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ASSESSMENT OF CHALLENGES AND COPING STRATEGIES OF MAJOR INPUT RESOURCES IN CATFISH FARMING

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Abstract

This study assesses the challenges catfish farmers are facing in the procurement of these input resources and coping strategies employed to control them for the farmers to remain in business. This study was carried out in Ibadan, the capital of Oyo State, Nigeria. A multistage sampling method is employed in this study. Three local government areas were purposefully selected among the eleven in Ibadan, Oyo State. The selected local governments were Oluyole, Ido, and Lagelu. Then, the snowball sampling method was employed to administer the prepared structured questionnaire. Descriptive and inferential statistics were used to analyze the data obtained. The results show that the majority (86.4%) of the catfish farmers depend on catfish breeders to source their fish seeds, with many having multiple sources to avoid disappointment in comparing costs and best fish seed. Among the challenges identified by the farmers are bad quality fish seeds that result in stunted growth, high cost of fish seed and fish feed, and poor-quality feed which usually pollutes pond water. Many farmers agreed that they breed their fish themselves to ascertain its quality, and stunted fish should be sold early. Farmers increase the cost price of their fish, use homemade feeds, and buy feeds in bulk to cushion the effect of the high cost of feed.

Key words**:** *fish seeds, fish feed, stunted growth, catfish farmers, resources*

INTRODUCTION

Catfish farming is no doubt a profitable enterprise, but the success and profitability of the enterprise are limited by various inherent challenges (Alawode and Ajagbe, 2020) [5]. Onyekuru *et al*. (2019) [21] and Kehinde (2022) [14] explained that some farmers may run at a loss or out of business after a few years of practicing due to insufficient planning, budgeting, and execution of the production plan, and without proper knowledge about the into business's profitability. This could be one of the reasons for the annual recurring fish deficit supply, which incapacitated aquaculture from meeting the expected demand for fish production in Nigeria (Iruo *et al*. 2018) [12]; yet aquaculture with all available resources has the potential to meet fish demand in Nigeria. This should not discourage anyone planning to venture into the business, since every profitable business has associated risks and threats that could hinder the expected profit. Successfully managing these risks and threats is a profit determinant of any adjudged profitable venture. Aphunu and Agwu (2014) [7] explained the need for catfish farmers to have competency in knowledge, skills and techniques involved in efficiently managing fish to maximize production. This is the reason why the analysis of strengths, weaknesses, opportunities, and threats (SWOTs) of any business is highly recommended to be carried out before the actual start-up of any business (Elfitasari and Albert, 2017) [9].

In aquaculture, especially in catfish farming, challenges are evenly distributed across every stage of production from the acquisition of ponds, and fish seeds (fry, fingerlings and juveniles) to the marketing of table-size catfish. The most prominent among these challenges besides water relates to the two major input resources *vis a viz* procurement of quality fish seeds and quality fish feed. Water

is an essential resource in fish farming. It is required in both in good quality and in abundant quantity. Notwithstanding in Nigeria, many catfish farmers usually ignore the cost of securing quality water in the required amount and in addition, usually do not recognize it as a challenge that can limit catfish production. However, water in an actual sense is a limiting factor to the optimum productivity of fish (Mohammad and Haque, 2021) [15]. Water is to fish what air is to human beings. It is the immediate environment of fish that supports the existence of fish.

Omeje *et al*. (2020) [20] and Onyekuru *et al*. (2019) [21] reported that the use of poor-quality catfish seeds and the high cost of feeds are among the factors for the low level of catfish production in Nigeria. Likewise, Shitote *et al*. (2013) [22] reported similar challenges in Kenya that lack of certified quality seed (Fingerlings) and commercially produced feeds are among the problems facing the fish farming sector.

