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# Investment Prospects In Integrated Fish Cum Poultry Farming System

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## Abstract

*The study examined the feasibility of a small scale integrated fish cum poultry farming project utilizing concrete tank of 4 x 4.8 x 3.5m. 900 post fingerlings of Clarias gariepinus (52 2.7g) were stocked in 3 concrete tanks at the rate of 1fish per 5m² and fed diets containing 38% (Diet 1), 33% (Diet 2) and 31% (Diet 3) crude protein levels. Three battery cages containing 15 laying birds were installed on each tank. The birds were fed with layer mash (CP 18%) while the fish were fed with 300kg of fresh maggots and pelleted feed. At the end of 213days, growth response and nutrient utilization of fish were based on Average daily weight gain,(DWG 4.48) relative growth rate (RGR 1834.27) and specific growth rate (SGR 1.39) . Final weight ranged from 949.2g to 963.2g. Daily weight ranged from 4.46g to 4.52g. Feed cost for fish was drastically reduced while revenue from poultry was significantly increased The profitability analysis of the operation showed that table size Clarias production generated return to investment of 31.19%, a rate of return on fixed cost 163.79% and a rate of return on variable cost of (161.07). The financial analysis reveals a viable investment.*

**Key words:** Fish, Poultry, Integrated, Small – scale, Economics.

## Introduction

The earth may have 10 billion people before the end of this century, and Africa will be contributing to this population explosion. While the world food production could grow significantly to feed the growing population, Africa may not be able to feed its increasing human population. Part of the strategy recommended for Africa to meet this great challenge is integrated crop-livestock-fish farming as an alternative to large-scale monoculture farming (Breine *et al* 1995).

Global fish supply is becoming scarce due to human influences as population increases (FAO, 1999). The transition to relative scarcity of fish cannot be prevented by more intensive fishing but rather ameliorated by aquacultural practices and better management of fisheries resources and intervention to judicious use of resources.

Generally, integrated fish farming is a relatively new culture technique with great potential for maximizing the efficiency and productivity of small holder farmers (Mokherjee, 1995; Little, 1995 and Onuoha, 1999). Integration with livestock enterprises is probably the most common form.

Chicken manure and unutilized feed contribute directly to the fish diet and indirectly enhance

plankton production in the water. Fish production has however remained the major activity in most of the integrated systems, (Engle and Skladamy 1992). The objective of this study was to examine and evaluate the economic feasibility of integrated fish and poultry farming venture with a view to recommend the practice to prospective fish farmers.

## Materials and Methods.

The study was carried out on a private farm. Three (3) (4m X 4.8m X 3.5m) concrete tanks constructed at Ake- Village in Ifo Local Government area of Ogun State, Nigeria were use in the study. The data and other pieces of information that were used in this economic analysis were based on the results, observation and experience obtained from culture system in Kehinde farm Nigeria Limited along old Lagos Abeokuta express way in Abeokuta, Ogun State, Lucky Groups of Company farm in Mowe Ofada road near Owode in Abeokuta, Ogun State and Ogun State Agricultural Development Project. They were stocked with nine hundred (900) post fingerlings of *Clarias gariepinus* (300 per tank) at the rate of 1 fish per $5m^2$ between April and October, 2005. The average weight of the stocked fish was 52 ± 27g. Three battery cages with capacity of 15 birds each were installed. The point of lay birds were housed in battery cages. The battery cages were suspended on the concrete fish tank and in such a way that the chickens dropping fall directly through the cages into the fish tanks to serve as organic manure. The birds were fed with layer's mash twice a day (CP 18%). The fish were fed with a combination of fresh maggots collected from near by poultry farm and pelleted feed (38%, 33% and 31%) crude protein. The fish were fed with 300kg and 1,050kg of maggot and pelleted feed daily at 3% body weight at the ratio of 1:3.

*Data collection and analysis.*

Data on size and weight of fish were collected bi-weekly to assess the growth of the fish during the culture period. Observations were recorded and the parameters observed include standard length, total length and weight. The fish were sampled in batches of 25 each, they were weighed with top loading balance Mettler Toledo, Model number Pb 602 to the nearest grams, the standard and total lengths were taken by using measuring board. The growth performances of the fish stocked in the tanks were monitored throughout the experimental period. For poultry the weight of the birds were taken using a weighing balance Mettler Toledo, Model number Pb 602 before they were sold. Data were also collected on the prices of output for both fish and poultry.

