



**ASSESSMENT OF CATFISH PRODUCTION IN MAIDUGURI METROPOLITAN COUNCIL, BORNO STATE, NIGERIA**

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**ABSTRACT**

The study assessed of Catfish production in Maiduguri Metropolitan Council of Borno State, Nigeria. Multi stage random sampling technique was applied to select 100 respondents for the study. Both descriptive and inferential statistics were used for analysis. The descriptive statistics used include; frequencies, means and percentages while the inferential statistics used multiple regression analysis. Data were collected using structured questionnaire. The result revealed that 73% of the respondents were male and 27% were female. However, majority (74%) were married, 45% of the respondents were between the ages of 34-45 years and 85% have access to extension. In addition, 46% of the respondents had 11-15 years' experience in catfish production. Furthermore, 45% of the respondents had secondary education and half of the respondents (50%) had 7-10 household size. The result of Multiple regression analysis shows that 77.97% variation in the dependent variable was explained by the independent variables included in the model. This study recommends that creation of avenue for sourcing/accessing loan will go a long way in assisting the women farmers in having input to inject in Catfish Production and extension agents/stakeholders should organized training for women in Catfish Production.

**Keywords:** Assessment, Catfish, Involvement, Production and Women.

**INTRODUCTION**

Fish are cold-blooded aquatic animals that live in water, breathe through gills, and are typically covered with fins and scales. They belong to the Kingdom *Animalia*, Phylum *Chordata*, Subphylum *Vertebrata*, and Clade *Olfactores*. Fish are among the earliest vertebrates, having first appeared almost 500 million years ago. With approximately 32,000 known species, they represent the most diverse group of vertebrates, found in water bodies across the world (Merriam-Webster, 2021). Nigeria's current fish production stands at approximately 0.8 million metric tons annually, falling short of the national demand of 2.7 million metric tons. This deficit of 1.9 million metric tons has led to an annual fish importation bill of \$1.2 million (Central Bank of Nigeria, 2021). Catfish production, in particular, has grown significantly, dominating over 80% of the country's aquaculture output. The major farmed fish species include *Clarias* and *Heterobranchus* (catfish), carp, and tilapia (Emmanuel, 2014). African catfish, indigenous to tropical and sub-tropical freshwater bodies such as lakes, ponds, and pools, are especially favored in Nigerian aquaculture (Olaniyi and Omitogun, 2012). Despite the country's contribution of about 5% to the total fish supply globally, growth remains modest at about 2% annually (Moses, 2006). Fish account for nearly 50% of total animal protein consumption in developing countries and a slightly lower proportion in developed nations. Fish farming is currently the fastest-growing animal food production sector, particularly in developing regions such as China and other Asian countries (Green Facts, 2014). Recognizing this potential, African governments under the African Union and the New Partnership for Africa's Development (NEPAD) are actively promoting private sector investment in aquaculture (NEPAD, 2015).



The fisheries sector in Africa supports over 10 million people involved in production, processing, and trade. Fish has become a key export commodity, with Africa generating an estimated \$2.7 billion annually from fish exports. However, the continued exploitation of natural fish stocks has reached critical limits, threatening the sustainability of this vital resource (Mutume, 2014). In addition to being a primary protein source, fish provides essential nutrients that are vital for human health. Its high digestibility, low cholesterol content, and rich protein profile make it especially suitable for pregnant women, children, and people with health challenges. Medical experts recommend fish for its preventive role against cardiovascular diseases (Adeleke and Afolabi, 2012; Kareem *et al.*, 2012; FAO, 2016).

In Nigeria, rising awareness of the health benefits of fish, coupled with population and income growth, has significantly increased fish consumption. Based on the 2014 population estimate of 180 million, Nigeria's total fish demand was projected at 3.32 million metric tons. That same year, fisheries contributed 0.48% to Nigeria's Agricultural Gross Domestic Product (GDP), while agriculture as a whole contributed 20.24% (Nigeria Fishery Statistics, 2016). Borno State remains a significant source of captured fish through its lakes and rivers. However, the ongoing insurgency in the region has severely disrupted fish production, with many residents, especially women engaged in fisheries, forced to flee their communities (Umar *et al.*, 2017). As a result, fish farming has become a viable alternative to meet local demand and compensate for the declining output from capture fisheries (Ajao *et al.*, 2012). Women in Maiduguri play critical roles in the fisheries value chain, especially in fishing, processing, and marketing. Their participation not only supports household income but also contributes to poverty reduction and food security. Nevertheless, women face several constraints in accessing productive resources, markets, and services—issues often referred to as the “gender gap.” These limitations hinder their full participation in agricultural and socio-economic development.

