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Evaluating Agri-financing effectiveness in sustainable Agricultural production: implications for Catfish farmers in Anambra State, Nigeria

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ABSTRACT

The inaccessibility of credit by farmers has been identified as a limitation to sustainable agriculture. This study examined the effectiveness of Agricultural credit on the productivity of cat fish farmers in Anambra State, Nigeria. Data collected from 150 respondents were analyzed with descriptive statistics, t-test and multiple regression. We confirm that only 46% of the farmers had access to credit, while, personal saving was the main source of capital for the cat fish farmers. Their average stock size, and output were 590, and 570 fishes respectively. A statistically significant difference existed between the stock size, output, casualties, and number of ponds of farmers that had access to formal credit and the farmers that had no access. Drivers of farmers' output were marital status, sex, educational level, experience, and credit. Farmers' access to credit was constrained by many factors. We recommend that Government and financial institutions should partner with legal aid organizations or government agencies to streamline the process of acquiring documentation to assist fish farmers in obtaining the necessary legal documents required for securing loans. Also, the fish farmers should form/strengthen cooperative groups among themselves to facilitate access to finance.

INTRODUCTION

A sustainable food system is one that provides food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations is not compromised (FAO 2018). Numerous inputs are required to make the food system sustainable, and, Tumen and Seven (2020) noted that credit is one of the critical inputs for sustainable agricultural development as it smoothens out agricultural risks and supports more efficient production decisions, hence, expanding the loans offered to finance the agriculture industry and facilitating quick access will guarantee that the necessary inputs are acquired on time and in adequate quantities.

Huge capital and financial investments are needed in Agriculture for the purchase of inputs like fertilizers, land, chemicals, machines, and seedlings. Hence, credit plays an important role in ensuring a modernized Agriculture, promoting the participation of farmers in Agriculture, and in making production more profitable, efficient, productive and sustainable (Odinwa, et al., 2020). Agricultural credit includes any of the several credits used to finance agricultural transactions such as loans, notes, bills of exchange and banker acceptances. It is repayable over a period of time with some interest charges as determined by the source of the credit (Odinwa, et al., 2020; Adewale et al., 2022).

The Nigerian agricultural sector provides over 40% of the nation's gross domestic product (GDP) with between 60% and 70% of the population productively engaged in farming (Adewale et al., 2022). As the

world population increases, food insufficiency and hunger risks also increase, and this calls for sustainable agricultural productivity and performance. Assouto and Houngbeme (2020) advised that sustained agricultural productivity is necessary to reduce hunger and poverty in developing countries. Haryanto et al. (2023) defined Agricultural productivity as the output produced by a given level of input in the agricultural sector. The Nigerian Agricultural system is dominated by crop and fish farming, livestock rearing, and forestry. Fish farming, which is a subset of aquaculture, involves raising of fish under controlled or semi controlled conditions for economic and social benefits. Fish farming is crucial to the economic growth of many countries since it provides people with a reliable source of food, income and is widely acknowledged as a significant source of vitamins and minerals for human health (Food and Agricultural Organisation (FAO) 2020; Sule & Yusuf, 2023). FAO (2020) reported that the Nigerian fish industry is a viable component of the Agricultural sector with an annual growth rate of 12.7% per annum.

The fish farming sub-sector has been plagued with numerous problems among which are low productivity, management issues and high cost of feeds, that require money for improvement (Daveze, 2020; Kuye, 2022). Kuye (2022) noted that most fish farmers buffer the consequences of these production issues utilizing credit or loans since it provides financial reserves used to revive and sustain their firms' production processes. However, both formal and informal sources that provide loans to farmers often consider giving loans to farmers as a high risk venture, and, hence, access to these financial services by most of the peasant fish farmers is perceived to be very small. Enoch and Odinwa (2022) affirmed that the Nigerian fish industry contributes significantly to the economic sector but needs financial support and agricultural credit to thrive.