The analysis involved a physical assessment of integrated monoculture based on weight and number of fish to determine the yield of fish in each enterprise. The gross margin technique was used to determine and compare the contribution of each enterprise- integrated monoculture and poultry to the profit of the whole farm. The gross margin is a measure of the difference between the gross return and the total variable cost for each enterprise.

*Calculations*

At the end of the experiment, the food conversion ratio (FCR), relative growth rate (RGR), specific growth rate (SGR) and percentage survival (S) were determined as follows:

$$FCR = \frac{\text{Weight of food supplied (g)}}{\text{Body weight increase (g)}}$$

$$RGR(\%) = \frac{w_f - w_i}{w_i} \times 100$$

$$SGR(\%) = \frac{\log w_f - \log w_i}{T \text{ (days)}} \times 100$$

$$S(\%) = \frac{N_1}{N_2} \times 100$$

Where $w_i$ = Initial weight (g) of fish i.e. at the beginning of experiment
$w_f$ = Final weight (g) of fish i.e. at the end of experiment
log = Natural logarithm
$N_1$ = Numbers of fingerlings stocked at the beginning of experiment
$N_2$ = Numbers of fingerlings alive at the end of experiment
S = % survival
Profit index = Weight of fish (*C. gariepinus*) cropped @ ₦ 300.00/kg

And incidence of cost was based on the following profitability indicators were calculated

(i) Net farm income (NFI) = Total value of product (TVP) minus Total fixed cost (TFC) minus Total Variable Cost (TVC).
(ii) Rate of Return to investment (RRTI) = (NFI/TCP) x 100%
(iii) Return on Fixed cost of production (RFC) or Gross Margin (GM) = Total Value of production (TVP) minus Total Variable Cost (TVC).
(iv) Rate of return on fixed Cost (RRFC) = (RFC/TFC) x 100%
(v) Rate of Return on Variable Cost {(TVP – TFC) / TVC} x 100%

## Results and Discussion

The proximate composition of experimental diets (Table 1) show that moisture content was highest in diet 2 and lowest in diet 3. Crude protein, fat and ash show a gradual decreased from diet 1 to 3.

Table 2: Although, there was a steady increase in the feed intake as dietary crude protein increased, other growth response parameters like the relative growth rate, (RGR) specific growth rate (SGR) maintained steady increased as dietary crude protein increased. Although, the growth rate of Clarias was found to be 4.52g/day, other studies showed a lower value. El – bolock (1976) reported an average daily growth rate of 0.34 – 0.041g/day in ponds with no supplementary feeding. Tokrisna (1995) observed a growth rate of 2.9g/day for the first eight months for Clarias of average weight of 598g to 1.36kg within a period of one year. The growth rate observed in this study could be attributed to the cultured medium in the concrete tank. Mukherjee (1995) observed higher growth rate in the earthen pond , since natural productivity occur as a result of organic matter in form of suspended particles present in water body couple with the availability of nutrients.

**Table 1(a): Gross Composition Of Experimental Diets (g/100/Diet)**

| Ingredients | Diet 1 38% Protein | Diet 2 33% Protein | Diet 3 31% Protein |
|---|---|---|---|
| Yellow maize | 27.92 | 32.30 | 35.77 |
| Groundnut cake | 42.49 | 35.10 | 35.77 |
| Fish meal | 20.75 | 18.77 | 16.48 |
| Vegetable oil | 5.00 | 5.00 | 5.00 |
| Brewer's Grain | 5.00 | 5.00 | 5.00 |
| Bone meal | 2.50 | 2.50 | 2.50 |
| Oyster shell | 0.50 | 0.50 | 0.50 |
| Vitamin mix | 0.60 | 0.60 | 0.60 |
| Salt | 0.24 | 0.24 | 0.24 |

**Table 1(b): Proximate composition of experimental diets**

| Ingredients | Diet 1 | Diet 2 | Diet 3 |
|---|---|---|---|
| Moisture (%) | 5.47 | 6.28 | 4.91 |
| Crude Protein (%) | 36.87 | 32.02 | 31.30 |
| Fat (%) | 8.53 | 8.39 | 7.93 |
| Crude fibre (%) | 5.06 | 6.37 | 5.23 |
| Ash(%) | 9.85 | 9.80 | 9.61 |
| NFE (%) | 34.22 | 37.14 | 41.02 |

The fingerlings (Table 2) fed actively on the live maggots. When offered the mixed diet of maggot plus feed, they consumed the maggot first before the feed. The results obtained (1.01kg) from this study supports previous observation by Mukherjee (1995), Breine *et. al.* (1995) and Vincke (1995), that live organism enhance the growth of fish at their early stages of development. Live food supplement with feed have been reported to be favourable for fish. Live organisms are known to contribute significantly to digestion of food by supplying digestive enzymes and also increase the efficiency of artificial feeds (Maguswi 1995 and FAO 1997.).

