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Research Article | **Araştırma Makalesi**

Effectiveness of Anchor Borrowers' Program on Fish Farming in Osun State, Nigeria

Nijerya'nın Osun Eyaletinde Balık Çiftçilerine Yönelik Sabit Borçlular Destek Programı Etkililiği

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Abstract: The main objective of this study is to ascertain the effectiveness of Anchor Borrowers' Program (ABP) on fish farming (FF) in Osun State, Nigeria.120 smallholder fish farmers Participating in ABP (PABP) were chosen using a multi-stage sampling approach. Data were obtained between January and March of 2023. Interview schedule was used to collect data on respondents' demographic characteristics, sources of information on FF (SIFF), benefits derived (BD) from PABP, constraints to PABP, and effectiveness of ABP (EABP) in FF. Data were analyzed using frequency count, percentage, mean, Chi-square, and Pearson Product Moment Correlation. Most respondents' were males (75.8%), members of fish farmers association (68.3%), and aged 46.0±9.0years. The FF information was accessed mostly through ABP representatives ($\bar{x}$=1.7). Access to SIFF was moderate (63.3%), and BD was moderate (66.7%). Increase production ($\bar{x}$=1.7) was the most BD from PABP. Poor access to water ($\bar{x}$=1.8) was the highest constraint to PABP. Constraints to PABP were moderate (74.2%), and EABP in FF was moderate (68.3%). EABP in FF was influenced by SIFF (r=-0.15). ABP representatives (r=-0.22), family and friends (r=-0.28), newspaper (r=0.16), cell phone calls (r=0.20) and extension agents (r=-0.21) information source types significantly influenced EABP in FF. The anchor borrowers' program was moderately effective in fish farming and this was influenced by sources of information on fish farming.

Keywords
- Anchor borrowers
- Aquaculture
- Effectiveness
- Fish farmers
- Fish farming

Özet: Bu çalışmanın temel amacı, Nijerya'nın Osun Eyaletindeki Sabit Borçlular Destek Programının balık yetiştiriciliği üzerindeki etkililiğini tespit etmektir. Sabit Borçlular Destek Programına katılan 120 küçük ölçekli balık çiftçisi çok aşamalı bir örnekleme yaklaşımı kullanılarak seçilmiştir. Veriler 2023 yılının Ocak ve Mart ayları arasında elde edilmiştir. Katılımcıların demografik özellikleri, balık çiftçileri hakkındaki bilgi kaynakları, sabit borçlular destek program katılımından elde edilen faydalar, katılımla ilgili kısıtlamalar ve programın etkililiği hakkındaki verileri toplamak için görüşme program kullanıldı. Veriler frekans sayısı, yüzde, ortalama, Ki-kare ve Pearson Ürün Moment Korelasyonu kullanılarak analiz edildi. Ankete katılanların çoğu erkek (%75,8), balık yetiştiricileri derneği üyesi (%68,3) ve 46,0±9,0 yaşındaydı.. Balık çiftçilerinin bilgilerine çoğunlukla sabit borçlular destek program temsilcileri aracılığıyla ulaşıldı ($\bar{x}$ = 1,7). Balık yetiştiricileri ile ilgili bilgi kaynaklarına erişim orta düzeydeydi (%63,3) ve elde edilen fayda da orta düzeydeydi (%66,7). Üretim artışı ($\bar{x}$=1,7) sabit borçlular destek programına katılımdan elde edilen en büyük faydaydı. Suya erişimin zayıf olması ($\bar{x}$=1,8) sabit borçlular destek programı katılımındaki en büyük kısıtlamaydı. Sabit borçlular destek program katılımındaki kısıtlamalar orta düzeydeydi (%74,2) ve program etkililiği de orta düzeydeydi (%68,3). Destek programının etkililiği balık yetiştiriciliği ile ilgili bilgi kaynaklarına erişimden etkilenmiştir (r=-0,15). Ayrıca program temsilcileri (r=-0,22), aile ve arkadaşlar (r=-0,28), gazete (r=0,16), cep

Anahtar kelimeler
- Sabit borçlular
- Su ürünleri yetiştiriciliği
- Verimlilik
- Balık çiftçileri
- Balık çiftçiliği

telefonu görüşmeleri (r=0,20) ve dahili acenteler (r=-0,21) bilgi kaynağı türleri de destek programına katılımı anlamlı olarak etkiledi. Bu destek program orta düzeyde etkiliydi ve bu etki durumunda balık yetiştiriciliği konusundaki bilgi kaynaklarına erişimin etkisi olmuştur.

1. INTRODUCTION

Aquaculture is the farming/cultivation of various aquatic species (aquatic animals and plants) in fresh, brackish and saltwater (Kaleem and Sabi, 2021). The aquaculture industry is a worldwide or global phenomenon. The industry, compared to all other animal food production industries, continues to develop at an average global annual growth rate of 8.8 percent annually (Onada and Ogunola, 2017). Approximately 424 aquatic species, including aquatic plants and animals, crustaceans, mollusks and fish, are cultivated around the world, which benefits millions of people by its production acting as a viable economic activity for nutrition, food security, sustainable livelihood, and poverty alleviation (Galappaththi et al., 2020). World aquaculture has grown significantly over the past 20 years to become a key economic sector that produces more than half of the world's seafood (Joseph**,** 2023). Fish farming (FF) is a segment of the aquaculture business that focuses on raising fish under controlled conditions for market and/or personal use (Samuel, 2020).

