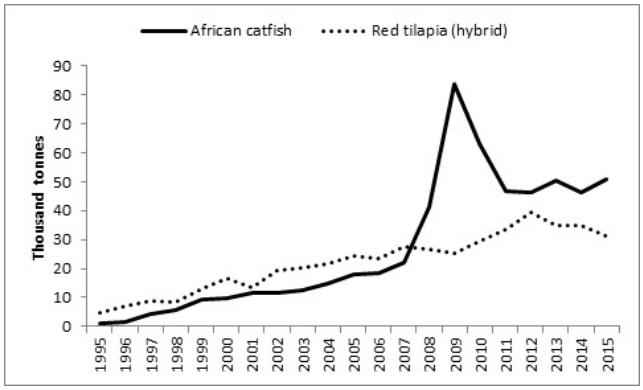

Figure 5: Aquaculture production of African catfish and red tilapia (hybrid) in Malaysia between 1995 and 2015. Data obtained from Malaysia, annual fisheries statistics.

The percentage contribution of African catfish to the total aquaculture production rose from 0.83% in 1995 to 17.73% in 2009, and it was historically the highest finfish production for any single species in Malaysia. Its contribution to freshwater aquaculture in the last two decades rose from 5.99% in 1995 to all time highest of 54.86% in 2009. However, the total production declined substantially from 83,727 in 2009 to 63,206 tonnes in 2010 and the trends continue until 2013 when it slightly rose and declined again in 2014, it later rose slightly in 2015 and the total production stood at 50,683.12 tonnes. The up and down experienced in African catfish production within this period affected the entire aquaculture industry in the country and one of the reasons might be the emergence of infectious diseases.

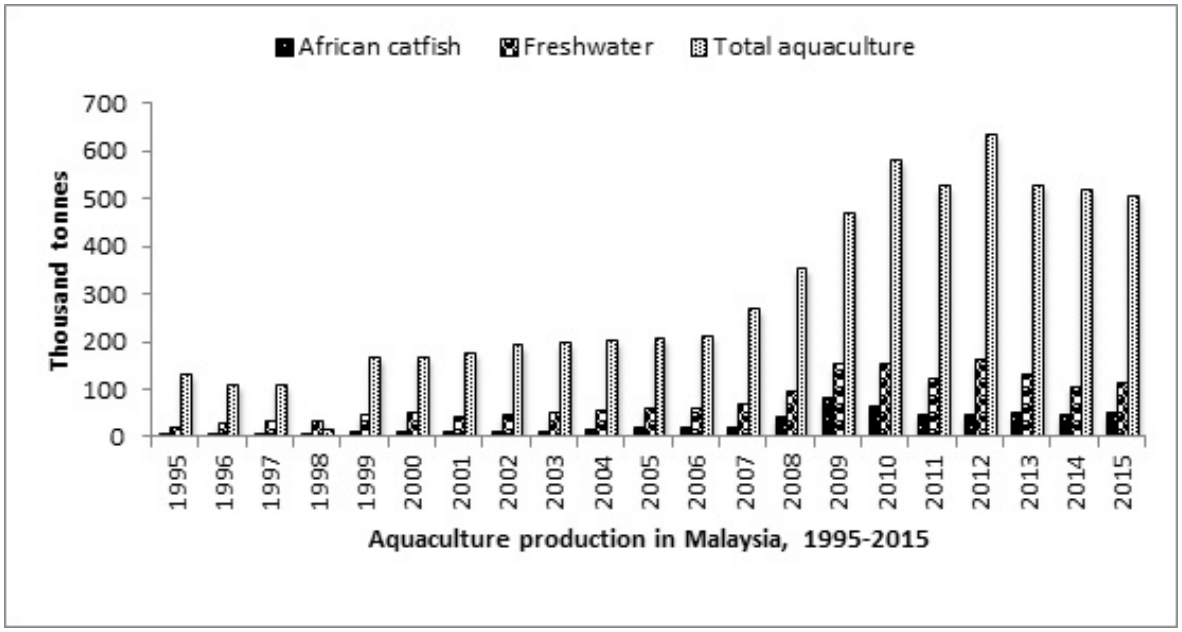

Figure 6: *Clarias gariepinus* production in Malaysia in comparison with total freshwater production and overall total aquaculture production between 1995 and 2015. Data obtained from Malaysia, annual fisheries statistics 1995-2015 (Department of Fisheries, Malaysia, DOF).