Table 3 shows the production based on the number of layers in the cages. An average daily egg production is 75.5% of the total number of layers was observed during the experimental

**Table 2: Growth performance and nutrient utilization of *Claria gariepinus***

| Parameters | Treatments | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Duration of experiment (days) | 213 | 213 | 213 |
| Number of fingerlings stocked | 300 | 300 | 300 |
| Number of dead at the end of experiment | 12 | 11 | 20 |
| Number alive at the end of experiment | 288 | 289 | 280 |
| Initial mean length(cm) | 8.11 | 9.12 | 7.22 |
| Final mean length(cm) | 31.21 | 30.12 | 34.21 |
| Mean length gain(cm) | 23.1 | 20.91 | 26.99 |
| Initial mean weight(kg) | 52.10 | 51.80 | 49.64 |
| Final mean weight(kg) | 1.15 | 1.01 | 1.02 |
| Mean weight gain(g) | 963.0 | 952.36 | 949.2 |
| Average daily weight gain(g) | 4.52 | 4.47 | 4.46 |
| Relative growth rate(%) | 1851.9 | 1832.4 | 1818.5 |
| Specific growth rate(%) | 1.39 | 1.39 | 1.40 |
| Mortality rate(%) | 4.17 | 3.80 | 3.14 |
| Survival rate | 95.83 | 96.2 | 92.86 |

period using commercial layers mash with 14.8% crude protein. The egg production of 32eggs/ day reached the peak in the third month with 34egg/day. Mortality rate was three out of the total number of layers. The result of Ita *et al.* (1986) conform with the results obtained.

Table 4: shows the annual production cost and returns for the small scale Clarias cum poultry farming system. The cost structure (table 4) revealed that the total fixed cost (TFC) constituted only 48.91% of the total cost of production (TCP) while the total variable cost (TVC) accounted for 51.09%.

In the first year of operation the total amount invested was N284, 200.00 out of which N139, 000.00 and N145, 200.00 were fixed (for tank construction, battery cages, and farm house) and variable (mainly for fish seeds, feed, layers mash, point of lay birds and surveillance) costs respectively. In the first year of operation, the net farm income (NFI) was N88, 670.00. This gave a rate of return to investment of 31.19%. The rate of return to variable cost was 161.07%. The profit

**Table 3: Egg production and Revenue from sales of egg in integrated Fish cum poultry farming for 213 days**

| Total No of layers | No of Eggs/day | Total No of Eggs | Unit price per 30Eggs |
|---|---|---|---|
| 45 | 34 | 7242 | N67,592@N280.00/layer |

**Table 4 (i) Annual Production Costs and Return for Small – Scale Integrated Fish cum Poultry (2005 price)**

| | Items | Unit Cost(N) | Amount | % of Total Cost |
|---|---|---|---|---|
| A | **FIXED COSTS** | | | |
| (i) | Construction of the 3 tanks | 30,000.00 | 90,000.00 | 31.67 |
| (ii) | 3 battery cages | 3,000.00 | 9,000.00 | 3.17 |
| (iii) | Farm house/ Guard shed | 40,000.00 | 40,000.00 | 14.07 |
| | Total Fixed Cost (TFC) | | 139,000.00 | 48.91 |
| B. | **OPERATING COSTS** | | | |
| (i) | Fish seeds | 15.00 | 13,500.00 | 4.75 |
| (ii) | 5 scoops net | 280.00 | 15,300.00 | 0.49 |
| (iii) | 18 bags of layer mash | 850.00 | 15,300.00 | 5.38 |
| (iv) | 45 birds | 600.00 | 27,000.00 | 9.50 |
| (v) | Fish feed (34% CP) 2.5 tons | 20,000.00 | 55,000.00 | 19.35 |
| (vi) | I poultry attendant | 12,000.00 | 12,000.00 | 4.22 |
| (vii) | I night guard | 12,000.00 | 12,000.00 | 4.22 |
| (viii) | Miscellaneous | 9,000.00 | 9,000.00 | 3.17 |
| | Total Variable Cost (TVC) | | 145,200.00 | 51.09 |
| | Total Cost of production (TCP) | | 284,200.00 | |