Despite these challenges, women have demonstrated resilience and potential in fish farming. Their involvement in multiple domestic and agricultural activities such as cooking, child-rearing, poultry keeping, and home gardening enables them to integrate fish farming into their routines. However, barriers such as gender inequality, limited access to land, inadequate capital, poor health, and weak infrastructure (e.g., bad road networks) continue to undermine their productivity and participation (UN, 2012). Unlocking the full potential of women in fish farming requires targeted interventions, including improved access to resources, capacity-building, financial support, and gender-sensitive policies. Supporting women's participation in aquaculture can contribute significantly to sustainable development in Maiduguri and beyond. The objectives of the study were to;

- i. describe the socio-economic characteristics catfish producer in the study area;
- ii. assess the levels of involvement of women in catfish production in Maiduguri;
- iii. examine the benefits of catfish production in Maiduguri;
- iv. determine socio-economic characteristics influencing the involvement of women in catfish production in Maiduguri; and
- v. describe the constraints of women in catfish production in Maiduguri.

## **MATERIALS AND METHODS**

### **The study Area**

The study was carried out in Maiduguri metropolitan council, Borno state, Maiduguri metropolis is one of the twenty-seven (27) local government area of the state and it's the state



capital. It is located within the Sudan savanna zone of Northern Nigeria. The state capital has an estimated area of 69,436km and it lies between  $11^{\circ}48'$  and  $11^{\circ}52'$  North and longitude  $13^{\circ}06'$  and  $11^{\circ}52'$  and latitude  $13^{\circ}06'$  and  $13^{\circ}14'$  East (Bureau of land and survey Maiduguri, 1996). According to the provisional census figure 2006, Maiduguri metropolis has an estimated population of 521,492 based on 3.2% growth rate (National population commission in Nigeria census, 2006). The area shares boundaries with Konduga Local Government Area in the North and North West, Here Local Government from the South and Mafa Local Government from the East. The area falls within the semi-arid zone. The area has an average annual rainfall between 500-600 mm (Nigeria Meteorological Agency, 2014). With an average annual temperature of  $35-37^{\circ}\text{C}$ . Months with the highest temperature in the area are March, April, May, June, ranging from  $58-42^{\circ}\text{C}$ , while the coldest month being December, January and February characterized by cold, the harmattan annual report on weather, Lake Chad Research Institute, 2007. The soil types the area varies from sundry, clay loan and clay soil. It is a vegetation cover of arable crops, tree crops Acacia tress and Neem trees. The principal ethnic group in Maiduguri metropolis is Kanuri, they are said to have come from Yemen and settled about 640km North to Lake Chad in the original Kanem Empire. Shehu Umar Garba installed the Empire from Kukawa (formed in 1814) to Yerwa (present Maiduguri metropolis). However, Kanuri being the dominant ethnic groups, other ethnic groups like Shuwa Arab, Marghi, Babur, Gwoza, Hausa, Fulani and other minor ethnic groups exist in the area. Despite the fact that the area is dominated by Muslims, there are Christian who also came from within the state (Borno State Ministry of Home Affairs, Information and Culture dairy, 1992).

The major economic activities carried out in the area are trading, sewing, tailoring, livestock rearing, weaving, farming and among others. Many civil are also found in the ministries, institution and non-governmental organizations. (Bello, 2017). Natural bodies of water in and around the state provide grounds for artisanal fishery. In recent times cultured fishery is also gaining popularity among households within Maiduguri metropolis.

### **Sampling Techniques and Sample Size**

Multiple stage random sampling was used to select sample for the study. The first stage involve purposive selection of (4) four district that are prominent in catfish production (Maisandari, Bolori, Dala Alamdari, Yerwa) out of (7) seven. The second stage involve simple random sampling in the selection of registered fish farmers. Final stage involves proportionate selection of the respondent.

