INTEGRATED CHICKEN CUM FISH FARMING FOR SUSTAINABLE RURAL AND URBAN COMMUNITIES IN NIGERIAN.

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ABSTRACT

Animal manure contains considerable quantities of nutrients for fish production among which are non-digested feed, metabolic excretory products and residues resulting from microbial synthesis. Other benefits of integration of chicken with fish are efficient resources utilization and conservation of environment due to waste management. This paper enumerates a layer chicken cum fish integrated strategies and projects a model I hectare pond with layers. The economic benefits were extrapolated in a cash flow projection on five years duration.

Key Words, *Fish, Poultry, Egg, manure, integration, Pond, economic projection.*

INTRODUCTION:

Livestock manure contains considerable quantities of nutrients for fish production. Protein content ranges between 10-30 percent, energy between 1100-1400 kilocalories per kilogram manure and soluble vitamins are synthesized in high concentration (Pratt,1975,NRC,1977, Tuleun,1992). It also contain non digested feed, metabolic excretory products and residues resulting from microbial synthesis, which can be utilized to replace reasonable parts of feedstuffs used in conventional fish feed thereby causing reasonable decrease in fish feed production cost (Falayi, 1998, Fashaki *et al,* 2000). Spartan (1979) reported that the benefit of manure when fed directly to *I. aureas* was in the production of benthic organisms and the result shows that tilapia hybrid ingest manure directly. Moav (1977),also confirmed that Chinese carp utilized about 95 percent of the valuable ingredients in poultry manure and that catfish and tilapia also have enormous potentials for direct manure consumption (Meyer,1977). Nitrogenous manure inputs in ponds clearly influence the pond water productivity as it supplies the plankton with essential nutrients needed for the multiplication and for growth inform of fertilizer and these life animals and plants are the natural food for the newly hatched baby fishes (Ovie,1996). C.T.F.T (1972) estimated 154 kilogramme weight poultry manure per hectare of fish pond per week as requirement for excellent results for fish protein in Gabon.

The need for fish protein has been emphasis with the projected population 88.50-106.71 million and fish demand between 1, 06200-1, 28052 m/ton from 1991-2000, with a population growth of 2.1% per year and 12kg fish consumption per head (Solarin,1992). The artisanal fisheries cannot cope, while reasonable foreign exchange are implicated year in and out on fish importation. The only option available to Nigeria with several land and food resources potentials is aquaculture in which feeding of formulated feed has become extravagant.

Integration of fish with poultry is cost saving in that waste from poultry Manure would serve as

fertilizer and feed to fish in ponds. A stone would have been used to kill two or more birds. Integration is geared to works making aquaculture and animal husbandry a sustainable venture for common man and his immediate family. The Asian world were already on integrated livestock cum fish and crop farming for many succeeding years (Azziz, 1978) because of their intensive fish culture techniques in which case animal manure (waste) have been adopted as the only feed resources for fish in captivity.

Other advantages of integrated fish farming with poultry include the synergistic effect and complementary nature of the various systems, increased effective utilization of resources including labour, feed, landspace, reduction on investment risk through diversification, income generation, family food source, employment opportunities and pollution free environment due to animal waste management (Lee, 1971; Hopkin, 1982; Otubusin, 1986).

This paper projects the methodological approach, basic requirements as input and major returns as output in an integrated chicken cum fish farming enterprise and the cash flow for period of five year.

MATERIALAND METHODS:

Facilities proposed for the site: fish and poultry resources

POND SITE LOCATION AND PREPARATION:

It is imperative for a farmer to locate a good site for his farming business.

Land availability is a key factor for planning an aquaculture venture. A land with no profitable competing value is better for pond construction especially, flooded or swampy piece of land that cannot be use for any other alternative profitable use.

The vegetation type in important. The landed property must not be filled with big trees because of the cost of removing item. The best soil type is loamy soil. Soil with a lot of rock is not good because of the cost of blasting the soil.. Clayey soil tends to be acidic and the cost of liming to control the acidic content is high.