The quality and viability of fish seeds are essential for the survivability, optimum growth, and harvest yield of the stocked catfish. The genetic makeup of catfish contributes to the growth and feed efficiency or feed conversion ratio (Jamabo *et al*. 2015) [13]. Likewise, the quality and quantity of fish feeds contribute to the growth and harvest yield of catfish at the end of the production cycle. Many authors have adjudged its contribution to catfish production as the highest which can be up to 70% of the total input resources (Ashley-Dejo *et al*. 2017; Onyekuru *et al*. 2019) [8, 21]. Therefore, without mincing words, fish feed could be seen as a major determinant of profitability in catfish production (Eriegha and Ekokotu, 2017) [10]. For this purpose, Zlaugotne *et al.* (2022) [24] reported the need for efficient and sustainable fish feed and most importantly the feed costs must be economically justified.

Therefore, this study aims to assess the challenges associated with the acquisition of fish seeds and fish feed as well as some coping strategies adopted by the farmers to keep themselves in the business.

MATERIALS AND METHODS

The Study Area

This study was carried out in Ibadan, the capital of Oyo State located in the South Western part of Nigeria. The rainy season in Ibadan is between March and October, while the dry season is between November and February. Agricultural activities in Ibadan are characterized mostly by secondary and quaternary services, although there are still features of primary functions such as farming. Ibadan is known as a hub for catfish production. Catfish marketers source their fish from Ibadan to sell to other parts of Nigeria.

Data collection and analysis

The population of the study is catfish farmers in Ibadan. A multistage sampling method is employed in this study. Three local government areas were purposefully selected among the eleven local government areas in Ibadan, Oyo State. The selected local governments were Oluyole, Ido, and Lagelu. Then, the snowball sampling method was employed to administer the prepared structured questionnaire since the number of respondents could not be ascertained during the sampling period. The sampling relies on the introduction of different catfish farmers by their colleagues who have met and responded to the questionnaire. Some visited areas in these three local government areas are Fodacic Adeoyo, Omi Panada, and Olodo.

A structured questionnaire was used to collect data from the respondents. The questionnaire focused on issues such as the socioeconomic characteristics of catfish farmers in the study area, means of sourcing Fish seeds and culture period, challenges associated with sourcing of fish seeds and challenges associated with catfish feeding. A total of 125 copies of the questionnaire were duly attended to by the respondents in the study areas. Descriptive and inferential statistics were used to analyze the collected data.

RESULTS AND DISCUSSIONS

Socio-economics characteristics

Catfish producers in the research locations are categorized according to their socioeconomic status in Table 1. From 23 to 77 years old, the farmers range in age. Within the study

locations, the average age of catfish farmers is 48.16±1.79 years, with the modal age class interval falling between 51 and 60 years old. According to Omeje *et al*. (2020) [20], the mean age of farmers in the Kainji Lake Basin of Nigeria was 36.7 years. This result is more noteworthy. A record of male domination in the catfish farming industry exists, even though both genders engage in the company (Ashley-Dejo *et al*. 2017;Onyekuru *et al*. 2019) [8, 21]. Concerns concerning male dominance and low female participation in paid initiatives in many emerging economies have been raised by the International Labour Organization (ILO) (2016) [11]. The industry's intense labor- and management-intensive character and male dominance in catfish production (Omeje *et al*., 2020) [20] are further factors contributing to this phenomenon. Farmers in the study area are entirely literate, with men making up the majority (68%) of farmers. 13.6% of them had completed at least elementary school, 34.4% had completed secondary school, and 52% had completed postsecondary education. So, unemployed graduates may find self-employment options through catfish farming.

Six to ten children make up the bulk of farmers' families (54.4%), with most of them being married (92%). Furthermore, suggested by this was that catfish farming in Nigeria provides a stable means of income for households to survive. Marital status is seen as a sign of social duty, trust, and success, according to research by Iruo *et al.* (2018) [12]. With an average experience of 11.26±0.98, the catfish farmers in the research region ranged in years from 2 to 27. It is noteworthy that many catfish farmers (32%) had experience ranging from 1 to 5 years, whilst only 4% had experience exceeding 21 years. Elfitasari and Albert (2017) [9] noted that a crucial prerequisite for the success of catfish farming operations is years of experience along with sufficient technical and administrative abilities (Olaleye *et al*. 2019) [19].