African catfish aquaculture in Nigeria

Aquaculture in Nigeria is a growing industry, which is expected to continue due to the needs to meet up with a large deficit (over a million tonnes) between fish production and consumption. The aquaculture industry in Nigeria is restricted to inland freshwater aquaculture, despite abundant marine water resources, and only a few species such as Clarias, tilapia and carps are being cultured. Nigeria imports about 0.72 million tonnes of frozen fish that was valued at over $US 500 million annually, this ranked Nigeria as the highest importer of seafood in Africa [3]. The history of fish culture in Nigeria can be dated back to 1951 when the feasibility of farming common carp

Cyprinus carpio and tilapia in Panyam, Jos and Onikan, Lagos, respectively, were tested simultaneously [8,14].

Catfish aquaculture later started in the 1970's and the production substantially increased in the 1980's when artificial propagation methods were successfully developed along with better understanding their nutrients requirements [15]. This industry continued to grow gradually and in the mid-1990, catfish became the dominant fish culture in Nigeria and is currently responsible for the major aquaculture output of the country [7]. Adewumi et al. [16] opined that *C. gariepinus* gave Nigeria a niche in the global aquaculture production, and it is currently the second highest producer of aquaculture products in Africa and the highest producer of African catfish in Africa as well as the world [7].

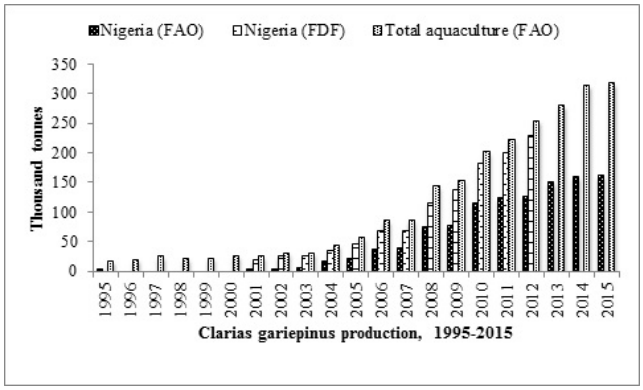

Figure 7: *Clarias gariepinus* production in Nigeria, in comparison with total aquaculture production, from 1995 to 2015. Data obtained from Food and Agriculture organization (FAO) and Federal Department of Fisheries (FDF), Nigeria.

According to FAO reports, the contribution of African catfish aquaculture to the total production in Nigeria jumped from 7.8% to 53.2% in 2001 and 2013, respectively (Figure 7). The 2015 data by FAO put the total African catfish production in Nigeria at 160,295 tonnes out of 316,727, which constitutes 50.61%. In contrast, a report of African catfish production by Anetekhai [8], based on the data obtained from Federal Department of Fisheries from Nigeria 2001 to 2012, showed that the contribution of African catfish to aquaculture production in Nigeria ranged between 80% and 90%. This discrepancy can be associated with the previously stated personal communication with FAO statistical experts that the official report for *C. gariepinus* in the FAO database was for pure *C. gariepinus*, while their hybrids and others that could not be confirmed, were reported as *Clarias* sp. (Xiaowei Zhou, 2017, Aquaculture statistician, Food and Agriculture Organization of the United Nations, Pers.com 2nd May 2017).