Nigeria is one of the Africa's leading producers of aquaculture and the leading producer in Sub-Saharan Africa (SSA). The country's aquaculture industry mostly concentrates on freshwater fish, with catfish species accounting for 64% of production (WorldFish, 2018). In the country, fish farming is without a doubt one of the agricultural and aquaculture industries with the quickest rate of growth (FAO, 2020; FAO, 1991). The country produces the most farmed fish in SSA, making about 52% of the overall production (Kaleem and Bio SingouSabi, 2021). Fish production in the country has increased 12% annually, over the past 35 years, rising from just over 6000 metric tons in 1980 to approximately 307,000 metric tons in 2016 (Kaleem and Bio SingouSabi, 2021). Nigeria's artisanal fisheries have been the focus of federal government efforts for the past 20 years because they are known to account for more than 95% of the nation's fish production.

Nigeria offers the largest market for fish and fisheries products in Africa (Samuel, 2020). Nigerians are high fish consumers. For the average Nigerian, fish makes up roughly 41% of their entire animal protein consumption. Thus, in an effort to boost aquaculture and/or fish productivity in order to meet the high increase in fish demand in the country, the Nigerian federal government over the years established fish production interventions (programs, projects and policies). The Unsubsidized Revolving Loan Scheme to Fishermen, International Assistance for Fisheries Development in Nigeria, and National Accelerated Fish Production (NAFP) are a few of the interventions. Despite these foregoing interventions as well as a lot of opportunities and possibilities, Nigeria is yet to completely explore its aquaculture and/or fish farming (FF) potentials. According to Samuel (2020), by comparison, the FF business is still in its infancy compared to the vast market potential for its production and commercialization. The country's fish supply and demand still experience a deficit (FMARD, 2015). Joseph **(**2023) affirmed that the country has a significant production deficit in fish.

Lately, the Anchor Borrowers' Program (ABP) was established and launched on November 17, 2015. The ABP is an agricultural program introduced by the Nigerian government through the Central Bank of Nigeria (CBN) to help Smallholder Farmers (SHFs) makes better use of inputs while also assuring credit performance (CBN, 2016). It provides farm inputs in-kind and in-cash to participant farmers to increase agricultural production and links them to already available markets. Through the inclusion of private sectors that act as input suppliers, the ABP increases the availability and affordability of inputs and improves the output market (CBN, 2016). The essential agricultural commodities promoted by ABP, among others, include cereals, roots and tuber crops, tree crops, legumes, and livestock. The principal objective of anchor borrowers' program is about credit access and improving farm finance as it provides farm inputs in-kind and in-cash support (for farm labour) to SHFs. This is expectedly to boost production and lower the importation of a specific commodity of interest (CBN, 2016).

In order to assist fish farmers in meeting the country's need for fish, the Fisheries Cooperative Federation of Nigeria (FCFN), a cooperative

representing the Nigerian fisheries sector, requested and/or advocated that the CBN include fisheries in its ABP (Ashagye, 2019). As a result, fish farmers from various geopolitical regions and states (including Osun State) of Nigeria have been included in the ABP, with the idea that, with help from the anchor borrower's program, they will be able to meet the nation's annual fish demand of 2.6 million tons. The inclusion in the CBN agriculture program would assist fish producers in overcoming other obstacles impeding increased fish production. Osun State, as one of the states in the Southwestern region, has benefitted from the ABP, with a total sum of ₦167,364,862.50 disbursed to them and farming activities spanned through the fishery value chain with these farmers going through the cycle of the program successfully. Notwithstanding, local production of fish in the State is still relatively low, which has created a demand-supply gap. More so, there is no empirical evidence that the participating farmers' enterprises have recorded significant growth in fish production. In addition, there are limited studies that have focused attention on how participating farmers in ABP have fared in the study area. This formed the motivation of this study, which aims to investigate the effects of ABP on aquaculture production in Osun state. Hence, accessing the effectiveness of ABP (EABP) among fish farmers in Osun State of Nigeria becomes pertinent. It is against this backdrop that this study investigates the EABP for FF among farmers in Osun State of Nigeria.

The study's primary objective is to determine the EABP in FF among farmers in Osun state, Nigeria. The specific objectives are to: describe the demographic characteristics of ABP fish farmers; ascertain the extent of accessing information on FF by ABP participants; ascertain the benefits derived (BD) from ABP; identify constraints faced by fish farmers participating in ABP (PABP); and determine the level of EABP in FF. The study's objectives led to the testing of the following hypotheses: a significant relationship cannot be found between the selected demographic parameters of respondents and EABP in FF; extent of accessing information sources on FF and EABP in FF do not significantly correlate with one another; BD from ABP and EABP in FF does not significantly correlate with one another; and constraints to PABP and EABP in FF do not significantly relate to one another.