Since just 48% of the fish farmers in the research region are members of a catfish farmers association and 52% are not, the majority of fish farmers in the area are unconcerned about belonging to one.

Table 1. Socio-economic of catfish farmers

Variables	Frequency	Percentage (%)	Mean
Age			
20 - 30	17	13.6	48.16±1.79
31 - 40	23	18.4	
41 - 50	25	20	
51 60	40	32	
61 - 70	15	12	
71 - 80	5	4	
Maximum: 77	Minimum: 23		
Gender			
Male	85	68	
Female	40	32	
Education			
Tertiary	65	52	
Secondary	43	34.4	
Primary	17	13.6	
Marital status			
Married	115	92	
Single	10	8	
Family size			
1 – 5	57	45.6	
6 – 10	68	54.4	
Years of experience			
1 – 5	40	32	11.26±0.98
6 – 10	25	20	
11 – 15	20	16	
16 – 20	35	28	
>21	5	4	
Maximum: 27	Minimum: 2		
Member of catfish association		0	
No	65	52	
Yes	60	48	

Source: Data Analysis, 2023.

Fish seed and culture period

Table 2 shows how the farmers source their fish seeds and different culture periods in the study area. The majority (86.4%) of the catfish farmers depend on catfish breeders to source their fish seeds either fry, fingerlings or juveniles. This observation agrees with the findings of Iruo *et al.* (2018) [10] that a more significant proportion of the fish farmers obtained their fingerlings from hatcheries while Ashley-Dejo *et al*. (2017) [8] are of the contrary opinion that many of their respondents sourced their fish seed from personal own fish farm. Many catfish farmers (68%) have multiple sources for sourcing their fish seeds, which vary between 2 to 6 breeders while 32% have only one source of breeders.

Table 2. Means of sourcing Fish seed and culture period

Variables	Frequency	Percentage (%)	Mean±SD
Sources of fish seeds			
Self	17	13.6	
Fish breeders	108	86.4	
Number of fish sources			
1	40	32	
2	40	32	
3	40	32	
6	5	4	
Why have more sources			
Disappointment	48	38.4	
To compare the best	62	49.6	
To compare the cost	15	12	
Fish seed stocked			
Fry	5	4	
Fingerling	12	9.6	
Juvenile	108	86.4	
Suitable time to stock			
Raining season	88	70.4	
Anytime	37	29.6	
Stocking per year			
Once	18	14.4	
Twice	60	48	
Thrice	47	37.6	
Number of fish stocked			
1 – 2,000	70	56	
2,001 – 4,000	20	16	
4,001 – 6,000	10	8	
6,001 – 8,000	15	12	
8,001 – 10,000	5	4	
>10,000	5	4	
Culture period			
3 – 4 months	40	32	6.0±2.37
5 – 8 months	65	52	
9 – 12 months	20	16	

Source: Data Analysis, 2023.

The farmers justified having multiple sources for sourcing fish seeds including disappointment (38.4%), comparison of best fish seeds (49.6%) and comparison of cost of fish seed (12%). Most of the farmers preferred to stock juvenile fish seed instead of fry and fingerlings. This could be due to juvenile fish seed's high survival rate over both fry and fingerlings. The majority (70.4%) of the farmers agreed that catfish are best stocked during the rainy season.

This could be due to water availability to raise fish to maturity. However, some (29.6%) catfish farmers think that catfish can be stocked any time of the year.

Therefore, many farmers (37.6%) stocked their ponds thrice, while 48% stocked their ponds twice and 14.4% stocked their ponds once per year. This could be associated with the length of the culture period and expected harvest weight.

Table 2 shows that the length of the culture period for catfish production varied between 3 and 10 months.

This result agrees with the report of Adewumi (2015) [2] that catfish can be cultured and grow to a minimum acceptable marketable size in a reasonable growing period (between 4 and 9 months) depending on the production system.