**Table1: Sampling Procedure**

S/no	Name of District	Number of Registered Fish Farmers	Number of Selected Fish Farmers
1	Maisandari	100	35
2	Bolori	90	20
3	Dala Alamdari	62	10
4	Yerwa	100	35
<b>Total</b>	<b>4</b>	<b>352</b>	<b>100</b>

**Source:** Field Survey, (2021)

### **Data analysis**

Data were analyzed using descriptive and inferential statistics. Descriptive statistics in the form of frequencies, mean, percentage and Likert scale will be employed to analyses objective; i, ii, iii, iv and vi. While inferential statistics in the form of multiple regression was used to achieve objective v. Multiple regression analysis is explicitly expressed as;



$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots + \beta_{10} X_{10} + e \quad \dots(1)$$

Where Y= Women involvement in catfish production

$\beta_0$  = Constant

$\beta_1$ – $\beta_{10}$  = Estimated co-efficient

e= error term

$X_1$ = Age (years) ;  $X_2$ = Gender -male (1), Female (0);  $X_3$ = Marital status (Married=1, 0 not Married);  $X_4$ = Access to credit (No access=0 and have access=1);  $X_5$ = Access to extension contact (No access=0 and have access=1);  $X_6$ = Fishing experience (Years spend in fish production);  $X_7$ = Educational status (non- formal education, primary, secondary and tertiary education);  $X_8$ = Size of pond (ft);  $X_9$ = Fish income (Naira) and  $X_{10}$ = Household size (Number of household members).

## RESULT AND DISCUSSION

### Socio-Economics Characteristics of Catfish Producers

The findings presented in Table 2 reveal that 45% of the catfish farmers were within the age range of 34–45 years, indicating that the enterprise is dominated by economically active youth. This observation aligns with Mohammed *et al.* (2023), who reported that fish farming in Maiduguri is largely practiced by individuals between 31 and 40 years, contributing significantly to household food and income security. Gender distribution shows that 73% of catfish producers were male, while 27% were female, suggesting a male-dominated industry. This is consistent with Umar *et al.* (2023), who found that 76% of fish farmers in Maiduguri and its environs were men, indicating gender disparity in access and participation in aquaculture. Similarly, Bulama *et al.* (2020) noted that women are more involved in processing and marketing rather than production. In terms of marital status, the majority (74%) of respondents were married, a factor that could contribute to family labor and farm stability. Regarding access to services, 53% of respondents reported no access to credit, which may hinder production expansion and input procurement. Conversely, 85% had access to extension services, a factor critical for knowledge transfer and the adoption of best practices. This aligns with findings by Umar *et al.* (2023), who emphasized the positive role of extension in improving fish health management among local farmers.

The data further show that 46% of respondents had 11–15 years of experience in catfish production, implying a well-grounded knowledge of aquaculture practices among the farmers. Experience, as argued by Mohammed *et al.* (2023), enhances decision-making and risk management in fish farming. Educational level plays a critical role in technology adoption and farm management. In this study, 45% of the farmers had attained secondary education, which is comparable to findings by Mohammed *et al.* (2023), who reported a significant proportion of catfish farmers with post-primary education in Maiduguri. Concerning production scale, 36% of respondents operated ponds within the 4–7 ft size range, reflecting medium-scale production. Annual income analysis showed that 26% of respondents earned ₦200,000–₦250,000, 25% earned ₦150,000–₦200,000, while only 5% earned less than ₦50,000. This distribution reflects varied levels of profitability and productivity among producers. Lastly, household size analysis revealed that 50% of the respondents had between 7–10 members, while 19% had 11–13 members. Large household sizes could provide labor support and affect consumption needs, as also observed by Mohammed *et al.* (2023).