2. MATERIAL AND METHODS

2.1. Work area and working schedule

The study was conducted in Osun State, which is located in the Southwestern region of Nigeria. The study area lies between longitudes 4° 00' and 30° 00'East of the Greenwich Meridian and latitudes 7°00' and 30°0' North of the equator. The period of data collection was January through March of 2023

2.2. Population and sampling procedure

All of the registered smallholder fish farmers in Osun State who are taking part in ABP consist of the population under investigation. The study's respondents were chosen through a multi-phase sampling procedure. Two out of the thirty (30) Local Government Areas-LGAs of Osun State were purposively selected based on the high predominance of registered smallholder fish farmers who participated in ABP. These selected LGAs were Ife-Central and Osogbo. Two communities from each of the selected LGA were purposively sampled based on prominence in FF and participation in ABP. These selected communities were Eleyele and Iremo from Ife-Central LGA, and Dada Estate and Okefia from Osogbo LGA. From the list of registered smallholder fish farmers PABP in the selected communities, 60% of the smallholder fish farmers PABP were selected at random, using the proportionate sample technique, from each of the communities that had been selected for analysis. Thus, the sample size for the study was 120 respondents.

2.3. Data collection

This research used primary data, which were collected through the use of quantitative research methods. Pre-tested structured interview schedule was used to obtain quantitative data. This covered information on demographic characteristics of fish farmers' PABP, extent of accessing information on FF, benefits fish farmers derived from ABP, constraints PABP and level of EABP in FF.

2.4. Measurement of variables

The three-point rating scale of Odebode et al. (2021) was adopted to measure extent of accessing information, benefits associated with PABP, barriers to ABP participation, and effectiveness of ABP in FF. Extent of accessing information on FF by ABP participants was measured at the interval level. Fifteen information sources, which include ABP representatives, family and friends, radio, television and extension agents, among others

were presented to the respondents. The respondents were requested to indicate the frequency with which they individually obtained information on FF from the previously stated sources. This was rated on a three-point rating scale of 'Always/Regularly (2)', 'Sometimes/Occasionally (1)', and Never (0). Every respondent's scores were added together. The highest and lowest scores were obtained. Using the mean and standard deviation, the respondents were categorized into: low access to information on FF, scores between minimum and slightly below mean – 1SD; moderate access to information on FF, scores between mean – 1SD and slightly below mean +1SD, and high access to information on FF, scores between mean +1SD and maximum. Also, the information sources were ranked from the most to the least used based on the computed and/or mean scores of each item rating.

Benefits associated with PABP were measured at interval level. Benefits fish farmers derived from PABP were measured by providing respondents with a list of ten probable benefits derivable from PABP which include increased production, improved income and increased sales output, among others. Respondents were asked to indicate the benefits they derived from PABP. Response options were measured on a 3-point rating scale of high benefit, moderate benefit, and not a benefit with scores of 2, 1 and 0 assigned, respectively. Each respondent's scores were added together. The lowest and highest scores were obtained. The average and standard deviation scores were utilized to divide the respondents into three groups: those with low benefits, ranging from minimum to slightly below mean – 1SD; moderate benefits, ranging from the mean – 1SD to slightly below mean +1SD; and those with high benefits, ranging from the mean +1SD to maximum scores. Also, the weighted mean score of each BD from PABP item ratings was calculated/computed and utilized to rank BD from the most derived benefits to the least derived benefits.

Measurement of barriers to ABP participation was made at the interval level. A list of 15 potential limitations (which include poor access to water, security related issues, and poor marketing facilities) associated with ABP participation were provided to respondents. Measurement was the degree to which participation in ABP was restricted. The choices and/or options of not a constraint, mild constraint, and severe constraint were used to measure the severity of the constraints to participation in ABP, with scores of 0, 1, and 2 assigned for each option, respectively. Each respondent's scores were summed together, with an obtained maximum score and a minimum score. The composite scores mean and standard deviation were utilized as a benchmark to categorize the respondents into three: high constraints category, scores between mean +1SD and maximum; moderate constraints category, scores between mean – 1SD and slightly below mean +1SD; and low constraints category, scores between minimum and slightly below mean – 1SD. Also, each constraint item's weighted mean score was calculated and utilized to rank the ABP participation constraints in order of severity.

Effectiveness of ABP in FF is the dependent variable of the study. This was measured at interval level. Effectiveness of ABP in FF were measured by providing respondents with a list of fifteen effectiveness items which include linkages to off-takers, farm input provision and postharvest management, among others. Respondents were asked to indicate the improvement seen in FF with their participation in the ABP. Response options were measured on a 3-point rating scale of greatly improved, improved and not improved with scores of 2, 1 and 0 assigned, respectively. For every respondent, the scores were totaled. The scores that were obtained ranged from minimum to maximum. Index of EABP was generated by adding all responses and the mean and standard deviation indexes were computed. The mean index and standard deviation index were used to categorize EABP in FF into: high effectiveness, scores between slightly above mean +1SD and maximum; moderate effectiveness, scores between slightly above mean – 1SD and mean +1SD; and low effectiveness, scores between minimum and mean – 1SD.

2.6. Statistical analyses

The collected data were entered into version 20 of the Statistical Package for Social Science. Descriptive statistics (mean, percentages, frequency) as well as inferential statistics (spearman rho, Chi-square, and Pearson Product Moment Correlation-PPMC) were used to analyze the generated data.

3. RESULTS

3.1. Demographic characteristics of respondents

The results in Table 1 reveal that the mean age of fish farmers who participated in ABP was 46.05±8.94years. The sex distribution shows that most (75.8%) of the respondents were male. As regards the respondents' main sources of farmland, 47.5% of the fish farmers acquired land for fish production by lease, while 35.8% obtained farmland by inheritance. The majority (67.5%) of the respondents belong to FF association.