Most (52%) catfish farmers raise their fish for a period varying between 5 to 8 months, 32% raise their fish between 3 to 4 months while 16% raise their fish between 9 to 12 months, while the average culture period is found to be 6.0±2.37.

This is consistent with the findings of Adeyemo *et al*. (2011) [3] who reported that it takes an average of eight months to produce catfish in Ibadan, Nigeria. Most (56%) catfish farmers stocked up to 2,000 juveniles in their ponds per production cycle.

Challenges of sourcing of fish seeds

The challenges of catfish growers experiencing in finding fish seed are indicated in Table 3. Most farmers (60%) felt that the most significant obstacles were the cost of fish seed, mobility, and distance. By contrast, 17.6% of farmers thought that the main problem was the stunted fish seed, while 22.4% thought sick or poor-quality fish seed was a concern. There has been minimal growth in the stocked fish seed for many (44%) catfish producers. Many (48%) cited water contamination or scarcity as the reason for the minor modifications. Some agreed that the time spent stocking the fish might be a factor. However, few people thought that over-sorting fish seed or runt, inadequate or irregular feeding, bad quality feed and water, and inexperienced farmers were to blame. The results are consistent with the study by Suwarsito *et al*. (2022) [23], which found that a decline in fish appetite is caused by deteriorating water quality.

Fish development thus slows down. However, poor seed, overstocking or overcrowding, poor water management, infection and diseases that reduce growth, poor feed management could be the major causes of stunted growth in catfish.

Table 3. Challenges associated with sourcing of fish seeds

Variables	Frequency	Percentage (%)
Sourcing fish seed		
Distance, mobility, and cost	75	60
Stunted growth	22	17.6
Sick/bad quality seed	28	22.4
Experience of stunted growth		
No	70	56
Yes	55	44
Causes of stunted		
Time factor	47	37.6
Water scarcity/pollution	60	48
Bad source and inexperience	8	6.4
Poor feed quality and water	5	4
Runt, over sorting	5	4
What to do with stunted fish		
Proper feeding	55	44
Dispose of it / early harvest	65	52
Change water	5	4
Control of stunted growth		
Maintain good water quality	45	36
Self-breeding	33	26.4
Proper care and feeding	47	37.6
Using a particular fish feed		
No	105	84
Yes	20	16
Reasons for changing fish feed		
Protein requirements at different growth stages	60	48
Cost and availability	60	48
Profit	5	4
Response to change of fish feed		
Slow response	68	54.4
Good response	57	45.6
Average fish weight at harvest		
0 – 1 kg	28	22.4
1 – 2 kg	45	36
>2 kg	52	41.6
Times of feeding per day		
Twice	125	100

Source: Data Analysis, 2023.

In contrast, some farmers (44%) said intensive and correct feeding regime may result in a better transformation. Many farmers (52%) felt that once such a situation is noticed on the farm, it is best to harvest the fish early and sell them off. However, many respondents (37.6%) agreed that catfish require extensive food management to prevent stunted growth, and 36% said that preserving high water quality would assist in resolving the issue. By contrast, 26.4% of respondents believe that fish farmers should develop their fish seeds to guarantee seed quality and prevent the problem of stunted growth in catfish farming. When it came to raising catfish, many farmers (84%) admitted to utilizing multiple fish feeds. The rationale behind their decision was based on three factors: the cost and accessibility of feed (48%) the varied protein requirements of catfish at different life stages (48%) and the anticipated profit (4%). It is advisable to use caution when combining other meals. According to Mramba and Kahindi (2023) [16], feed—especially non-conventional feed—is a source of pathogens, which can lower water quality and raise the danger of infections. Farmers generally (100%) said that they feed their fish twice a day, and many (54.4%) agreed that catfish react slowly to changes in diet. Many farmers (41.6%) also raised their fish to harvest weights greater than 2 kg.