**Table: 2 Socio-Economics Characteristics of Catfish Producers**

Socioeconomic	Frequency	Percentage
<b>Age</b>		
18-25	11	11.0
26-33	18	18.0
34-45	45	45.0
46-53	14	14.0
53-65	9	9.0
65 and above	3	3.0
<b>Marital Status</b>		
Single	10	10.0
Married	74	74.0
Divorced	2	2.0
Widow	8	8.0
Widower	6	6.0
<b>Access to credit</b>		
Yes	47	47.0
No	53	53.0
<b>Access to extension</b>		
Yes	85	85.0
No	15	15.0
<b>Fishing experience</b>		
<=5 years	10	10.0
5-10years	12	12.0
11-15years	46	46.0
16-20years	20	20.0
25years	12	12.0
<b>Level of education</b>		
Primary	25	25.0
Secondary	45	45.0
Tertiary	30	30.0
<b>Size of pond(Fit)</b>		
Less or equal to 1	12	12.0
2—3	20	20.0
4—5	36	36.0
6—7	32	32.0
<b>Income</b>		
Less than 50,000	5	5.0
50,000-100,000	11	11.0
101000-150,000	18	18.0
150001-200,000	25	25.0
200,001-250,000	26	26.0
>250,000	15	15.0

**Source:** Field Survey, (2021)

The results on organizational membership among catfish producers are presented in Table 2. Findings indicate that 95% of the respondents were members of one or more producer associations or organizations. This high level of membership suggests that catfish production in Maiduguri is not only a recognized enterprise but also benefits from organized structures that support its operations. Membership in such associations often enhances access to training, credit facilities, input supplies, and markets, which are vital for improved production efficiency (Adewumi & Olaleye, 2011). Furthermore, the study reveals that a majority of the catfish producers (74%) engage in commercial-scale production, while only 23% operate at a subsistence



level. This indicates that catfish farming in the study area is largely driven by market-oriented goals. The dominance of commercial production implies that producers are likely motivated by profit and are more willing to invest in improved technologies and practices, which can lead to increased productivity and income (Ezenwa *et al.*, 2006). This trend reflects the growing importance of aquaculture as a viable economic activity in urban centers like Maiduguri.

**Table: 2 Socio-Economics Characteristics of Catfish Producers cont'd**

Socioeconomic	Frequency	Percentage
<b>Size of pond(Fit)</b>		
Less or equal to 1	12	12.0
2—3	20	20.0
4—5	36	36.0
6—7	32	32.0
<b>Income</b>		
Less than 50,000	5	5.0
50,000-100,000	11	11.0
101000-150,000	18	18.0
150001-200,000	25	25.0
200,001-250,000	26	26.0
>250,000	15	15.0

Source: Field Survey, (2021)

### Level of Catfish Production in Maiduguri

The level of catfish production in Maiduguri is presented in Table 2. The findings reveal that a significant proportion (45%) of catfish producers operate at a medium production level, averaging around 3,000 kg. This is followed by 24% who produce at a moderate level of approximately 2,000 kg. Additionally, 19% of respondents engage in high-level production, estimated at about 5,000 kg, while the smallest proportion (12%) produce at a low level of less than 50 kg. These results indicate that the majority of catfish producers in the study area fall within the medium-scale production category. This suggests that catfish farming in Maiduguri has moved beyond subsistence levels, although it has not yet fully transitioned to large-scale commercial operations. Medium-scale fish farming typically involves semi-intensive production systems, moderate capital investment, and limited but expanding market access. This category of producers has the potential for growth and increased productivity, particularly if provided with adequate support in terms of access to quality feed, technical training, credit facilities, and extension services (Ayinla, 2007; Akinrotimi *et al.*, 2011). The dominance of medium-scale production further reflects a growing interest and investment in aquaculture as a viable livelihood option in Maiduguri. With the right enabling environment, these producers can scale up operations to meet rising demand for fish protein in the region and contribute significantly to local economic development.

**Table: 3 Levels of Catfish Production in Maiduguri**

Levels (n=100)	Frequency	Percentage	Mean	Min	Max
Low 500kg	12	12.0	2,891.20	202.1	11,122.3
Moderate 2000kg	24	24.0			
Medium 3000kg	45	45.0			
High 5000kg and above	19	19.0			

Source: Field Survey, (2021)

### **Involvement of Women in Catfish Production in Maiduguri**

The involvement of women in catfish production in Maiduguri is detailed in Table 4. The findings reveal that a significant majority (70%) of women do not participate in catfish hatchery operations, while only 30% are involved. This low level of engagement in hatchery activities suggests a lack of interest or possibly insufficient access to training and resources necessary for effective participation in this aspect of aquaculture. Conversely, the results indicate that 89% of the women surveyed own fish ponds, highlighting that a substantial proportion are actively involved in production. This ownership facilitates their participation in fish farming, allowing them to engage in various production practices. Specifically, 52% of the women reported that they both purchase commercial fish meal and prepare local fish meal, demonstrating a blend of traditional and modern practices in their production methods. Additionally, 70% of the women buy fingerlings for their production, indicating reliance on external sources for stock.