3.2. Frequency (extent) of access to sources of information on FF (SIFF)

Table 2 show results of respondents' extent of access to SIFF. The findings show that 73.3% of respondents said that they always accessed information on FF through ABP representatives. The results further reveal that most (65.0%) of the respondents indicated that they always accessed FF information through family and friends. Regarding radio, a higher percentage of respondents (90.0%) consented to sometimes receiving information on FF from radio. In terms of television, 95.8% of the respondents indicated that they sometimes received information on FF from television.

Table 2 reveals the respondent's access to all the SIFF. Most of the respondents (63.3%) had moderate access to SIFF and/or production.

Table 1. Distribution of respondents according to demographic characteristics.

Characteristics	Frequency	Percentage (%)	Mean± SD / Mode
Age (years)			
≤40	9	7.5	
41-50	73	60.8	
51-60	32	26.7	46.05 ± 8.94
>60	6	5.0	
Sex			
Male	91	75.8	Male*
Female	29	24.2	
Sources of farmland			
Inherited	43	35.8	
Rented	20	16.7	Lease*
Lease	57	47.5	
Membership of fish farmers association			
Member/yes	82	68.3	Member/yes*
Non-member/no	38	31.7	

Values in asterisks implies mode.

Table 2. Distribution of respondents according to their frequency (extent) of access to sources of information on fish farming.

Sources of information	Never f (%)	Sometimes f (%)	Always f (%)	Mean	Rank
ABP representative	0 (0.0)	32 (26.7)	88 (73.3)	1.73	1
Family and friends	1 (0.8)	41 (34.2)	78 (65.0)	1.64	2
Radio	5 (4.2)	108 (90.0)	7 (5.8)	1.01	3
Television	3 (2.5)	115 (95.8)	2 (1.7)	0.99	4
Newspapers	14 (11.7)	104 (86.7)	2 (1.7)	0.90	5
Cell phone calls	29 (24.2)	88 (73.3)	3 (2.5)	0.78	6
Extension agents	43 (35.8)	61 (50.8)	16 (13.3)	0.77	7
Whatsapp	38 (31.7)	82 (68.3)	0 (0.0)	0.68	8
Newsletter	81 (67.5)	39 (32.5)	0 (0.0)	0.32	9
Short Message Service (SMS)	94 (78.3)	24 (20.0)	2 (1.7)	0.23	10
Facebook	101 (84.2)	19 (15.8)	0 (0.0)	0.15	11
Twitter	102 (85.0)	18 (15.0)	0 (0.0)	0.15	11
Email	111 (92.5)	9 (7.5)	0 (0.0)	0.07	13
Instagram	111 (92.5)	9 (7.5)	0 (0.0)	0.07	13

Table 3. Categorization of respondent's access to sources of information on fish farming.

Access to information	Frequency	%	Minimum	Maximum	Mean	SD
Low (4.00 – 7.39)	18	15.0	4.00	14.00	9.54	2.14
Moderate (7.40 – 11.67)	79	63.3				
High (11.68 – 14.00)	26	21.7				

3.3. Benefits derived from ABP by fish farmers

Table 4 presents BD from ABP. The result shows that increased production ($\bar{x}$=1.74), improved income level ($\bar{x}$=1.70), improved future potential of the enterprise ($\bar{x}$=1.52), increased sales output ($\bar{x}$=1.49), improved performance and progress of the enterprise ($\bar{x}$=1.45) and increased access to market ($\bar{x}$=1.35) were the benefits mostly derived from ABP by fish farmers.

Table 5 presents categorization of BD by fish farmers from ABP. The result reveals that most respondents (66.7%) had moderate benefit from ABP.

3.4. Constraints on fish farmers' participation in ABP

Table 6 shows the ranking of various constraints on fish farmers' participation in ABP. Poor access to water ($\bar{x}$=1.83) and security related issues ($\bar{x}$=1.81) ranked first and second, respectively. Poor marketing facilities ($\bar{x}$=1.74), difficulty in accessing the anchors ($\bar{x}$=1.71) and stress of accessing loan ($\bar{x}$=1.60) ranked third, fourth and fifth, respectively.

Table 5 presents categorization of respondents based on constraints to participation in ABP. The result reveals that the majority of respondents (74.2%) faced moderate constraints on participation in ABP.

Table 4. Distribution of respondents based on benefits derived from anchor borrowers' program.

Benefits derived from ABP	Not a Benefit f (%)	Moderate Benefit f (%)	Major Benefit f (%)	Mean	Rank
Increased production	7 (5.8)	17 (14.1)	96 (80.1)	1.74	1
Improved income level	6 (5.0)	24 (20.0)	90 (74.9)	1.70	2
Improve the future potential of the enterprise	0 (0.0)	57 (47.5)	63 (52.5)	1.52	3
Increased sales output	10 (8.3)	41 (34.2)	69 (57.5)	1.49	4
Improved performance and progress of the enterprise	0 (0.0)	65 (54.2)	55 (45.8)	1.45	5
Increased access to the market	7 (5.8)	64 (53.3)	49 (40.8)	1.35	6
Stimulate expertise	7 (5.0)	93 (77.5)	21 (17.5)	1.12	7
Enhance access to better service delivery	29 (24.2)	72 (60.1)	19 (15.8)	0.91	8
Ease of access to quality fish feed	27 (22.5)	80 (66.7)	13 (10.8)	0.88	9
Ease access to insurance service	63 (52.5)	54 (44.9)	3 (2.6)	0.50	10

Table 5. Categorization of respondents based on benefits derived from anchor borrowers' program.