Challenges associated with catfish feeding

Table 4 shows the challenges associated with catfish feeding. All the farmers agreed that the price of catfish feed is increasing. The high cost of commercial fish feeds is a major limiting factor for the profitability in aquaculture (Adeogun *et al*. 2007) [1]. Shitote *et al*. (2013) [22] emphasized that commercially produced feeds are hard to come by and when available, are expensive for most farmers to afford. The implication is that the cost of production of catfish will invariably increase. This is because the feed cost in catfish production is observed to be the single largest input resource that determines the enterprise's profitability. The majority (84%) of catfish farmers agreed that the increasing cost of fish feed hurts the business's profitability. This observation agrees with the report of Okpeke and Akarue, (2015) [18]. Therefore, catfish farmers adopted various strategies to cope with the increasing cost of fish feed. Such systems include increasing catfish selling price at harvest (37.6%); and using homemade or locally produced meals with adjusted feed composition or formulation (26.4%) while 36% of them increase their capital base by securing more loans. This shows that due to the high cost of imported feeds, many catfish farmers are forced into using locally produced meals that are not up to international standards. The use of homemade or locally made feed has negative impacts on pond water. Most (94.4%)

of the farmers agreed that those feeds pollute the pond water. Elfitasari and Albert (2017) [9] reported that internal and external factors cause pollution of pond water. Such feeds that pollute pond water according to the farmers are maggot blood meal (62.4%), locally made feeds (28%), and sinking pelleted feed (9.6%). Mohammad and Haque, (2021) [15] identified daily feed input as one of the substances contributing to pond water deterioration. Likewise, Mramba and Kahindi, (2023) [16] are of the opinion that pond management practices such as daily feed input, stocking density, and fertilization have a significant impact on water quality. All farmers agreed that once pond water is observed to is polluted, it should be changed. This is necessary because reduced water quality will weaken and reduce fish's immune systems and make them vulnerable and easily susceptible to disease, which will invariably reduce their survival rate (Suwarsito *et al.* 2022) [23].

Catfish farmers in the study area are indifferent on the mode of feeding fish, as 50.4% agreed that they do not feed their fish to satiation, while 49.6% confirmed that they do provide their fish to satiation. Feed management becomes essential in catfish farming due to the following reasons as given by the farmers: fish feed is wasted if fish is fed in excess (37.6%). This could be because fish feed cannot be retrieved after being given to fish in water like other livestock. In addition, 34.4% of the farmers agreed that feeding fish should be discouraged due to scarcity of resources or funds (34.4%) and some (28%) farmers believed that if the feed is supplied in excess, the pond water may be polluted, and fish may die. These observations agree with the report of Eriegha and Ekokotu (2017) [10] that feeding fish in excess will result in wastage of valuable feed nutrients, poor fish growth, and a high possibility of water quality deterioration, which could culminate in fish mortality and reduced profitability.

Many (54.4%) farmers agreed that there is an advantage in buying fish feed in bulk. However, catfish farmers identified some challenges that can cause discouragement of the practice. Most (68%) farmers identified rat and cockroach attacks as a challenge, some (12%) identified loss of flavor and mold infestation while few (8%) identified expiration of the feed as challenges that cause discouragement of buying catfish in bulk.

Table 4. Challenges associated with catfish feeding

Variables	Frequency	Percentage (%)
Increasing cost of fish feed		
Yes	Yes	100
Coping with high cost of feed		
Increase catfish selling price	47	37.6
Go for loan	45	36
homemade/ adjust formulation	33	26.4
Negative impact on profitability		
No	20	16
Yes	105	84
Impact on pond water		
it does pollute water	118	94.4
no impact	7	5.6
Feeds that pollute pond water		
Locally made feeds	35	28.0
Maggot and blood meal	78	62.4
Sinking pelleted feed	12	9.6
What to do		
Change pond water often	125	100
Feeding fish to satiation		
No	63	50.4
Yes	62	49.6
Reason for feed management		
Wastage	47	37.6
Lack of funds	43	34.4
They die if the food is too much	35	28
Is there any advantage in buying fish feed in bulk		
Yes	68	54.4
No	57	45.6
Challenges of storing fish feeds		
Rat and cockroach	85	68
Loss of flavor	15	12
Expiring	10	8
Mold infestation	15	12

Source: Data Analysis, 2023.