Furthermore, the findings show that 95% of the women routinely wash and clean their fish ponds, doing so weekly, bi-weekly, or tri-weekly. This commitment to pond maintenance reflects their dedication to ensuring optimal production conditions, which is crucial for the health and growth of the fish. Overall, these findings imply that while women are significantly involved in catfish production in terms of pond ownership and maintenance, their participation in hatchery activities remains very low. This suggests the need for targeted interventions to encourage and support women's involvement in all facets of catfish farming, particularly in hatchery operations, which could enhance their economic opportunities and contribute to local food security (Mikkelsen, 2012; Mouton *et al.*, 2016).

**Table: 4 Women Involvement in Catfish Production in Maiduguri**

Statement	Frequency	Percentage
<b>Do you involve in catfish hatchery</b>		
Yes	30	30.0
No	70	70.0
<b>Do you own fish pond</b>		
Yes	89	89.0
No	11	11.0
<b>Do you prepare local fish meal or you buy industrial meal</b>		
Yes	52	52.0
No	48	48.0
<b>Do you buy fingerlings</b>		
Yes	70	70.0
No	30	30.0
<b>Do you routinely wash/clean fish pond</b>		
Yes	95	95.0
No	5	5.0

Source; Field Survey, (2021)

### **Benefits of Catfish Production in Maiduguri**

The benefits derived from catfish production among producers are outlined in Table 4.4. The results indicate that a substantial majority (86%) of catfish producers report that their involvement in this industry helps them pay school fees for their children. Furthermore, 94% of the producers highlight that catfish farming generates employment opportunities not only for themselves but also for their ad hoc staff. This employment generation is crucial for local



economies, contributing to poverty alleviation and improved livelihoods (Bene *et al.*, 2016). In addition, 85% of the producers indicate that catfish production has enabled them to secure better accommodation, which reflects an improvement in their standard of living. Moreover, 65% report having access to better education, highlighting the positive impact of their earnings on family education and overall community development. Significantly, 95% of the producers recognize catfish as an excellent source of protein, which contributes to food security and improved nutrition within their households. These findings imply that catfish production offers numerous benefits that enhance the well-being of producers and their families, ultimately leading to increased inputs and outputs in their operations. The positive economic impacts of aquaculture are essential for promoting sustainable development in the region (Ayinla *et al.*, 2007; FAO, 2020).

**Table 5: Benefits of Catfish Production in Maiduguri**

Statement	Frequency	Percentage
<b>Do the profit from catfish production help you in paying school fees</b>		
Yes	86	86.0
No	14	14.0
<b>Do catfish production generate employment for you and your adhoc staff</b>		
Yes	94	94.0
No	6	6.0
<b>from the benefit of catfish production which among the following you own</b>		
Car	32	32.0
House	26	26.0
Better education	65	65.0
Better accommodation	85	85.0
Improve medical care	42	42.0
<b>is the catfish production a good source of protein</b>		
Yes	95	95.0
No	5	5.0

**Source;** Field Survey, 2021

### **Socio-economics Characteristics Influencing Women Involvement in Catfish Production**

Multiple regression analysis was employed to examine the socio-economic factors influencing women's involvement in catfish production in Maiduguri. The model demonstrates a coefficient of determination ( $R^2$ ) of 0.7797, indicating that approximately 77.97% of the variation in the dependent variable can be explained by the independent variables included in the model. This high  $R^2$  value suggests that the model fits the data well. The regression results, presented in Table 6, reveal that several socio-economic variables namely age, marital status, gender, access to extension services, fishing experience, level of education, size of pond, types of enterprises operated, and membership in organizations are statistically significant at the 1% level. This implies that an increase in the coefficients of these variables is associated with higher fish output. For instance, greater access to education and extension services can enhance women's skills and knowledge in aquaculture, thereby improving productivity (Bene *et al.*, 2016). Furthermore, access to credit and household size were found to be significant at the 5% level. This indicates that an increase in the coefficients of these variables will also lead to higher fish production. Specifically, each additional unit of credit access or an increase in household size is likely to result in greater catfish profits. Access to credit can facilitate investments in improved technologies and inputs,



while a larger household size may provide additional labor resources for production activities (Kumar and Quisumbing, 2015). Overall, these findings underscore the importance of enhancing socio-economic conditions and access to resources for women in catfish production, as they can significantly contribute to increased productivity and economic well-being.