Soil chemistry analysis should be carried out especially, in other to ascertain the presence and concentration of some heavy metals that could be toxic to the fish (Okoye, 1996).

B. Clearing: All obstacles on the sites are removal with bulldozer or tractor. Where any of these machineries is not available manual work can be adopted.

C. pegging / mapping: This is done after site clearing. This is use size the pond. Pegs are used to determine the position of the slope, main dyke, pond depth (bottom) feeder canals and drainage canals.

D. Excavation and Dyke building: A bulldozer is needed for this operation. Scraping of the top soil layer (10-15cm) is done and keep the soil somewhere which will be use to line the pond, because it is rich in nutrient. A depth of 1.0m (shallow) or 1½ m (deepest) pond is recommended.

E. Water inlets and outlets / drainage: Water inlets are built at the highest part of the pond to ensure easy filling and aeration while outlets are built at the lower part of the pond. PVC, Pipes, Plastic, Bamboo strokes e.t.c could be used as inlet while outlets can be made with concrete monk and water to be released is monitored.

F. Liming: This operation is carried out both in fresh and old pond before stocking.

Liming is done in other to check the acidity of the soil, reduced turbidity of the water, enhances primary productivity of the pond, improve the availability of soil nutrient and relieve carbonic ions that positively influence photosynthesis.

LIME & APPLICATION LEVELS

Agricultural lime (Calcium carbonate)	2270 kg/ha
Powdered limestone ($CaCo_3$)	1140kg/ha
Hydrated lime ($Ca\ OH)_2$	114kg/ha
Quick lime (CaO)	200kg/ha

Source: Adeniji, 1996; Okoye, 1996.

Fertilizations of pond is directly done through feacal ovpyrings into the pond water. The does not requirement extract cost of fertilizer.

POND ON MANAGEMENT BEFORE STOCKNG.

Immediately a pond is excavated, water will be added to about 0.2 -8.5 m levels and check for retentions, before liming could take place. This is important because if the soil has low water retaining capacity, there is high possibility of leaching of both the water and nutrients, especially in earthen pond.

B. POULTRY HOUSE Flooding from inlet system is screened filtered to check the size of the Fauna and Flora that comes in. The water must be from a good source because of pathogenic microbes that might constitute nuisance and have side effect on the productivity of the pond.

Poultry house with roofed top and treated wood walled to I meter level, while the remaining part (1meter) to lintel is wire netting. The house is to be built on standing concrete pillars located very close to the dyke nearing the deepest area of the pond i.e 1-1¼ meters depth. The floor is made up of perforated or spaced wood which would allow free movement of staff. Battery cages are located which accommodate the layers, feeders and drinkers and free movement to feed and for egg collection.

C. POULTRY STOCKING AND MEAT PRODUCTION.

Point of lay (POL) birds of proven qualities is advisable. Presently birds such as warren, Babcock and Harco strains, yaffa etc are common but they must be obtained from reputable farms where all vaccination and other prophylactic measures have been adopted before sales. Depending on the cage type, a cage may occupy 1or 2 or more birds. Good source of feed, (layer's mash) is of good advantage. You may do home mixed feed by using concentrate from reputable feed companies to mix with maize and wheat offal. This approach will cheapen the feed cost per bag.

Provide clean and cool water regular. Normally, 200 point of lay birds of mean wt. 1.5kg will consume only I bag of 25 kilograms per day. Do not underfeed or overfeed your birds. Always lock doors and engage the service of a security dry and height to prevent theft, which may work against your intending profit. Eggs are collected 3-4 times daily (10.00am, 11-12.00 noon, 200pm and 5-6 pm). You can have your lighting programme for better ovulation and egg lay. Put on light inside the poultry house by 7.00 pm and put it out at 8.00pm, increase this gradually within the week until you permanent light out at 10.00pm.

Arrange your eggs in crate and sell. The old layers are usually sold at end of project on kilogramme basis. You may cull birds' due to wound, unproductive or sickness (Oluyemi & Roberts, 1985).