The Nigerian government formulated the 2003 presidential initiative on fisheries and aquaculture development in order to support government programs and projects that promote fish production financially and technically (Enoch & Odinwa, 2022). These efforts by the Government to encourage the fish farmers oftentimes either do not get to the grass root, or get to farmers who use them for non-agricultural activities, thereby making the effort of the government fruitless (Aliyu, 2016; Enoch & Odinwa, 2022). Aliyu, (2016), attributed the deterioration in the productivity of Nigeria's Agriculture to farmers' limited access to credit facilities because access to credit can help farmers to increase their productivity in terms output. The inaccessibility of credit by these farmers hinders their ability to source the required inputs to increase their output and this, in turn, limits agricultural development by reducing fish farmers' output, expected income, savings and overall welfare (Daveze, 2020).

Enoch and Odinwa (2022) revealed that farmers had low access to formal agricultural credit, and this was attributed to the fact that most farmers in the developing countries are risk averse. The stringent conditions, such as high interest rates, collateral security, and short repayment periods introduced by lending institutions also contributed to the low accessibility of credit among farmers. Assouto and Houngbeme (2020), reported that acess to credit is positively correlated to agricultural productivity, and Adewale et al. (2022) affirmed that agricultural credit is a positive determinant of Agricultural output with a 1% increase in agricultural credit leading to approximately 67% increase in agricultural output, while Assouto and Houngbeme (2020) reported that access to credit led to 30.67% increase in agricultural productivity, and attributed low productivity of small holder farmers to credit constraints.

Several authors have called for an investigation of credit access and utilization among fish farmers in a bid to encourage sustainable productivity of the fish farmers. A wide range of literature has stressed that access to credit has a positive effect on productivity, and, Assouto and Houngbene (2020) called for country/spatial specific analysis because this effect can vary depending on the place, enterprise etc. This study therefore contributes to filling this gap in the literature and complementing other studies by examining the nexus between access to credit and the productivity of fish farmers in Anambra state. It specifically identified the socio economic characteristics of the fish farmers, ascertained their level of access to agricultural credits, examined the differences in the stock size, casualty, number of ponds and output of fish farmers that had access to credit and fish farmers that had no access to credit, determined

the drivers of fish output and identified the constraints to credit accessibility in the area. The focus is essentially on output (number of fishes harvested) because agricultural productivity is a measure of the performance of the agricultural sector. In this study, agricultural productivity was measured using output of fish per stock. Empirical revelations from this study can be used as a reliable guide in evaluating the relevance of credits use, and in designing agricultural policies and programmes needed to bring about efficient allocation of scarce resources and proper utilization of credits for a sustainable agri-food system.

METHODOLOGY

The study was conducted in Anambra State, Nigeria. Anambra State is one of the five states located in the South-East Geopolitical zone of Nigeria. The state is made up of 21 local Government areas and four (4) Agricultural zones (Awka, Anambra, Aguata and Onitsha). Its boundaries are formed by Delta State to the West, Imo State to the South, Enugu State to the East and Kogi State to the North. It lies within latitude 6° 45'and 5° 44^1 N and 6° 36^1 and 7° 20^1 E of the area within the Greenwich meridian. The State has a population of over 4,000,000 persons with a land area of 4,865km^2 (National Population Commission (NPC), 2006; Onubogu, 2021; Nwoye, et al 2022). Agriculture is a key economic activity in Anambra State (Onubogu, 2021; Nwoye, et al 2022).

The population of the study comprised of all the catfish farmers in Anambra State. Multi-stage sampling procedure involving purposive and snow ball sampling techniques was used to select a sample of one hundred and fifty (150) respondents for the study. This was based on the extent of fish farming activities by the fish farmers in the area. Cross sectional data of the respondents were collected with questionnaires/ interview schedule, and these data were analysed with descriptive statistics, t-test and multiple regression analysis.

A 4 point Likert scale categorized as: to a great extent (TGE) = 4, to some extent (TSE) = 3, to a little extent (TLE) = 2, and to no extent (TNE) = 1, was used to identify the level of access to agricultural credits in the study area. The values (4+3+2+1) were added to get a value of 10. This was divided by 4 to obtain a mean score of 2.5. Any level of access with a mean score ≥2.5 was regarded as high credit access level while those with mean scores of < 2.5 were regarded as low credit access level.