**Table 6 Socio-economics Characteristics Influencing Women in Involvement Catfish Production in Maiduguri**

Socioeconomic variables	Coefficient	Std. Err	T-value
Age	0.2511	0.0313	8.0***
Marital Status	0.7068	0.0880	8.0***
Access to credit	0.0782	0.0341	2.3**
Access to extension	0.0579	0.0186	3.1***
Fishing experience	0.0552	0.0251	2.2***
Level of education	0.1485	0.0143	10.4***
Size of pond (Fit)	0.3191	0.1201	2.7***
Income	0.1287	0.0231	5.6***
Household size	0.2271	0.1065	2.1**
Membership of organization	0.3261	0.0207	15.8***
Type of enterprise operate	0.8021	0.2580	3.1***
_cons	2.1790	0.1603	13.6***
<b>R<sup>2</sup></b>		<b>0.7797</b>	

Source; Field Survey, 2021 Note: \*\*, \*\*\* are significant at 5% and 1% respectively.

### Constraints of Women Involvement in Catfish Production in Maiduguri

The constraints faced by catfish producers, as detailed in Table 7, highlight several significant challenges encountered during production. A staggering 98% of the producers reported that the high cost of catfish feeds is a major constraint, while 96% identified a lack of equipment as a critical issue. Furthermore, 94% of the producers indicated that theft or pilfering poses a serious threat to their operations. Additional constraints reported by the producers include a shortage of skilled personnel (89%), low purchasing power (88%), water poisoning due to washed ponds (85%), transportation challenges (84%), poor purchasing mentality (80%), and feed poisoning (61%). These issues collectively impede the productivity and profitability of catfish farming in the region. Notably, the least reported constraint, affecting 52% of producers, is the prevalence of pests and diseases.

**Table: 7 Constraints of Women Involvement in Catfish Production in Maiduguri**

Constraint	Frequency	Percentage
Water poisoning	85	85.0
Pest and disease	52	52.0
Feed poisoning	61	61.0
Shortage of skilled personnel	89	89.0
Lack of equipment's	96	96.0
Theft/Pilfering	94	94.0
Cost of catfish feeds	98	98.0
Transportation	84	84.0
Low purchasing/power	88	88.0
Poor purchasing mentality	80	80.0

Source; Field Survey, (2021) \*multiple response

The implications of these findings suggest that the majority of catfish producers experience significant challenges that hinder their potential income. Addressing these constraints is essential



for enhancing the production function of catfish farming. Targeted interventions, such as improving access to affordable feeds, investing in necessary equipment, and providing training to develop skilled labor, could significantly improve productivity and economic outcomes for these producers (Mouton *et al.*, 2016; FAO, 2020).

## CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study it can be concluded that the level of Involvement of Women in Catfish Production in Maiduguri is low and the risk involved in fish farming is solely borne by the catfish farmers. The findings of this study implies that the men are more likely involved in Catfish Production than their female counterparts. The Catfish business compliment other sources of income in Maiduguri and contribute to the protein requirements of the family. The regression of Socio-economics variables on the Influence of the Involvement of Women in Catfish Production in Maiduguri showed that the model exhibits an  $R^2$  of 0.7797 which explained that the variation of the dependent variable makes the model fit and very well. The age, marital status, access to extension, fishing experience, level of education, size of pond, income, membership of an organization and types of enterprise operates on were all significant a 1% level while access to credit and household size were significant at 5% level. Lastly the major constraints faced were cost of Catfish feeds, lack of equipment and theft/ pilfering.