Benefit derived	Frequency	%	Minimum	Maximum	Mean	SD
Low (4.00 – 9.91)	11	9.2	4.00	19.00	12.69	2.77
Moderate (9.92 – 14.68)	80	66.7				
High (14.69 – 19.00)	29	24.2				

Table 6. Distribution constraints on respondents' participation in anchor borrowers' program.

Constraints to participation in ABP	NC f (%)	MC f (%)	SC f (%)	Mean	Rank
Poor access to water	1(0.8)	18(15.1)	101(84.2)	1.83	1
Security related issues	3(2.5)	16(13.3)	101(84.2)	1.81	2
Poor marketing facilities	0(0.00)	31(25.8)	89(74.2)	1.74	3
Difficulty in accessing the anchor	4(3.3)	26(21.7)	90(75.0)	1.71	4
Stress of accessing the loan	4(3.3)	40(33.3)	76(63.4)	1.60	5
Late distribution of loans	0(0.00)	50(41.7)	70(58.3)	1.58	6
High cost of inputs	0(0.00)	50(41.7)	70(58.3)	1.58	6
Untimely delivery of inputs	0(0.00)	51(42.5)	69(57.5)	1.57	7
Insufficient loans	10(8.3)	34(28.3)	76(63.3)	1.55	8
Delay in payment by off-takers	9(7.5)	49(40.8)	62(51.7)	1.44	9
High cost of labour	15(12.5)	40(33.3)	65(54.2)	1.41	10
Insufficient land	17(14.2)	44(36.7)	59(49.2)	1.35	11
Poor extension contact	56(46.8)	52(43.3)	12(10.0)	0.63	12
Unfavourable government policies	65(54.2)	41(34.2)	14(11.7)	0.57	13
Flood or excessive rain	74(61.8)	36(30.0)	10(8.3)	0.46	14

NC = Not a Constraint, MC = Mild Constraint, SC = Severe Constraint

Table 7. Categorization of respondents according to constraints to participation in anchor borrowers' program.

Constraints on participation in ABP	Frequency	%	Minimum	Maximum	Mean	SD
Low (11.00 – 17.75)	12	10.0	11.00	30.00	20.88	3.12
Moderate (17.76 – 23.87)	89	74.2				
High (23.88 – 30.00)	19	15.8				

3.5. Effectiveness of ABP for FF

Table 8 shows data on EABP in fish production as provided by fish farmers in the study area. The results reveal that the majority (53.2%) of the respondents agreed that they had greatly improved the level of increased production and advice. Increased production and advice ranked highest ($\bar{x}$=1.51) amongst all the effectiveness statements. Access to advisory services ranked second ($\bar{x}$=1.45) on the list, with a slight majority of respondents (51.7%) expressed agreement on improved level of access to advisory services. In terms of linkage to various markets and marketing strategies, 60.7% of the respondents indicated that they had improved level of linkage to various markets and marketing strategies. Linkage to various markets and marketing strategies came in third on the list of EABP experienced with a mean score of 1.10. Linkages to off-takers ($\bar{x}$=0.91) ranked fourth on the list of EABP experienced, with the majority (63.3%) of the respondents indicating they had improved linkages to off-takers.

Table 9 presents categorization of EABP on FF. The results reveal that more than half (68.3%) of the participants adjudged the EABP on FF to be moderate.

3.6. Relationship between demographic characteristics of ABP fish farmers and the EABP on FF

Results in Table 6 show that ABP fish farmers age (r= -0.02,p=0.81), sex (χ^2=0.57, p = 0.45), source of farmland (χ^2 = 4.34, p = 0.11) and membership of fish association (r = -0.02, p=0.85) were not significantly ($p \geq 0.10$) associated to EABP on FF.

Table 8. Distribution of effectiveness of anchor borrowers' program in fish production.

Effectiveness items	NA f (%)	IL f (%)	GIL f (%)	Mean	Rank
Increased production and advice	2 (1.7)	54 (45.1)	64 (53.2)	1.51	1
Access to advisory services	2 (1.7)	62 (51.7)	56 (46.6)	1.45	2
Linkage to various markets and marketing strategies	17 (14.2)	73 (60.7)	30 (25.1)	1.10	3
Storage facilities	68 (56.7)	48 (40.1)	4 (3.2)	0.95	4
Linkages to off-takers	27 (22.5)	76 (63.3)	17 (14.2)	0.91	5
Farm input provision	44 (36.7)	69 (57.5)	7 (5.8)	0.69	6
Availability of general production practices	34 (28.3)	57 (47.5)	29 (24.2)	0.56	7
Postharvest management	54 (51.7)	64 (46.6)	2 (1.7)	0.50	8
Access to harvesting process technical services	62 (53.4)	56 (45.7)	2 (0.8)	0.47	9
Availability and good marketing facilities	68 (56.7)	49 (40.8)	3 (2.5)	0.45	10
Guaranteed market price	74 (61.7)	41 (34.2)	5 (4.2)	0.42	11
Fish disease control	64 (61.7)	55 (46.6)	1 (0.8)	0.40	12
Ease of access to required input	78 (65.2)	37 (30.8)	5 (4.2)	0.39	13
Value addition process	82 (68.4)	34 (28.3)	4 (3.3)	0.35	14

NA = Not at all; IL= Improved Level; GIL= Greatly Improved Level.