Comparison between catfish aquaculture in Malaysia and Nigeria in the last two decades

The catfish aquaculture industry in Nigeria and Malaysia has many similarities. For example, it represents the dominant finfish culture in the two countries and it has both experienced significant developments in the last two decades [7,8,10] . As shown in Figure 8, the output of African catfish was similar until 2003, when the production in Nigeria significantly outgrew that of Malaysia, which peaked in 2009 and has since declined. The percentage contribution to either freshwater aquaculture or total aquaculture was higher in Nigeria than Malaysia. This disparity is largely due to the nature of total aquaculture in the two countries. The industry in Malaysia is highly diversified with over 20 finfishes, crustaceans and aquatic plants. In Nigeria, there are only a few species of finfish being cultured and very little production coming from the freshwater giant prawn, *Macrobrachium rosenbergii.* African catfish in Nigeria has a high market price of about 700 naira/Kg, which is equivalent to US$ 2.3 USD. On the other hand, African catfish in Malaysia is sold at about MYR 4.4/Kg, which is equivalent to US$ 1.01. The dominant catfish culture system in the two countries is ponds. Therefore, expansion and intensification of production to meet market demands may have some challenges to sustainability.

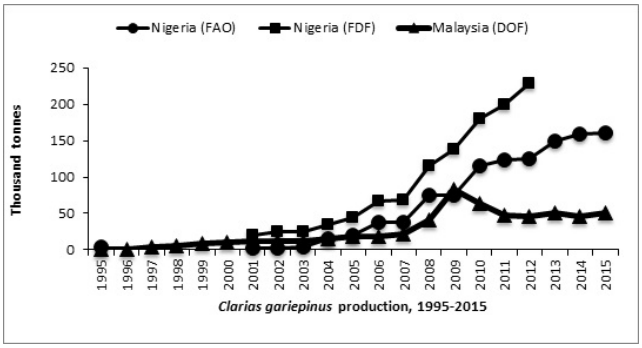

Figure 8: Comparison of African catfish production between Malaysia and Nigeria in the last two decades. Data obtained from Malaysia, Department of Fisheries (DOF), Food and Agricultural organization statistics (FAO) and Federal Department of Fisheries, Nigeria (FDF).

Prospects of African catfish aquaculture in Malaysia and Nigeria

There is a great prospect for catfish aquaculture in both Malaysia and Nigeria because these two countries are currently net importers of fish [1]. Therefore, aquaculture has great promise to bridge the gap between supply and demand for fish and fish products while, at the same time, improving food security and creating more jobs. Malaysia remains one of the highest consumers of fish per capita in the world and this trend is expected to increase [17]. This indicates that aquaculture production will continue increasing and thus the production of African catfish may also increase due to the fast growth and acceptability of consumers. Nigeria is still far from being self-sufficient in fish production and there have been concerted efforts by the government to increase local aquaculture production [18]. It has been projected that Nigeria needs an average annual increase of 3.8% in fish production to keep up with demands of an ever-increasing population [17]. This might lead to increased production of African catfish in the country because of a relatively good knowledge regarding their culture techniques and high market demands. In fact, the demand and market price for catfish are higher compared to tilapia or carps [19]. Comparatively, the trends towards higher production in Nigeria than Malaysia may continue in the future, although Malaysia has a larger potential for aquaculture growth because it is highly diversified [11,12]. In Nigeria, there are on-going efforts to diversify the aquaculture industry through increased production and domestication of some indigenous species such as snakehead

(*Parachana africana* and *obscura*), but African catfish production might still enjoy the lead for a long time.

Conclusion

African catfish aquaculture may not be huge globally based on the available official statistical data but it is an important industry in both Malaysia and Nigeria. While it represents the major finfish culture in Malaysia for almost a decade now, it has been responsible for the aquaculture development in Nigeria and the development of aquaculture in Nigeria is essentially that of African catfish. Nigeria is at the moment second highest producer of culture fish in Africa and this basically depends on her African catfish turn out, which also placed her as the highest producer of the fish in Africa and in the whole world based on the available statistical data from Food and Agricultural Organization (FAO). The future of African catfish aquaculture in the two countries tends to be great, considering available resources in terms of land and water, and the tendency of increase population with a consequent increase in demand for fish. African catfish being the dominant fish culture at the moment and with a lot of favourable attributes may experience an increase in production to meet up with the increase fish demands. However, the future increase in production is likely to be higher in Nigeria than Malaysia, considering the population increase, diversification status of aquaculture industry in the two countries, required technicalities and acceptability of African catfish.