Catfish Production in Maiduguri is a viable venture that generate employment especially to Women. Based on the finding this study, the following recommendation were made:

- i. The cost of Catfish feeds in Maiduguri is escalating and is dwindling the profit of Women involved in Catfish Production. It is imperative that government, stakeholders and NGO to look into the lingering situation with the subsidized fish feeds.
- ii. There is shortage of skilled personnel to inculcate the technical know-how to Women Catfish farmers. It is therefore, recommended that NGO, extension agency to train more personnel in order to stop down the training to teaming Women Catfish farmers.
- iii. Creation of avenues for sourcing/accessing loan will go a long way in assisting the Women farmers in having input to inject in Catfish Production.
- iv. Majority of Women in Catfish Production use not having the skills/technical know-how on how to hatch. This made them rely on buying Catfish. It is therefore recommended that extension agents/stakeholders should organized training for Women in Catfish Production.
- v. The government should create a conducive enabling environment such as provision of social amenities in the fishing communities. Despite their being the major contributor to the domestic fish output.

## REFERENCES

- Adeleke, M. L. and Afolabi, M. T. (2012). Fish as a Source of Protein: Importance and Nutritional Value. *Journal of Agricultural and Food Science*, **10**(3):45–52.
- Adewumi, A. A. and Olaleye, V. F. (2011). Catfish culture in Nigeria: Progress, prospects and problems. *African Journal of Agricultural Research*, **6**(6):121–128.
- Ajao, E. A., Komolafe, O. O. and Adedokun, F. O. (2012). Women's Participation in Fisheries: A Case Study of Maiduguri. *Nigerian Journal of Rural Extension and Development*, **8**(1), 70–75.
- Akinrotimi, O. A., Abu, O. M. G. and Aranyo, A. A. (2011). Transforming aquaculture from subsistence to commercial level for sustainable development in Niger Delta region of Nigeria. *Journal of Agriculture and Social Research*, **11**(1):22–29.
- Ayinla, O. A. (2007). Analysis of feeds and fertilizers for sustainable aquaculture development in Nigeria. In M.R. Hasan, T. Hecht, S.S. De Silva, & A.G.J. Tacon (Eds.), Study and analysis of feeds and fertilizers for sustainable aquaculture development (FAO Fisheries Technical Pp.49).