Table 9. Categorization of effectiveness of anchor borrowers' program in fish farming.

Effectiveness of ABP	Frequency	%	Minimum	Maximum	Mean	SD
Low (3.00-6.88)	13	10.8	3.00	22.00	10.68	3.79
Moderate (6.89 – 13.67)	82	68.3				
High (13.68-22.00)	25	20.8				

Table 10. Relationship between selected demographic characteristics of fish farmers and effectiveness of anchor borrowers' program in fish farming.

Variables	Df	χ^2	r-value	p-value
Age	-	-	-0.02	0.81
Sex of respondents	1	0.57	-	0.45
Source of farmland	2	4.34	-	0.11
Membership of fish association	-		-0.02	0.85

df = Degree of Freedom, χ^2 = Chi-square Coefficient, r = Correlation coefficient.

3.7. Correlation between SIFF and EABP in FF

Table 7 indicates that there was a significant association between SIFF and EABP in FF ($r = -0.15$, $p < 0.10$). Also, ABP representative ($r= -0.22$), family and friends ($r= -0.28$), newspaper ($r=0.16$), cell phone calls ($r=0.20$) and extension agents ($r= -0.21$) were significantly ($p \leq 0.10$) related to EABP in FF.

3.8. Relationship between BD from ABP and EABP in FF

The result (Table 8) reveals no significant correlation ($p > 0.10$) between BD from ABP and EABP in FF ($r = 0.33$).

3.9. Correlation between constraints to participation in ABP and EABP in FF

The result (Table 9) shows that no significant correlation existed between the constraints associated with participation in ABP and EABP in FF($r = 0.12$, $p \geq 0.10$).

Table 11. Correlation between sources of information on fish farming and effectiveness of anchor borrowers' program in fish farming.

Variables	r-value	p-value
Sources of information	-0.15*	0.10
ABP representative	-0.22*	0.02
Family and friends	-0.28*	0.00
Radio	-0.07	0.48
Television	-0.01	0.88
Newspapers	0.16*	0.07
Cell phone calls	0.20*	0.03
Extension agents	-0.21*	0.02
Whatsapp	0.05	0.62
Newsletter	0.08	0.40
Short Message Service (SMS)	0.04	0.67
Facebook	-0.14	0.13
Twitter	-0.01	0.89
Email	-0.00	1.00

r = Correlation coefficient. *Significant at p≤0.10.

Table 12. Relationship between benefits derived from anchor borrowers' program and effectiveness of anchor borrowers' program in fish farming.

Variable	r-value	p-value
Benefits derived from participation in ABP	0.09	0.33

r = Correlation coefficient.

Table 13. Correlation analysis of constraints to participation in anchor borrowers program and effectiveness of anchor borrowers program in fish farming.

Variable	r-value	p-value
Constraints to participation in ABP	0.12	0.18

r = Correlation coefficient.

4. DISCUSSION

The responders were relatively middle-aged and active, which implies that ABP fish farmers had the energy to satisfy the demands of improving and/or increasing the production of fish. The result is also suggestive of a greater dominance of more mature fish farmers who participated in ABP amongst farmers involved in the fish production business. This finding is consistent with Maina et al. (2014) who reported that the majority of fish farmers were below the age of 50 years. The result is also consistent with Oyibo and Odebode (2024) and Oyibo (2020) who found a mean age of 42.7±11.9 years and 46.37±9.24 years among rural farming households and farmers in Niger-Delta Area and Delta State of Nigeria, respectively. That most of the respondents were male implies that more males were engaged in FF than females. The implication is that FF involvement in the study area is gender sensitive. This finding is in consonance with Samuel (2020) and Oluwasola and Ige (2015) findings that 85.6% and 80.0% of fish farmers were males in Southwestern Nigeria and Ibadan Metropolis of Oyo State, respectively. However, the result disagrees with Ofuoku (2015) who found that over half (63.1%) of rural farmers in Delta State's Central Agricultural Zone were females. The high proportion of males compared to females among the respondents could be due to the patrilineal nature of Africa which gave the males more access to resources than the females (Balogun et al., 2021). Male dominance could also be attributed to the fact that women are risk averse, and fish farming is faced with a lot of uncertainties and risks.

It could be inferred that the predominant land sources for fish production were lease and inheritance. The implication of lease as a major source of farmland is that respondents get it with conditions. In addition, the implication is that respondents had less control over their fish production lands, because they did not have absolute control over the leased land. The presence of respondents who had access to farmland through inheritance could be attributed to older farmers relinquishing farmlands to the younger generation to continue with agricultural activities. The resource poor farmers can have access to land when it is acquired by inheritance, which may encourage more people to engage in farming (Oyibo, 2021). The fish farmers

generally had a high level of membership in fish associations. Membership of the FF association could influence EABP in FF, because FF association serves as a source of ABP information and influences the adoption of new farming practices as well as enhances networking, access to the market, government initiatives, resources and credit facilities, and sharing of ideas, knowledge and information. This result agrees with Samuel (2020) who found that 60.0% of fish farmers belong to fish associations in Southwestern Nigeria. The result also corroborates Belewu et al (2023) who found that 100% of ABP beneficiaries belong to agricultural organizations.

