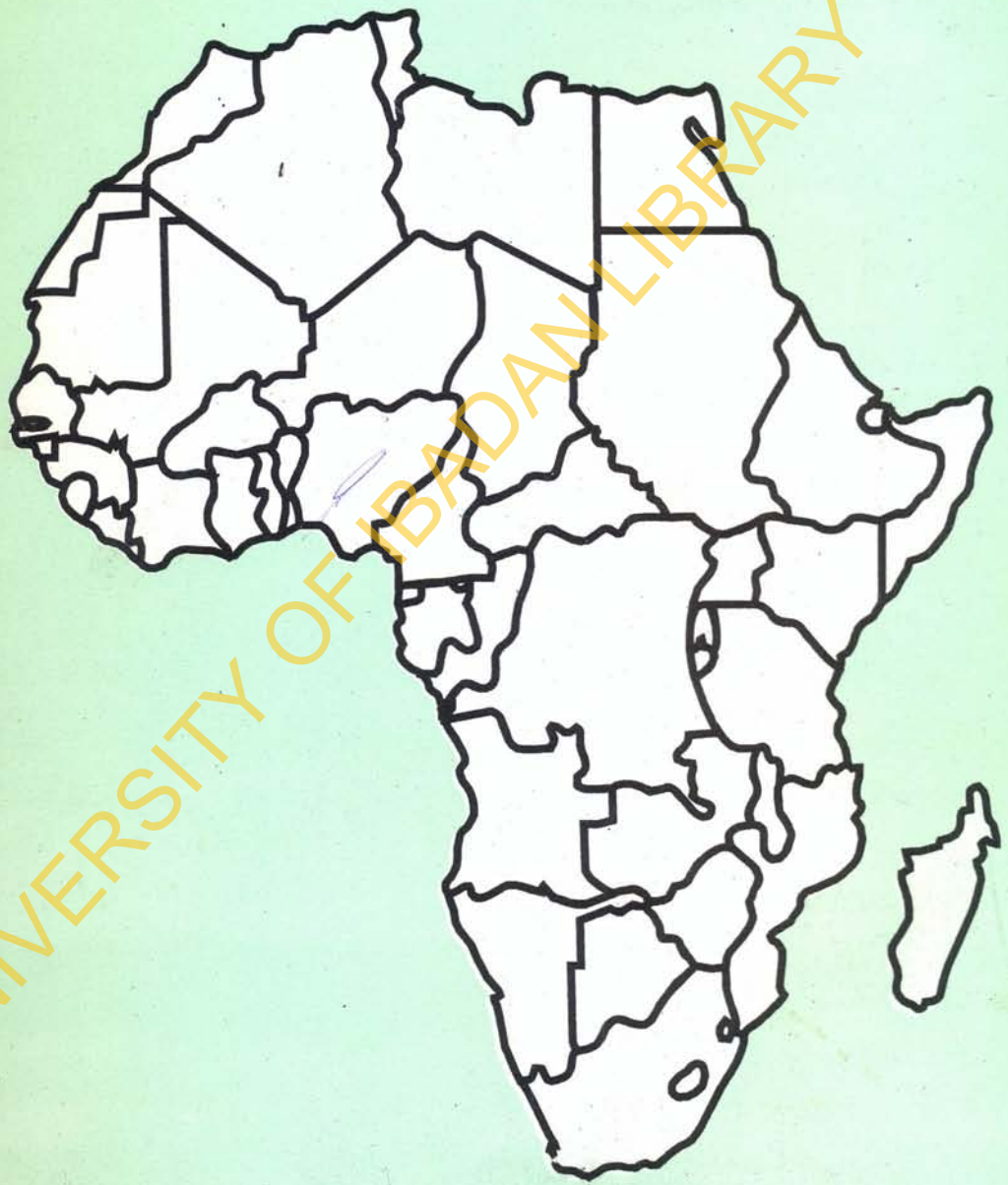
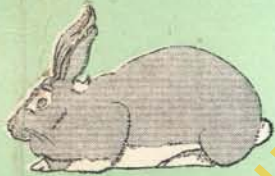




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ELASTICITIES OF RESOURCE- USE IN FISH PRODUCTION: A CASE STUDY OF OYO AGRICULTURAL ZONE, OYO STATE.