The differences in the stock size, casualty, number of ponds and output of fish farmers that had access to credit and fish farmers that had no access to credit, were ascertained with a two sample t-test. The formula for two sample t-test is:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{SE_{\bar{X}_1 - \bar{X}_2}}$$

where: $\bar{X}_1 - \bar{X}_2$ is the difference between the means of the variables of fish farmers that had access to credit and those of fish farmers without access to credit.

SE = the standard error of the mean difference.

The factors that affect fish farmers' output were determined using multiple regression analysis. The model was specified thus:

$$Y = a+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6..... b_nX_n$$

Where; Y = Output (number of fishes harvested per season),
a = constant,
X_1 = Sex (dummy: male = 1, female = 0)
X_2 = Age (in years)
X_3 = Marital status (dummy: married = 1, otherwise =0)
X_4 = Educational level (in years)

X_5 = Years of fish farming experience (years)
X_6 = Household size (number)
X_7 = Membership of cooperative society (dummy: yes =1, No = 0)
X_8 = Access to credit (1 if farmer has access to credit 0 = otherwise)
X_9= Casualty (number of deaths)
e_i = Error Term

To identify the constraints to credit accessibility, a 4-point Likert scale categorized as: Very serious (VS) = 4, Serious (S) = 3, Not Serious (NS) = 2, Not a Problem (NP) = 1, was employed. Any constraint with a mean score ≥2.5 was regarded as serious constraint to credit accessibility while constraints with mean scores < 2.5 were considered as not serious constraints.

RESULTS AND DISCUSSION

Socio-economic characteristics of the fish farmers.

The Socio-economic characteristics of the respondents displayed in Table 1 show that the mean age of the farmers was 46 years. This is an indication that most fish farmers are in the active age range where productivity is expected to be high, and that there a promising future in fish farming. This contradicts the average age of 43 years reported by Yisa et al. (2022). Both male and female farmers were involved in fish farming, though majority (51%) of the respondents are female. Yisa et al. (2022), on the contrary, had found that male farmers dominated fish farming. About 79% of the respondents were married with an average household size of 5 persons, and this implies that fish farming is a source of livelihood since married farmers depend on its output for their families' sustenance. The average number of years spent in school by the farmers and years of fish farming experience were 11 years and 13 years respectively. These years spent in formal education setting and in the enterprise will enable the farmers to have better understanding of the enterprise, and take crucial decisions on loan conditions (Yisa et al., 2022). Most (75%) of the farmers rely on personal savings as their primary source of funding and 64% of these farmers do not belong to cooperative groups. This aligns with the findings of Yisa et al. (2022) that rural farmers often lack access to cooperative benefits, and this further results in them being dependent on out of pocket expenditure to finance their farming activities. Imade, et al., (2023) likewise reported that as many as 60% of catfish farmers fund their production activities with their personal saving The fish farmers had poor access to credit as only 46.00% of them have access to credit though 71.33% of the farmers were aware of the benefits of farm credit in fish farming. Enoch and Odinwa (2022) and Imade, et al. (2023), likewise complained of low access to credit by fish farmers. The average numbers of fishes stocked, fishes harvested per stock and casualty per stock are 590, 570 and 20 fishes respectively, with the average number of ponds owned as 5. This greatly differs from the average number of 4,153.43 fishes harvested by cat fish farmers in Edo State as reported by Imade et al. (2023).

Fish Farmers' Level of Access to Agricultural Credits

The findings on the fish farmers' level of access to various sources of agricultural credits are displayed in Table 2. The overall grand mean of 2.29 is an indication of low level of access to sources of agricultural credits. The farmers have high access to agric credits from co-operative societies, money lenders and family and friends. This finding is in agreement with Enoch and Odinwa (2022) who highlighted that fish farmers have a generally low level access to various agricultural credit sources due to high interest rates and also due to the fact that they are risk averse This suggests a need for improved awareness and access to agricultural credits among fish farmers to support their activities effectively.