Impact of socioeconomic on challenges

The dependent variables, such as stunted development, use of single fish feed, bulk feed purchases, and the impact of high feed costs on profitability, were tested using binary logistic regression to see if they affected the demographics of catfish producers at $P < 0.05$. Age and family size were impacted by stunted growth, as Table 5a demonstrates. According to Shitote *et al*. (2013) [22], despite frequent feeding using government-supplied feed, most fish producers in Kenya complained about undersized fish. Similarly, using single fish

feed affected age, marital status, and years of experience. About 20% more money is made by businesses when there is a 20% rise in marital status, particularly in very healthy marriages (Ahituv and Lerman, 2005) [4]. Experience is crucial for overcoming obstacles related to catfish farming, like the high cost of fish feed, according to Ashley-Dejo *et al*. (2017) [8]. According to Omeje *et al*. (2020) [20], farmers' experience is crucial in the sustainability, productivity, and management of catfish production.

Additionally, Table 5b demonstrates how bulk catfish feed purchases impacted age and family size. The profitability of high feed costs also impacted age, gender, education level, and family size. The present discovery aligns with the findings of Ngeywo *et al*. (2015) [17], who reported that age is an important determinant of a farmer's productivity and profitability. The degree of education significantly impacts the production and profitability of catfish farming, according to Onyekuru *et al*. (2019)[21]. More significant family sizes give catfish farming a free labor force to boost output and profitability (Amsalu and de Graaff, 2007) [6].

Table 5a. Impact of dependent variables on the catfish demographic

	Stunted growth			**Use of single fish feed**		
Variables	Coefficient	T-value	P-value	Coefficient	T-value	P-value
Age	1.062*	3.647	0.056	-4.197*	3.77	0.052
Gender	-0.58	0.315	0.574	-26.398	0	0.998
Education	0.499	0.382	0.537	-0.904	0.265	0.607
Marital status	-0.009	0	0.995	7.927*	4.33	0.037
Family size	8.89764*	5.472	0.019	0.014	0	0.989
Experience	-0.582	1.251	0.263	5.569*	4.198	0.04

Source: Data Analysis, 2023.

Table 5b. Impact of dependent variables on the catfish demographic

	Bulk purchase of feed			**Impact of feed on profitability**		
Variables	Coefficient	T-value	P-value	Coefficient	T-value	P-value
Age	1.14*	4.563	0.033	1.391*	3.864	0.049
Gender	1.074	1.099	0.294	-2.777*	3.761	0.052
Education	-0.122	0.025	0.874	2.22*	3.356	0.067
Marital status	-0.456	0.135	0.714	-1.178	0.672	0.412
Family size	-1.823*	4.493	0.034	-2.19*	3.225	0.073
Year of experience	-0.778	2.26	0.133	-0.239	0.154	0.695

Source: Data Analysis, 2023.

CONCLUSIONS

Like any other industry, catfish farming has a limited potential profit margin. Due to some inherent problems, producers may not even break even or perhaps experience a loss. The effective handling of these difficulties increases the business's potential for profitability. High-quality catfish seeds and feedstuffs are essential for a profitable catfish farming operation. Catfish with stunted growth are a common problem for farmers due to poor-quality fish seeds. This is the reason why a lot of farmers get their fish seeds from different places. Upon noticing their fish's growth is impeded or inhibited, they typically sell off their stock. If you want to learn how to breed to assure the quality of your fish seeds, it is recommended that you obtain them from government-approved hatcheries or independent farmers. Catfish growers are finding it increasingly difficult to manage and sustain the exorbitant expense of fish feed. Many catfish producers have employed homemade or local feed to grow their fish. Many people feed their fish unusual feed supplies, such as poultry excrement, which frequently contaminates pond water and occasionally has been shown to have infections that are dangerous to fish. To save their industry, catfish farmers are thus putting out intense demands for assistance from the government and other essential parties.

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