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ABSTRACT

This paper examined the elasticities of resource use in fish production in Oyo agricultural zone, Oyo state. The data used is from a primary source. The instruments of data collection were structured questionnaire and in-depth interview. Multi-stage sampling technique was employed to sample 120 fish farmers. However, only 100 respondents were valid and used in the final stage of this work. Descriptive, Gross Margin Analysis (GM) and inferential statistics (production function) were employed in the analysis of the data. The results of the analysis shows that labour, number of fingerlings, feed, fertilizer and years of experience contribute to increase in fish output, while age of the pond, area of the pond, lime and production period decrease the fish output in the study area. However, the total sum of elasticities of production of the variables was greater than unity that is 1.97.

Key words: Elasticities, Fish production.

INTRODUCTION

Background of the study

One of the greatest problems confronting Nigeria today is the lack of adequate protein intake both in quality and quantity to feed the nation ever-growing population. This inadequacy results in problem of malnutrition. The resultant effect of deficiency in the amount of protein intake is that people's health is adversely affected; particularly the mental capability, working productivity and eventually, the overall national economic growth, (Okoruwa et al 1999).

Fish represents 55% of the protein intake sources for Nigerians. Nigeria is believed to be the largest consumer of fish and fish products in Africa reflecting its population size, economic status and dietary habit of the populace (Oderinde, 1998).

In Nigeria, the total domestic fish production fluctuated between 562,972 and 524,700 metric tones (MT) in 1983 to 2003, while the output of fish farming during this period was between 20, 4766 and 52,000 MT. Fish farming accounted for between 3.64 and 9.92% of the total domestic fish production in Nigeria within this period. The bulk of production came from artesian fishing (Inoni, 2007). Moreover, the total fish production was 579, 537 MT in 2005 which amounted to 0.66% of Nigeria's GDP.

The fisheries sector still has a deficit in supply of fish to the populace and this has turned Nigeria into one of the largest importers of fish in the developing world. This has negative economic implication i.e. GDP of the country. However the massive importation has not been able to meet the ever-increasing demand. Given this situation, it is therefore

pertinent to provide the poor and hungry with a low cost and readily available strategy to increase food production using less land per output and less water without further damage to the environment (Pretty et al, 2003).

Over the years different governments in Nigeria have recognized the relevance of the fisheries sub-sector and several attempts were made to boost productivity through institutional reforms and the various fiscal and economic measures. Some of these measures involved tax exemption and input subsidy schemes for distribution to fishermen to stimulate increased production. Despite all these forms of external intervention in the development plan, the performance of Nigeria's agricultural sector has not been commendable considering the nation's vast natural resources, particularly the aquatic resources in the country.

The short fall in fish production is not because of non-availability of the resources, but due to non-maximization and non-sustainable utilization of the available aquatic resource. According to Amao et al, (2007). Nigeria has over 12.5million hectares of inland water capable of producing over 350,000 metric tones of fish annually. Tobor, (1990), reported that there are about 1.75 million hectares of suitable land for aquaculture in Nigeria and 25% of this will yield 656, 820 tones of fish per year when placed under cultivation. Kapetsky, (1981) said that about 6,450 tones of fish can be produced annually from 75,000 hectares of coastal lagoons

All the above evaluations and estimations are the evidences that Nigerians can produce enough fish to meet its demand and export excess and reduce poverty, provided the vast aquatic resources are harnessed and utilized

with high level of productivity. To solve the country's high demand for fish, Nigerians must turn to their under-utilized inland water for improved fish production and aquaculture. The major problems of fish farmers in Nigeria are; poor technology, inadequate fish feed, fish fingerling, capital, human capital, poor management.