**Table 4(ii): Profitability analysis of integrated fish cum poultry farming**

| Profitability indicators | Values (1 Years) |
|---|---|
| Net farm income (NFI) ₦ | 88,670 |
| Rate of Return to investment (%) | 31.19 |
| Return on fixed cost (%) | 227,670 |
| Rate of Return on fixed cost (%) | 163.799 |
| Rate of Return on Variable Cost (%) | 161.07 |

of N88, 670.00 is the net farm income (NFI) for the first six months of the year. Economic viability of aquaculture depends on the interplay of variances complex factors. It is often the aim of fish farm operators to cut down production cost in order to increase the return on investment. However production cost is a function of operational skills, which include selection of sites, fish species and the manipulation of the growth pattern of the stock, management capability of the operators and also the production capacity of the culture system. This result conforms with the finding of other workers (Light foot 1990; Engle and Skladamy, 1992; Rathanavaraha, 1992; Altieri and Yurjevic, 1992; and Onuoha, 1999). The practical application of these factors is that nutrients are supplied to the ponds in form of inorganic or organic fertilizers this may be as a result of their composition of primary nutrients i.e nitrogen, phosphorus and potassium (N:P:K), in mineral form and in finite amounts. Organic fertilizer exemplified by the encouragement success (growth rate of about 4.52g/day).

By fertilizing with poultry manure at 40% plus feeding at 60% of the normal rate. it is possible to produce the same quantity, that is. not significantly different, for fish in an intensive culture with 3-5% fish biomass feeding rate. Poultry droppings recycled as manure with other factors such as Nitrate and Phosphate that are the major nutrients and feed for fish.

Jayaraman *et al.* (1991) reported that recycling of cattle shed washing for fish culture under mixed farming maximized farm income beside reducing risk measured as coefficient of variation in net farm business income from 15.62% to 45.71% in pure crop farms. Similar benefit was possible in this system also which would help to stabilize income encouraging its adoption widely, particularly by small and marginal farmers.

Availability of cheap protein foods like eggs, fish and chicken to the fish farmer is an important benefit to the integrated farming system. Stealing of fish or poaching is a common social problem of the culture system especially in developing countries. This necessitated the provision of a night guard for the project.

This system generated 213 man – days of employment which means that when taken up mixed farming, the farmer should get employment throughout the year. Specifically, it would provide benefit as women labour could maintain it and they need not engaged labour outside the family. The financial analysis is based on the intensive culture in which formulated rations are fed in addition to live maggot to achieve faster growth at short time interval. Special fish servicing activities like tanks, fishing gears etc. will only

be borne by the prospective investor in the first year, these inputs in the subsèquent year are added to the benefit of the investor; hence makes investment profitable. The prospect here is bright, especially when modern methods based on sound scientific, ecological, technological and economic principles are applied. This innovation, as Garharsen (1977) point out, on a large scale for profit in terms of better commercial and social returns on investment of money, time and human effort will be realized only by the informed and venture same.

## Conclusion

In physical and economic terms, investment prospect in integrated fish cum poultry farming enterprise has a very bright prospect in Nigeria, considering the need to explore and utilize the tank to culture fish and supplement the grossly inadequate protein requirements. Such an enterprise cannot be easily achieved without tackling some attendant problems like fish supply vis-à-vis population growth, effect of income growth amongst the populace vis-a- vis fish demand and lukewarm attitude of most government policies towards effective fisheries development. Other problems are manpower shortage.

Prospects however, abound for this enterprise in view of the role fish play in world protein supply. The economics of production and sales for this type of enterprise has shown quite encouraging results considering the low cost of capital investment and profitable revenue that accrue based on experience from other countries. It is proposed that strategies for development of this enterprise include provision of credit facilities, integrated rural development as an important step to attack the aspects of vicious cycle of poverty, productivity, marketing and welfare problems.

Proper policy and planning in both government and private agencies can adopt a strategy of optimum utilization of natural resources through intuitive judgment in decision-making. Based on investment prospect analysis and with good management, such system is profitable. Implication for future trend for management, combined culture system and aid are a very successful venture.

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