(D). MANAGEMENT OF INTERGRATED CHICKEN CUM FISH FARMING

STOCKING DENSITY: A polyculture fish pond combines 2 or more fish species: The recommenced fresh water fish species in Nigeria

by Okoye (1996) include:

1. Tilapia and *Clarias* species To control excessive breeding of tilapia
2. Tilapia and Heterobranchus species-To control excessive breeding of tilapia and promotion of good growth of Heterobranchus.
3. Tilapia and *Heterotis* species- To promote fingerlings and breeders of both fish species.
4. Tilapia common carp - To promote fingerlings and breeders or table size fish.
5. *Heterotis*, Tilapia and *Clarias* - Density control of tilapia by *Clarias* and production of *Heterotis* breeders.
6. *Heterotis,* Tilapia and Heterobranchus density control of tilapia by *Heterobranchus* and production of *Heterotis* breeders. Bigger size catfish are produced.
7. *Lates,* Tilapia - Density control that gives a better tilapia output but needs bigger fish pond or reservoir.

In this write-up, a consideration of Tilapia, common carp and Heterobranchus is recommended at ratio 1:10:5. Introduce about 2000 Carp fingerlings and about 20,000 Tilapia fingerlings mean weight 5g per hectare pond is the first 2 months and then 5000 fingerlings of *Heterobranchus spp.*. Mean weight 10-20g. The fry and fingerings of Tilapia produced would serve as food for Heterobranchus in which case the nutrient requirement of the catfish can be meant. The manure serves as feed for Carp and the abundant *Tilapia species*.

It is important to inform farmers that:-

1. No single fish species can effectively utilized the pond natural resources
2. Monoculture system can be wasteful at times in that the food resources are not maximally utilized.
3. Correct stocking ratio, stocking density and timing of stocking as recommended (Ita, *et, al* 1986).

FEED AND FOOD CHAIN: In case of integrated layer Cum fish farming, the manure serves as organic fertilizer for the growth and development of plankton and nitrification of the pond. The plankton, algae and forages serve as food for young Tilapia and Carp respectively. Thereby tilapia breed rapidly and the fry are fed to the catfish stocked at later days (usually after 2months of stocking) (Eyo, *et. al.*, In-press).

Water quality precautions:-

It is necessary to start fish farming with water of good quality that has low suspended solids, nutrient, but alkaline and well aerated with good oxygen content. Avoid water from first rain where dry season is prolong because this may contain high quantity of carbonic acid and suspended solids that are injurious to fish. Also beware of using borehole or deep well waters which have not been tested for dissolved solids content or may contain poisonous gases (Hydrogen sulphide, sulphur IV oxide) and heavy metals (Zinc, Mercury, Cadmium). Use only well aerated/ dechlorinized tap water to reduce chloride gas, which is injurious to fish stocked. Good sources of water include rivers, lakes or reservoir, which does not contain large quantity of floating and suspended algae and/or gases, which could affect fish production. Avoid introduction of effluent from cooling system or factories, which could result in mass fish death in the fish ponds. It is important to maintain water temperature of fish in warm condition between 27°C and 32°C which is favorable for fish eggs to hatch and fry, fingerlings and broodstocks to be healthy (Adeniji, 1996). The pond must be avoided of over fertilizer by collection of chicken droppings with sacks and sundrying for re-use. Over-fertilization leads to pollution, high number of aquatic plants, decomposition, entry of pollutant run-off, deoxygenating, etc. If pond water is alkaline as indicated with pH paper, gypsum ($CaSO_4$) or Alum ($AlSO_4$) can be applied to make its alkaline lower.

Simultaneously if the water is highly acidic as indicated by pH paper the application of lime ($CaCO_3$) can be used to raise it pH to acceptable alkaline condition.

When pond water is low in oxygen content, it can be aerated by stirring the pond water with a paddle or paddling a canoe over its surface or moving boat with out-board engine at a fast speed over the surface of a large pond (Adeniji, 1996).