References

1. FAO (2016a) The State of World Fisheries and Aquaculture-Contributing to food security and nutrition for all. Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome pp: 200.
2. Dauda AB, Folorunso LA, Dasuki A (2013) Use of Probiotics for Sustainable Aquaculture Production in Nigeria. Journal of Agriculture and Social Research 13: 35-45.
3. Atanda AN (2012) Fish species diversification in Agriculture for the success of the agriculture transformation agenda: The role of tilapia production; Fisheries Society of Nigeria (FISON) annual public lecture, Lagos, Nigeria.
4. Subasinghe RP (2005) Epidemiological approach to aquatic animal health management: opportunities and challenges for developing countries to increase aquatic production through aquaculture. Preventive Veterinary Medicine 67: 117-124.
5. FAO (2014) FAO year book, Fishery and Aquaculture Statistics, Food and Agriculture Organization of the United Nations, Rome.
6. FAO (2016b) Cultured Aquatic Species Information Programme: Clarias gariepinus. Fisheries and Aquaculture Department, Food and Agricultural Organization of the United Nations, Rome.
7. FAO (2017) Fishery and Aquaculture Statistics. Global aquaculture production 1950-2015 (FishstatJ). In: FAO Fisheries and Aquaculture Department. Rome.
8. Anetekhai MA (2013) Catfish aquaculture industry assessment in Nigeria. Seisay M and Nouala SA edited. Published by Inter-African Bureau for Animal Resources, African Union.
9. Hecht T, Uys W, Britz PJ (1988) Culture of sharp tooth catfish, Clarias gariepinus, in southern Africa. National Scientific Programmes Unit: CSIR, SANSP Report pp: 153.
10. DOF (2016) Annual Fisheries Statistics 2015. Department of Fisheries, Malaysia, Ministry of Agriculture and Agro-based Industries, Putrajaya.
11. Liong PC, Hanafi HB, Merican ZO, Nagaraj G (1988) Aquaculture development in Malaysia. In: Juario JV, Benitez LV (Editors) Perspectives in Aquaculture Development in Southeast Asia and Japan: Contributions of the SEAFDEC Aquaculture Department. Proceedings of the Seminar on Aquaculture Development in Southeast Asia, 8-12 September 1987, Iloilo City, Philippines pp: 316.
12. Kechik IA (1995) Aquaculture in Malaysia. In: Bagarinao TU, Flores EEC (editors), Towards Sustainable Aquaculture in Southeast Asia and Japan: Proceedings of the Seminar-Workshop on Aquaculture Development in Southeast Asia, Iloilo City, Philippines, pp: 125-135.
13. Csavas I (1995) Status and perspectives of culturing catfishes in East and South-East Asia. Presented at the International Workshop on the Biological Basis for Aquaculture of Siluriformes, May, Montpellier, France 8: 2-10.
14. Akinrotimi OA, Abu OMG, Aranyo AA (2011) Environmental friendly aquaculture key to sustainable fish farming development in Nigeria. Continental J Fisheries and Aquatic Science 5: 17-31.
15. Faturoti EO, Balogun AM, Ugwu LC (1986) Nutrient utilization and growth responses of Clarias fed different protein levels. Nig J Appl Fish Hydrobiol 1: 31-49.
16. Adewumi AA, Olaleye VF (2010) Catfish culture in Nigeria: Progress, prospects and problems. African Journal of Agricultural Research 6: 1281-1285.
17. Wing-Keong NB (2009) The current status and future prospects for the aquaculture industry in Malaysia. World Aquaculture 40: 26-30.
18. FDF (2008) Fisheries Statistics of Nigeria, Projected human population; fish demand and supply in Nigeria, 2000-2015. Federal Department of Fisheries, Nigeria.
19. Dauda AB, Dasuki A, Bichi AH (2015) Analysis of Constraints to Aquaculture Development in Sudano-Sahelian Region of Nigeria. Tropical and Subtropical Agroecosystems 18: 189-193.