It was observed that access to information through ABP representative ($\bar{x}$=1.73), and family and friends ($\bar{x}$=1.64) ranked highest and second on the list of FF information sources, respectively. Furthermore, information access from radio ($\bar{x}$=1.01) and television ($\bar{x}$=0.99) ranked third and fourth among FF information sources, respectively. The result reflects the high status of respondents in terms of always accessing FF information through ABP representatives as well as family and friends. The result also reflects the relatively high status of ABP fish farmers concerning accessing FF information through radio and television. Furthermore, the result indicates that the predominant information sources on FF for ABP fish farmer beneficiaries were family and friends, and ABP representatives. The implication is that FF and/or production information is communicated and/or disseminated to ABP participants through ABP representatives as well as family and friends. The implication is also that ABP representatives as well as family and friends can be used to create awareness about ABP *vis a vis* of a technology as well as enable technology dissemination. The result is similar to the findings of Odebode et al (2021) and Eforuoku (2018) that friends and relatives were the most frequently used sources of information by rural farming households. The access through family and friends might be because of strong family and social ties as well as interpersonal relationships.

It could be deduced that there was moderate access of fish farmers' to SIFF, which suggests that they had relatively moderate access to available information sources on FF business. The implication is that respondents had a moderate level of information on fish production and/or farming technology. In addition, the implication is that fish farmers participating in ABP received information on FF from marginally few sources.

It could be deduced that the fish farmers' need for increased production, improved income level and increased access to market as well as improved future potential of the fish enterprise were clearly provided by ABP participation. The implication is that ABP has enabled fish farmers to increase production sales output and access to the market as well as improved income level *vis a vis*performance and progress of their enterprise. This may probably be the reason for fish farmers' continuous participation in ABP, despite all odds of high-level constraints to their participation in ABP (Table 7). These findings corroborate Umeh et al. (2019) that ABP has a positive effect on farmers which translates to increased income and improvement in the standard of living for the farmers, and achievement of food security of the nation in the long run. The result also supports the finding of Balogun et al (2021) that ABP beneficiaries had high revenue and profit. A closer look at the BD from ABP showed that there are many benefits attached to fish farmers' participation in ABP. It could be inferred that fish farmers' had a moderate benefit from PABP, which is suggestive that the fish farmers relatively benefitted from PABP. The moderate benefit from PABP is expected to affect EABP in fish production.

Poor access to water, security related issues, poor marketing facilities, difficulty in accessing the anchors and stress of accessing loans were the most severe constraints to fish farmers' participation in ABP. These findings are in line with Ayinde et al (2018) who reported administration, technical difficulty and accessibility, as common constraints of ABP. In an earlier study in Nigeria, Samuel (2020) found inadequate access to credit as the greatest obstacle in FF. Constraint to participation in ABP due to poor access to water implies that fish farmers have difficulties in accessing quality water in sufficient quantity, which is a single and important factor in FF enterprise. Hence, fish farmers were discouraged from participating in ABP. The constraint of stress of accessing loans indicates that fish farmers have difficulties in accessing credit facilities to engage in productive FF. This may be due to the unavailability and inadequacy of sources of credit as well as credit/loans. The stress of accessing a loan could

result in inadequate capital and low production levels as credit sources have shown to have a positive relationship with capital and technical efficiency. Hence, it discouraged participation in ABP. Okotie (2018) reported that despite funding from government and international agencies, farmers are still faced with difficulty in accessing credit facilities. Furthermore, the constraint of poor marketing facilities could be because of extreme difficulties in getting buyers as well as delay in payment by off-takers.

A closer look at the constraints showed that fish farmers faced moderate constraints to participation in ABP, which invariably might slightly negatively influence EABP in FF. The result disagrees with Oyibo and Odebode (2023) who found high constraints among rural farmers in Nigeria's Niger-Delta Area. The moderate constraint to fish farmers' participation in ABP is aligned with earlier findings of this study where the BD from ABP is moderate (Table 5), indicating that there is likely an indirect relationship between BD from ABP and constraint to the participation in ABP. This suggests that the constraints faced by the fish farmers were slightly strong enough to hinder them from deriving high benefits from participation in ABP.

It was observed that increased production and advice ($\bar{x}$=1.51), and improved level of access to advisory services ($\bar{x}$=1.45) ranked highest and second amongst all the effectiveness statements, respectively. These findings show that most of the respondents experienced improvement in production and access to advisory services. The implication is that participation in ABP can increase fish production *vis a vis* access to fish production advisory services. Furthermore, the implication is that increased production and access to advisory services, which are two extremely fundamental enterprise necessities, are not obstacles or trouble to fish farmers PABP. This is quite good, because of the importance of increasing production and advisory services access to the EABP for FF. The result is similar to Onoja et al (2024) who found that ABP was effective in increasing rice production and/or yield. A closer look at the effectiveness statements showed that linkage to various markets and marketing strategies came in third on the list of EABP experienced with a mean score of 1.10, while linkages to off-takers ($\bar{x}$=0.91) ranked fourth. The results suggest that more of the respondents had a linkage to various markets and marketing strategies as well as off-takers. The implication is that many of the fish farmers PABP had no issues with linkage to off-takers *vis a vis* various markets and marketing strategies. This further implies that fish farmers PABP can comfortably link fish products to off-takers and various markets. In addition, the results imply that linkages to off-taker and various markets and marketing strategies were more reliable and improved during ABP. This result corroborates Akingbade (2019) who posited that timely off-take of rice paddy under ABP was reliable.