FISH SAMPLING: Fish sampling can be carried out weekly or biweekly to determine your fish growth by the use of cast net. Take some fish samples and weigh to compare the new weight with the old weights. A progressive increase in body weight is a sign of good feeding and good health. Reduction of growth must be a concern to farmer by checking all the growth and the water quality precautions earlier mentioned in this test.

FISH HARVEST/SALES;

At the end of the culturing month, the water can be drained in other to effect total cropping of the stocked fishes, renovation of pond inside, flooding and restocking. At harvest, fish are sorted into species and sizes because different fish commands different price. The tilapia is much cheaper than catfish and Carp, while Carp is cheaper than Catfish. Fish are sold in kilogramme at the pond site. Where the sales of fish are not possible at site, harvested fish should be washed, degutted when they are going to be stored in refrigerator or processed to avoid fish quality deterioration (Eyo, 1996).

RESULTS AND DISCUSSION

Tables 1 and 2 reveals the capital input materials on the fish pond and poultry resources as well as the general operating cost for a period of 5 years.

Tables 3a and b also reveals the succeeding year output from fish pond and poultry (eggs and old layers) for the five year projection.

Table 4 revealed the bank loan, repayment and interest (Incase the input is a loan) for the 5 five year period.

Table5 also revealed the depreciation of capital input for the succeeding years.

At the end of the whole exercise for 5 year period a net profit of about 9 million naira is recorded in the integrated chicken Cum fish farming system. No inorganic fertilizer or fish feed is required and two major protein food eggs and meat are produced at once from the farming system (Hopkins, 1982, Ita, *et, a,l* 1986).

CONCLUSION AND RECOMMENDATION

Integrated chicken Cum fish farming as revealed in this proposal is viable in that the outputs surpasses the inputs in material and considerable net profit was realized even after the loan and interest repayment were deducted. In the quest fore more sources of protein supplement to livestock, the chicken cum fish integration farm establishment and management is proposed in this paper based on available information and technologies on the symbiotic relationship between poultry waste (Manure) and fish. This system is recommended for big time farmers, NGO's, government agencies, retired civil and military men and women and the young graduates roaming about for white-collar jobs.

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COST MODEL OF 1 HECTARE FISH POND AND ACCESSORIES.

TABLE1: CAPITAL INPUT (₦)

	items	1st	2nd	3rd	4h	5th
1	Land acquisition in rural area including clearing	4000	-	-	-	-
2	Excavation (N10,000 per plant day for 10 days)	100,000	5000	5000	5000	5000
3	Inlet and monk construction	30,000	-	-	-	-
4	Fencing and gate	20,000	-	-	-	-
5	1 dugout canoe &Paddle	10,000	2000	2000	2000	2000
6	Cast net	20,000	5000	5000	5000	5000
	Subtotal	184,000	12,000	12,000	12,000	12,000
(B) COST MODEL OR POULTRY HOUSE						
7	Poultry House	100,000	-	-	-	-
8	Standing pillars	20,000	-	-	-	-
9	Battery Cages	100,000	-	-	-	-
	Pick up Van	400,000	-	-	-	-
	Contingency (10%of 1 - 10	80,400	1,200	1,200	1,200	1,200
	Subtotal	884,440	13,200	13,200	13,200	13,200

Table 2: Operating/Recurrent input (₦)

ITEM	1ST	2ND	3RD	4TH	5TH
A. Fish pond;					
1. Fish seed tilapia (4000x5)	20,000	20,000	20,000	20,000	20,000
2. Carp (4000x5)	20,000	20,000	20,000	20,000	20,000
3. Catfish (5000x20)	100,000	100,000	100,000	100,000	100,000
4. Lime	5000	5000	5000	5000	5000
Total	145,000	145,000	145,000	145,000	145,000

B. POULTRY

1. POL chicken (100x500)	500.000	500.000	500.000	500.000	500.000
2. Feed (5x360x800) Home mix	1440,000	1440,000	1440,000	1440,000	1440,000
3. Medication	12,000	12,000	12,000	12,000	12,000
Total	1,952,000	1,952,000	1,952,000	1,952,000	1,952,000