Table 1. Socio-economic characteristics of the respondents

Variables	Frequency	Percentage	Mean
Sex			
Female	77	51.33	
Male	73	48.67	
Age (Years)			45.99(0.929)
< 40	49	32.67	
> 40	101	67.33	
Marital Status			
Single	32	21.33	
Married	118	78.67	
Years in School			10.86 (0.329)
1 – 6	33	22.00	
7-12	69	46.00	
> 12	48	32.00	
Household Size			5 (0.122)
1-5	72	48.00	
> 5	78	52.00	
Experience (years)			12.75 (0.598)
1 – 10	74	49.33	
> 10	76	50.67	
Source of capital			
Other sources only	37	24.67	
Personal Savings	113	75.33	
Membership of Cooperative Society			
Yes	54	36.00	
No	96	64.00	
Access to Credit			
Yes	69	46.00	
No	81	54.00	
No. of Fishes Harvested. (output/stock)			570.06 (27.426)
1 – 100	2	01.33	
101 – 500	73	48.67	
> 500	75	50.00	
No. of Fishes Stocked. (Stock size)			590.20 (27.343)
1 – 500	75	50.00	
> 500	75	50.00	
Casualty per stock			20.14 (0.993)
1 – 10	27	18.00	
> 10	123	82.00	
No. of Ponds			5.49 (0.235)
1 – 5	87	58.00	
>5	63	42.00	
Awareness of Agricultural Credit			
Yes	107	71.33	
No	43	28.67	

Source: Field survey, 2024. Note: standard errors of the means are in parentheses

Table 2: Fish Farmers' Level of Access to various sources of Agricultural Credits

S/N	Source	Mean score	Position	Decision
i	Co-operative societies	2.57	1st	High level
ii	Money lenders	2.56	2nd	High level
iii	Family and friends	2.50	3rd	High level
iv	Commercial banks	2.27	4th	Low level
v	Microfinance banks	2.24	5th	Low level
vi	Bank of Agriculture (BOA)	2.15	6th	Low level
vii	Produce buyers	2.07	7th	Low level
viii	Guaranteed fund credit scheme	1.97	8th	Low level
ix	Non Governmental organisations (NGOs)	1.95	9th	Low level
	Grand Mean	2.25		

Source: Field survey, 2024

Comparison of farmers that had access to credit and farmers that had no access to credit

A Levene's test for equality of variance conducted on the stock size, output, casualty, farmers' age, Years of experience of the farmers and number of ponds of the farmers that had access to formal credit and the farmers that had no access, showed that while Farmers' age, and years of experience had equal variance, stock size, output, casualty and number of ponds had unequal variance. Therefore, a standard independent t test was run on the data on the farmers' ages and years of experience in the two groups of farmers while the Welch's t test was run on the data on the stock size, output, casualty and number of ponds in the two groups of farmers with a 95% confidence interval for the mean difference.

The results as shown on Table 3 reveal that there was no statistically significant difference between the mean ages and years of experience of the cat fish farmers that had access to formal credit and those that did not access formal credit. However, statistically significant differences existed between the mean output of cat fish, number of cat fish stocked, number of casualty per stock and number of ponds owned by the fish farmers that had access to formal credit and farmers that did not access farm credit.

This study found that the 342 fishes difference between the average number of fishes stocked by FATC and the average number stocked by FNATC is statistically significant (($t_{102.837}$) = 6.937, p<001). The mean output of cat fish in farmers that had access to credit was 757.59(43.912) whereas that of farmers that had no access to formal credit was 410.31(22.471). The average output of fish in FATC was 347 fishes more than that of FNATC. The Welch's two samples t-test showed that the mean difference was statistically significant ($t_{(102.32)}$ = 7.041, p<0.001). The number of casualties (deaths) in fish farming was more amongst FNATC than FATC and this was statistically significant (($t_{117.987}$) = -2.650, p=0.009) with a mean difference of -4 fishes which shows FATC had less casualty than FNATC. Likewise, the average number of fish ponds owned by FATC was 2 ponds more than that of FNATC and this was statistically significant (($t_{119.847}$) = 4.428, p=0.003). The implication of these findings is that FATC were more privileged to buy more fishes, and also had resources that enabled them mange the fishes with minimum casualties thereby being more productive (more output) than the FNATC. This affirms that credit support is effective for sustainable cat fish production.