It could be deduced from a closer look at the EABP on FF that ABP was averagely effective in FF and/or production. The inference is that ABP to a marginal extent was achieving its objectives as related to fish production in the study area. The result is dissimilar to Elugbaju (2019) who found high EABP on fish production (63.6) in Ogun State. The moderate EABP on fish production may be connected to the moderate access to SIFF and/or production as well as moderate constraints to participation in ABP.

The non-relationship between demographic characteristics of fish farmers and EABP in FF depicts that age, sex, source of farmland and membership in the fish association had no significant relationship with EABP in FF.

The negative correlation between SIFF and EABP in FF implies that the more SIFF, the less EABP in FF. This implies that ABP was more effective in FF for fish farmer beneficiaries who had and/or utilized less SIFF, which further suggests that SIFF could influence the EABP in FF. In addition, the implication is that with increased information sources on FF, the effectiveness status of ABP decreases. According to Oyibo (2021), the SI determines the reliability and accuracy of the information on agricultural production. The relationship between ABP representative, family and friends, newspaper, cell phone calls and extension agents' information source types with EABP in FF implies that ABP representatives, family and friends, newspaper, cell phone calls and extension agents' information source types had a significant relationship with effectiveness status of ABP in FF.

The negative relationship of information source types (ABP representatives, family and friends, and extension agents') with the effectiveness status of ABP in FF implies that ABP representatives, family and friends, and extension agents' information source types

negatively influence the effectiveness status of ABP in FF. This implies that the more information from family and friends, ABP representatives and extension agents, the less effective the ABP in FF. This could be because of information overload; the farmers become confused when they are too loaded with information, hence decreasing effectiveness. The positive relationship of newspaper and cell phone calls information source types with the effectiveness status of ABP in FF implies that newspaper and cell phone call information source types positively influence the effectiveness status of ABP in FF. The positive correlation of newspaper and cell phone call information source types implies that the more information from newspapers and cell phone calls, the more effective the ABP in FF. This could be because when the fish farmers are confused, they can easily go back to the newspapers to check as the information is in print or check the cell phone calls in case of cell phones.

There was no association between BD from ABP and EABP in FF, indicating that BD from ABP had no significant relationship with the effectiveness status of ABP in FF. It could be deduced that the BD from ABP does not necessarily influence and/or decide EABP in FF. The effectiveness status of ABP in FF is influenced by sources of information; ABP representatives, family and friends, newspapers, cell phone calls and extension agents.

There was no correlation between the constraints associated with participation in ABP and EABP in FF, implying that fish farmers' constraints to participation in ABP had no significant relationship with the effectiveness status of ABP in FF. One could infer that the respondents' constraints to participation in ABP do not necessarily impact the effectiveness level of ABP in FF. Also, this depicts that the EABP in FF was not determined by the constraints faced. The implication of this is that constraints faced by participating farmers were not strong enough to influence the EABP in their FF.

5. CONCLUSION

Fish farmers participants of ABP were relatively mature and middle aged with the energy to meet with the demands of improving fish production. Although both male and female fish farmers participated in ABP, ABP is dominated by male fish farmers. Most of the ABP fish farmers belonged to cooperative societies and utilized leases as predominant source of farmland. The farmers had relatively moderate access to available information sources on FF business. Fish farmer's sources of information were mainly ABP representatives, family and friends, and radio. Fish farmers had a moderate benefit from participation in ABP with moderate constraints to participation in ABP. The effectiveness of ABP on FF was moderate which was influenced by sources of information *vis a vis*ABP representative, family and friends, newspapers, cell phone calls, and extension agents information source types**.** Finally, sources of information as well as ABP representative, family and friends, and extension agents information source types reduced EABP on FF, while newspaper and cell phone call information source types enhanced effectiveness.

In light of the conclusion, the following suggestions are made: The dominance of males over females in FF should be tackled. Platform for sensitization of female gender about FF should be created to allow for more gender balance in FF. Newspaper information source type had a significant positive effect on EABP in FF; therefore, stakeholders are encouraged to utilize newspapers as information sources. Anchor borrower program should be subjected to periodic review, adequate monitoring and evaluation to ensure its effectiveness on FF. Considering the positive influence of cell phone call as an information source type in ensuring EABP on FF, the intervention program should embrace and offer sensitization on the importance of cell phone calls as a source of information to beneficiaries. Poor access to water is one of the major constraints identified in this study; therefore, the government should make available quality water facilities that both the fish farmers and the entire community can have access to. In addition, alternative sources of water supply should be provided by the fish farmers and the community to complement efforts made by the government or other agencies.

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CONFLICT OF INTEREST

The authors of this article declare that they have no known competing personal relationships and/or financial interests that could have appeared to influence the work reported in this paper.

AUTHOR CONTRIBUTIONS

Fiction: AAE, JOC, OO; Literature: JOC; Methodology: JOC, OO, AAE; Performing the experiment: JOC; Data analysis: JOC, OO; Manuscript writing: JOC, OO, Supervision: OO, AAE. All authors approved the final draft.

ETHICAL STATEMENTS

The University of Ibadan's Department of Agricultural Extension and Rural Development's Ethical Committee gave its approval for this study's conduct, on 04/01/2023 (Ethic committee approval number: AERD/01-2023/0020).

DATA AVAILABILITY STATEMENT

The data used in the present study are available from the corresponding author upon reasonable request.

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