C. GENERAL OPERATING COST.

Staff salary & allowance					
1. Manger	300,000	300,000	300,000	300,000	300,000
2Attendants	180,000	180,000	180,000	180,000	180,000
3. security	180,000	180,000	180,000	180,000	180,000
4 Driver	90,000	90,000	90,000	90,000	90,000
5.Running cost of 1 pick up van	100,000	100,000	100,000	100,000	100,000
6 Contingency (10%of A-c)	280,200	280,200	280,200	280,200	280,200
Total	1130200	1130200	1130200	1130200	1130200
Sub total	3,227,200	3,227,200	3,227,200	3,227,200	3,227,200
Input grand total (capital & Operating cost)	4,111,640	324,400	3,240 400	3,24400	3,240,400

Table 3: Out put

(A) Fish pond output projection for 5 years

Items	1st	2nd	3rd	4th	5th
i. Tilapia adult less 50% of initial no (2000x400g0 800kg at N100 each	80,000	80,000	80,000	80,000	80,000
ii. carp adult less 10% of initial No (N1800x1kg) 1800kgx~~N~~ 250	450,000	450,000	450,000	450,000	450,000
iii. Catfish less 5% Clarias spp (2375x1.2kg)2850xN350 –*Heterobanchus* spp (2395x1.3kg) 3087.5xN350	997,500 1,080,625	997,500 1,080,625	997,500 1,080,625	997,500 1,080,625	997,500 1,080,625
Sub total	2,608.125	2,608,125	2,608,125	2,608,125	2,608,125

B. Poultry Out put projection for 5 years					
i. Egg production at 85% for 11 months only at N400 per crate of 30 eggs.	3,740,000	3,740,000	3,740,000	3,740,000	3,740,000
ii. Old layer less 10% mortality of initial no stocked (900x1.3kg) at N350 per Kilogramme	409,500	409,500	409,500	409,500	409,500
Sub Total	4,149,500	4,149,500	4,149,500	4,149,500	4,149,500
(c) Fish pond and poultry or succeeding 5 year period					
(A) Out put (fish pond)	2,608,125	2,608,125	2,608,125	2,608,125	2,608,125
B) Output (poultry	4,14,500	4,14,500	4,14,500	4,14,500	4,14.500
Grand total, (A+B)	6,757,625	6,757,625	6,757,625	6,757,625	6,757,625

Table 4. Repayment of 4,111, 640 in 5years at 22% interest rate

Year	Total payment	Principal	Interest	Loan balance after payment.
0	-	-	-	4,111,64 0
1	1726888.8	82,2328	904560.8	3,289,312
2	1545976.6	822,328	723648.64	2466984
3	1365064.4	833,328	542736.48	1644656
4	1184152.3	822,328	361824.32	822328
5	1003240.1	822328	180912.16	0
	6,825,322.2	4,111,640	2,713,682.2	....

Table 5 DEPRECIATION OF CAPITAL INPUT

TOTAL CAPITAL INPUT = 1,068,440

Year	Annual depreciation		Remaining balance
1	10% of 1,968, 440	=106,844	961596
2	10%of 961596	= 96,159.6	865436.4
3	10% of 864436	=86443.6	77992.4
4	10% of 777992.4	=7799.24	700193.16
5	10% of 700193.16	=70019.316	630173.84

Depreciation for 5 years = 437,265.75

Profit= To – (T1+TR+DP)

Where To = Total output for 5 years

To= total input for 5 years

To= Total repayment over 5 years

DP=Depreciation of capital assets for 5 years.

To= 6757,625 +6,757,625+6,757,625+6,757,625+6,757,625

To= 4,11 640 + 3,240, 400+3,240400+3,240,400+3,240,400

=17,073,240

TR= 6,825,322.2

OP=437,265.75

Profit=33,788,125 (17,073,240+6,825,322.2+437,265.75)

=33,788,125

Profit = 9,452,298.