There is increasing trend and high level of awareness of pond fish production in the state, particularly in the Oyo agro-ecological zone, where farmers are shifting their attention from poultry production to fish production. The current development of awareness and increasing in number of fish producers in Oyo agricultural zone is welcome. This is creating more interest which requires timely evaluation of their production efficiency with aim of minimizing the gap between demand and supply. Previous studies in this study area have focused on either arable crops or livestock production with less attention to aquaculture production.

This study, therefore, is set to provide answer to the following questions: What is the level of knowledge of farmers on the technical-know-how in fish production? What are the major constraints to increasing fish input productivity of the farmers? What are their level of marginal productivity and the elasticity of their production? Is fish production profitable in the study area? This study will shed more light on the current productivity level among the farmers and provide information on the inputs and output coefficient. The findings of this study will help to know how to educate farmers on the use of resources to boost productivity.

The general objective of this study is to determine the elasticities of resources use in fish production among fish framers in Oyo agro-ecological zone, Oyo state. While the specific objectives of the study are; to analyze the socio-economic profile of the fish farmers in the study area, to evaluate the marginal productivity of the input used and to estimate the elasticity (Return to Scale) of their production.

METHODOLOGY

This study was carried out in Oyo Agricultural Zone of the ADP. This zone comprises of six Local Government Areas namely: Oyo East, Oyo West, Atiba, Afijio and Iseyin, Itesiwaju Local Governments.

Oyo state lies roughly between latitude $7^{\circ}5'$ and $9^{\circ}12'$ North of the equator and longitude $2^{\circ}36'$ and $4^{\circ}34'$ East of the Greenwich Meridian. The state has a tropical wet and dry climate with an annual rainfall

ranging from 1190mm in the Northern parts to 2178mm in the Southern part including Oyo Zone. The temperature is high throughout the year with annual mean of 26.9°C . The state falls within the tropical rainforest in the south (including Oyo Zone) and Guinea Savannah in North.

Agriculture is the main occupation of the people in the state with over 60% of the labour force engaged in crop production. Over 80% of these farming populations are engaged in small scale farming and are low income earners other occupations of the people include: petty trading, crafts, civil service professional jobs such as Law, Architecture, Medical practices, Engineering, e.t.c and often lesser jobs.

The people of Oyo Zone are predominantly Yorubas, with very rich cultural heritage. The deep culture of these people is widely reflected in their traditional farming that has just been modified through new innovations introduced by Agricultural Development Projects (ADPs) technologies. The major food crop produced in this zone includes: yam, Cassava, Maize, Vegetables, fruits. Others include cowpea, sorghum, Plantain, tree crops. Recently, some farmers have been shifting their production from poultry towards pond fish production in the zone, making fish farming more prominent and popular.

SOURCES AND METHOD OF DATA COLLECTION.

The data used is from a primary source. It was collected from practicing fish farmers in the area. The instruments of data collection were both structured questionnaires and in-depth interview. One hundred and twenty farmers were sampled

Multi-stage sampling technique was employed to sample 120 fish farmers. The first stage involved the selection of four (4) (Oyo East, Oyo West, Atiba, Afijio) out of six (6) Local Governments in the zone based on the information available. The second stage involved selection of one village (Kosobo, Ladigbolu, Ajegunle and Ilora quarters) with highest population of fish farmers in each local government area while the third stage was the purposive selection of fish farmers in proportional to population size in each village. However, only 100 respondents were valid and used in the final stage of this work.

ANALYTICAL METHOD

Descriptive, Gross Margin Analysis (GM) and inferential statistics (production function) were employed in the analysis of the data.

The descriptive statistics was used to elicit answer to the first objective, this include: mean

values and frequency distribution of relevant data like socio-economics profile of the fish farmers. The second objective was achieved with the aid of Production Function to explain the relationship between output and input used. The results from the analysis of relevant

variables in relation to output were obtained and interpreted accordingly.