Table 3: Two sample t tests on some variables of the fish farmers

	Pooled mean	FATC Mean	FNATC Mean	t-stat	Degree of freedom	P-value	Mean difference	SE of difference
Stock size	590.20 (27.343)	775.07 (43.863)	432.72 (22.630)	6.937	102.837	0.006	342.356	49.351
Output	570.06 (27.426)	757.59 (43.912)	410.31 (22.471)	7.041	102.323	0.000	347.286	49.322
Casualty	20.14 (0.993)	17.48 (0.848)	22.41 (1.655)	-2.650	117.987	0.009	-4.929	1.860
Farmer's age	45.99 (0.929)	47.32 (1.470)	44.86 (1.173)	1.320	148	0.189	2.455	1.859
Experience	12.75 (0.598)	13.77 (0.872)	11.88 (0.815)	1.584	148	0.115	1.892	1.194
Number of ponds	5.49 (0.235)	6.58 (0.380)	4.57 (0.248)	4.428	119.847	0.003	2.012	0.454

Source: Field survey, 2024; Note: figures in parentheses are standard errors. FATC = farmers that had access to credit. FNATC = farmers that had No access to credit

Determinants of the Output (Number of Fish harvested) of the Fish farmers

The factors that determine the output (number of fishes harvested) of the fish farmers in the study area were identified using four functional forms of multiple regression results as displayed in Table 4. The linear – linear functional form had more significant variables, and the highest R^2 and was chosen and discussed as the best output for this study. The results clearly reveal that five variables – sex of the farmer, marital status, educational level of the farmer, farming experience, and access to farm credit – significantly affected the output of fish farmers.

Sex has a negative sign (against the female farmers) which implies that the output of male farmers is less than the output of the female farmers. It shows that on the average, a male farmer will have 136 pieces of fish less that his female counterpart. This could be due to the fact that female farmers will be more available to monitor the activities in the farm. The result also shows that the number of fishes harvested by married farmers is 19 pieces more than that harvested by the unmarried farmers. This can be attributed to the fact that married farmers are expected to concentrate more in the enterprise than unmarried farmers. Meanwhile, the unmarried may likely leave the job for the hired labourers who may steal the fishes, unlike the married farmers who will use family labour for most activities in the pond. This affirms the assertion of Umaru, et al. (2021) that marriage is advantageous because members of a family serve as sources of labour for performing critical farm tasks.

The education of the fish farmers is a positive determinant of their output. Umaru, et al. (2021) had explained that education enables farmers to be efficient in the use of scarce resources which subsequently increases productivity. Another positive determinant of the number of fishes harvested by the fish farmers is the number of years of experience in fish farmers. The farmers who have access to credit will have 97 fishes (65% increase) more than those without access to credit. This implies that farm credit is essential in fish farming as it enables farmers to expand their scale of operation thereby increasing productivity. Adewale et al. (2022) identified agricultural credit as one of the positive determinants of Agricultural

output. They reported that 1% increase in agricultural credit led to approximately 67% increase in agric output. Assouto and Houngbeme (2020) however explained that access to credit led to 30.67% increase in agricultural productivity, and attributed low productivity of small holder farmers to credit constraints.