- Ayinla, O. A. (2007). Analysis of Feeds and Fertilizers for Sustainable Aquaculture Development in Nigeria. *Journal of Agricultural and Food Science*, **4**(7):453–470.
- Ayinla, O. A., Fagbenro, O. A. and Balogun, J. K. (2007). The Role of Aquaculture in Food Security in Nigeria. In D. J. B. De Silva & S. S. De Silva (Eds.), *Food security and aquaculture: The Role of Aquaculture in Sustainable Development* (19-30). Colombo: FAO.
- Bello, M. (2017). An Analysis of Economic Activities in Maiduguri Metropolis. *Journal of Economic Studies*, **15**(2):45–58.
- Bene, C., Paul, M. E. and Pomeroy, R. (2016). The Role of Fish in the Nutritional and Economic well-being of small-scale fishers: Evidence from rural households in Africa. *World Development* **8**(4):58-69.
- Bene, C., Paul, M. E. and Pomeroy, R. (2016). The role of fish in the nutritional and economic well-being of small-scale fishers: Evidence from rural households in Africa. *World Development*, **4**(8) 14-20.
- Borno State Ministry of Home Affairs, Information and Culture. (1992). *Cultural Diary of Borno State*. Maiduguri, Nigeria.
- Bulama, Y. M., Idi, A. S., Jibrin, S. A. and Mustapha, F. M. (2020). Value chain analysis of the African Catfish (*Clarias gariepinus*) among women farmers in Jere Local Government Area, Borno State, Nigeria. *Nigerian Journal of Fisheries and Aquatic Sciences*, **8**(2):78–85.
- Bureau of Land and Survey Maiduguri. (1996). *Maiduguri Metropolitan Area Report*. Maiduguri, Nigeria.
- Central Bank of Nigeria (CBN). (2021). *Fish Production and Importation Report*. Abuja: CBN Publications.
- Emmanuela, O. C. (2014). Overview of Aquaculture in Nigeria. *Nigerian Journal of Fisheries Science*, **2**(1):25–33.
- Ezenwa, B. I. O., Alegbeleye, W. O., Oladosu, G. A., & Ayinla, O. A. (2006). A review of the status of aquaculture in Nigeria. Nigerian Institute for Oceanography and Marine Research (NIOMR).
- FAO. (2016). *The State of World Fisheries and Aquaculture*. Rome: Food and Agriculture Organization of the United Nations.
- FAO. (2020). *The State of World Fisheries and Aquaculture 2020: Sustainability in action*. Rome: Food and Agriculture Organization of the United Nations.
- FAO. (2020). *The State of World Fisheries and Aquaculture 2020: Sustainability in action*. Rome: Food and Agriculture Organization of the United Nations.
- Green Facts. (2014). *Fish Farming and Aquaculture*. Retrieved from [www.greenfacts.org](http://www.greenfacts.org)
- Kareem, R. O., Ayanboye, C. A. and Babalola, D. A. (2012). Health Benefits of Fish and the Nigerian Dietary System. *African Journal of Food and Nutritional Science*, **4**(2):15–21.
- Kumar, N. and Quisumbing, A. R. (2015). Gender inequality in ownership of productive assets in developing countries: *A literature review*. In D. J. L. C. A. R. Quisumbing & R. B. M. K. K. S. (Eds.), *Gender and Land: Evidence from Rural Areas in Africa and South Asia* (pp. 21-45). International Food Policy Research Institute (IFPRI).
- Lake Chad Research Institute. (2007). *Annual Report on Weather Patterns*. Maiduguri, Nigeria.
- Merriam-Webster. (2021). Fish - Definition and Facts.
- Mikkelsen, E. (2012). *Women in aquaculture: The role of women in fish farming and management*. In R. J. L. P. Pomeroy & E. A. Katona (Eds.), *Aquaculture and the Environment* 321-335. Oxford: Wiley-Blackwell.
- Mohammed, S. T., Ghidde, A. A., Shettima, B. G. and Umoru, M. Y. (2023). Resource-use efficiency of male and female fish farmers in Maiduguri: A comparative analysis. *Nigerian Journal of Fisheries and Aquatic Sciences*, **11**(1):45–55.
- Moses, B. S. (2006). *Fisheries in Nigeria: Past, Present and Future*. Calabar: University Press.
- Mouton, A. J., Gültekin, O., & De Silva, S. S. (2016). Gender roles in aquaculture: A review of the evidence from Southeast Asia. *Fisheries Research*, **174** 163-175.
- Mouton, A. J., Gültekin, O. and De Silva, S. S. (2016). Gender roles in aquaculture: A review of the evidence from Southeast Asia. *Fisheries Research*, **7**(4):163-175.
- Mutume, G. (2014). Africa's Fish Industry and Export Potentials. *Africa Renewal*, **28**(1):30–34.
- National Population Commission of Nigeria. (2006). *Population and Housing Census of the Federal Republic of Nigeria: National and State Population and Housing Tables*. Abuja, Nigeria.
- NEPAD. (2015). *Fish for All Summit: Mobilizing Africa's Private Sector for Aquaculture Development*. Addis Ababa: New Partnership for Africa's Development.
- Nigeria Fishery Statistics. (2016). *Annual Report on Agricultural GDP and Fisheries Contribution*. Abuja: Federal Ministry of Agriculture.



- Nigerian Meteorological Agency (NiMet). (2014). *Annual Weather Report*. Abuja, Nigeria. [ResearchGate+1Wikipedia+1](#)
- Olaniyi, C. O. and Omitogun, O. G. (2012). Breeding and Genetics of African Catfish. *Journal of Aquaculture Research and Development*, **3**(4):33–39.
- Umar, H. M., Modu, B. M., Mohammed, Z. B. and Yagana, A. (2023). Analysis of socio-economic and practices of fish farmers towards fish health management in Maiduguri and its environment. *FUDMA Journal of Sciences*, **7**(2):123–130.
- Umar, I. S., Mohammed, A. M. and Sanda, A. R. (2017). Women in Fisheries and the Effects of Insurgency in Borno State. *Journal of Agricultural Extension*, **21**(3):48–56.
- United Nations (UN). (2012). *Gender Equality and Women's Empowerment in Agriculture*. New York: UN Women.