Gross Margin Analysis is given as:

$$GM = TR - TVC \tag{1}$$

Where GM = Gross Margin (N)

TR = Total Revenue (N)

TVC = Total Variable Cost (N)

Production Function:

$$Q = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 \tag{2}$$

Where

Q = Total quantity of fish produced (kg)

X₁ = Feed (kg),

X₂ = Number of fingerling (kg) / amount (N)

X₃ = Labour (man –day)

X₄ = Area of pond (m²)

X₅ = Fixed cost (N)

X₆ = Cost of lime (N)

X₇ = Cost of fertilizer (N)

X₈ = Cost of equipment (N)

RESULTS AND DISCUSSION

The summary analysis of socio- economic characteristics of the sampled farmers in the study area is presented. The socio-economic factors considered include the age of the farmers, sex, primary occupation, marital status, family size, years of experience, educational background, fish training, extension visit, and other factors.

Age has economic effect on the contribution of human capital to production. Age influences the amount of physical efforts, rate of adoption of new innovation and improved technology. The farmers age ranges between 20 to 65 years, about 79% of the farmers are at most 49years, while the mean age value for farmers was 40 years with standard deviation of 10 years.

The variance in the farmers' age might imply variation in the level of productivity with regard to the effective man- hour of labour in fish farming. The mean age of the farmers in this study shows that fish farmers are relatively young.

78% are male. This signifies a typical Nigerian farming system, especially the Western region in which men are the predominant farmers. 77% were married. The larger percentage of the fish farmers that married thus gain advantage of the household members as source of family labour in the activities of fish production on the farm. It further reveals the involvement of young people in fish farming.

Variable	Freq	%
Age (years)		
20-29	17	17
30-39	27	27
40-49	35	35
50-59	18	18
60-69	3	3
Gender		
Male	78	78
Female	22	22
Marital Status		
Single	19	19
Married	81	81
Household Size		
1-3	30	30
4-6	53	53
7-9	14	14
>9	3	3
Income		
30000-90000	3	3
100000-300000	20	20
400000-600000	21	21
700000-900000	11	11
1000000-3000000	26	26
4000000-7000000	11	11
>8000000	8	8
Occupation		
Primary	44	44
Secondary	56	56
Years of Experience		
1-5	53	53
6-10	34	34
11-15	11	11
16-20	2	2
Level of education		
Non-Formal	1	1
Primary	5	5
Secondary	31	31
Higher Education	63	63
Fish Training		
No Training	31	31
Informal	29	29
Formal	40	40
Visit		
No Visit	62	62
Forth-nightly	19	19
Monthly	19	19

In West African countries, especially in Nigeria, farm labour requirement is usually influenced by the family size of the farmers' household. Family labour has been source of labour in production instead of hired labour. The analysis indicates that the family size of the farmers in the study area ranges between 1 and 15 members. 83% of the farmers have at most 6 members per family; while 17% have between 7 and 15 members per family. The average family size was 6 members with standard deviation of 2 members.

Forty-four percent of the farmers have fish production as primary source of their livelihood, i.e. primary occupation while 56% have fish production as their source of supplementary income, i.e. secondary occupation. This shows that larger percentage of fish producers in the study area are not full time farmers. The survey conducted revealed that some poultry farmers have been shifting to fish farming, using it as back-up because of the incident of bird flu (Avian Influenza) experienced in the past six years, high cost of poultry feeds and erratic prices of egg and other poultry products observed in the country.

More than 50% of the fish farmers have less than 6 years of experience in fish production. While the mean and standard deviation was 6.4 and 3.9 years respectively. This has shown that larger percentage of the farmers were still young in their fish production experience. From the analysis of the data, it was discovered that many of farmers in the study area started diversifying into fish production after the negative economic effects

of bird flu (Avian Influenza) on poultry production in recent years past.

More than 90% of the farmers in the study area have at least secondary education. The higher level of the farmers' in the study area was connected with many higher institutions of learning that are located within environment. The higher level of education background of majority of farmers would be advantageous in introduction of new innovation and adoption of new technologies in fish production in the nearest future. This is an indication that fish production has brighter prospect if the fish farmers are given necessary motivation and logistic support.