Table 4: Factors that Determine the Output of Fish farmers

Variables	Linear-Linear	Linear-Log	Log-Linear	Log-Log
Age	-4.216 (0.2810)	-0.842 (0.652)	-0.006 (0.598)	0.1173 (0.786)
	-1.090	-0.450	-0.530	0.272
Sex	-135.99** (0.010)	-265.24** (0.019)	-0.581***(0.001)	-0.647*** (0.000)
	-2.132	-2.111	-3.462	-3.963
Marital status	19.428** (0.022)	68.055 (0.446)	0.489** (0.020)	0.413** (0.049)
	2.415	0.774	2.400	2.022
Education	14.551*(0.097)	-81.019 (0.473)	-0.005 (0.845)	0.643 (0.290)
	1.670	-0.723	-0.196	1.077
Experience	198.690***(0.001)	201.251** (0.034)	0.045* (0.091)	0.444** (0.037)
	3.617	2.470	1.726	2.140
Household size	-10.379 (0.479)	-49.909 (0.590)	-0.010 (0.827)	-0.167 (0.436)
	-0.713	-0.541	-0.220	-0.794
Membership of coop	-8.205(0.906)	-25.315 (0.483)	0.039 (0.752)	0.248 (0.346)
	-0.119	-0.708	0.329	0.955
Access to credit	96.851***(0.000)	124.920* (0.074)	0.903** (0.016)	0.740*** (0.000)
	6.321	2.768	2.517	3.980
Casualty	1.2338(0.452)	-10.657 (0.344)	0.001 (0.804)	0.066 (0.944)
	0.766	-0.955	0.250	0.700
Constant	106.49***(0.001)	-25.543** (0.037)	4.173*** (0.000)	4.121*** (0.000)
	3.921	-2.162	9.188	3.45
R^2	0.818	0.706	0.775	0.791
$\bar{R}^2$	0.780	0.645	0.729	0.749
F stat	13.55 (0.000)	11.74 (0.000)	16.91 (0.000)	18.58 (0.000)
Durbin Watson	1.990	1.934	1.890	1.986

*Source: field survey, 2024. Note: Figures in front of the parentheses are the coefficients, figures in parentheses are the p values while figures under them are the t-values. ***, **, and * show significant levels at 1%, 5% and 10% levels respectively.*

Constraints to Credit Accessibility

The findings on the constraints to credit accessibility among fish farmers are displayed in table 5. The overall grand mean of 2.81 is an indication of strong constraints to credit accessibility by farmers. The most serious constraints are: Insufficient legal document/Collateral/guarantor (M 2.97), Non-membership of associations (M 2.92), Inadequate information on where to source for credit/ignorance (M 2.90), Diversion of loans by farmers to other uses (M 2.90), Terms/conditions for borrowers (M 2.85), Distance of enterprise (M=2.82), and Inadequate track records (M 2.80), Other serious constraints include: Lack of borrowing experience (M=2.78), High cost of obtaining credit/interest rate (M=2.72), Inability to evaluate financial purpose (M = 2.65) and Literacy level (M = 2.63).

Table 5: Constraints to Credit Accessibility

S/N	Constraints	Mean score	Position	Decision
i	insufficient legal document /Collateral/Guarantor	2.97	1st	serious
ii	non-membership of associations	2.92	2nd	serious
iii	inadequate information on where to source for credit/ignorance	2.90	3rd	serious
iv	diversion of loans by farmers to other uses	2.90	4th	serious
v	terms/conditions for borrowers	2.85	5th	serious
vi	distance of enterprise	2.82	6th	serious
vii	inadequate track records	2.80	7th	serious
viii	lack of borrowing experience	2.78	8th	serious
ix	high cost of obtaining credit/interest rate	2.72	9th	serious
X	inability to evaluate financial purpose	2.65	10th	serious
Xi	literacy level	2.63	11th	serious
	Grand Mean	2.81		

Source: Field survey, 2024

CONCLUSION AND RECOMMENDATION

Fish farming in the study area is an agribusiness engaged by mostly educated married farmers who are in their active ages and whose source of capital is mostly from personal saving. The level of access to agricultural credits among these fish farmers is alarmingly low, and access to farm credit is a significant positive determinant of the output of fish farmers. We recommend that Government and financial institutions should implement initiatives such as partnerships with legal aid organizations or government agencies to streamline the process of acquiring documentation to assist fish farmers in obtaining the necessary legal documents required for securing loans. The fish farmers, on their part, should form and strengthen cooperative groups among themselves, while joint efforts should be made by the financial bodies, Government, ministry of Agriculture and farmers to check mate the constraints to farm credit accessibility.

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