About 60% of the farmers have either no fish training background or informal training in fish production. While only 40% has formal fish training background. For farmers to make efficient use of the available resources to boost fish production in the study area there is urgent need for organizing workshop or seminar on fish production and management. Such training will improve the skills of the fish farmers' and later transformed into efficient utilization of resources and increase productivity.

The analysis of the survey carried out revealed that about 62% of the farmers did not have extension agent or consultant visiting their farm, while the 38% either have extension visit occasionally or forth-nightly. This inadequate exposure of farmers to improved fish production technologies could result in low productivity and inefficient utilization of fish resources.

Summary of the gross margin

Variable	No of Farmers	Minimum	Maximum	Mean
Income	100	32900.00	45425.48	43434.80
TVC	100	21025.00	22791.60	23153.00
GM	100	11875.00	22633.88	20,281.80

Gross Margin Analysis is given as:

$$GM = TR - TVC$$

$$TR = \text{N } 43434.80$$

$$TVC = \text{N } 23153.00$$

$$GM = \text{N } (43434.80 - 23153.00)$$

$$GM = \text{N } 20,281.80$$

Gross margin analysis of the fish farmers in the study area range between N11875.00 and N22633.88. The gross margin mean was N 20,281.80 per production cycle. This has shown that on average fish production was a profitable enterprise. Considering this value the prospective farmers should harness their resources to make use of the advantage of the profitability of fish production as a means of

source of income, job creation for unemployed youth and improving the standard of living of the citizens.

Evaluation of the marginal productivity and the elasticity (return to scale) of the input used.

The table below shows that labour, number of fingerlings, feed, fertilizer and years of experience contribute to increase in fish output, while age of the pond, area of the pond, lime and production period decrease the fish output in the study area. However, the total sum of elasticities of production of the variables was greater than unity that is 1.97. This implies

increasing returns to scale and it means that fish production in the study area had an increasing return to scale. Each marginal increase in the value of inputs results in a higher increase in product than the previous unit.

Elasticities of inputs used in fish and Return to Scale (RTS)

Ind. Variables	Elasticity of Production
Labour	0.1897
No of fingerling	1.0160
Feed	0.0596
Age of pond	-0.0052
Area of pond	-0.0060
Lime	-0.0045
Fertilizer	0.0012
Production period	-0.6663
Experienced	0.0198
Return to Scale (RTS)	1.9683

It could be deduced that fish production on Oyo zone fall within stage 1 of the production function curve. This stage indicates that production has just started increasing (the mean of years of experiencing in fish production is 6.4 years) and it will be irrational for farmers in this area to stop expansion of their scale of production. The implication of this is that increase in marginal inputs lead to higher marginal physical product (MPP), at this point, even if the price of the product remains constant, farmers still have advantage of making higher profit.

CONCLUSION

Although fish production in the study area is relatively new and majority of fish farmers have no formal training. However, since the gross margin of the average fish farmers was estimated to be ₦ 20,281.80 while the value of the Return to Scale (RTS) was estimated to be 1.97 (increasing in return to scale). There is future prospect for fish farmers and brighter hope for fish production in Nigeria.

RECOMMENDATION

Women's participation in fish production should be encouraged to boost fish production towards the achievement of Federal Government Millennium Development Goals (MDGs) in agricultural sector. Farmers in the study area should increase the fingerlings stocked density (number of fingerlings per unit area), increase the quality and quantity of the feed and this will result in quantity of table fish produced.

Extension services should be made available to the fish farmers, seminars or

workshop on fish production should be organized for fish farmers and young graduates who have interest in fish production.

Facilities that would serve as stimulant to fish market activities and more credit facilities should be channel to the practicing fish farmers to boost their production

If all these recommendations are properly implemented, it would have tremendous multiplier effect, ranging from provision of job for unemployment, income generation, improve protein intake at lower prices and on the economy of the area and the whole nation as a whole.

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