Environtropica, August 2013, Vols 9&10, 136-145 ISSN 1597-815X

Poultry cum Fish Farming for Sustainable Soil and Water Enrichment and Quality Appraised Pedigree Birds.

B. A. Falayi[1] (PhD) and E. A. Adesulu[1] (PhD)
[1]*Department of Biological Sciences,*
College of Natural and Applied sciences,
Wesley University of Science and Technology,
P.M.B. 507, Ondo. Ondo State, South-west, Nigeria
Correspondence: fabacome@gmail.com

Accepted July 30, 2013

Abstract
African nations are bedeviled by gross shortage of protein food. There are abject malnutrition, hunger and disease manifestations. The incessant war and corruption (on the side of many of our leaders), environmental disasters infiltrated by the general global warming coupled with the large number of unemployed graduates from universities and other tertiary institutions; as well as terrorist menaces are rampart. There are abundant natural land mass and water resources for agriculture and fish culture to sustain our population and rid us of the pending disaster. Our inland water bodies are rich in divers' fish species of proven quantities and qualities. Indigenous chickens in our localities are reducing in size due to inbreeding and loss of vigour. Integration of Poultry and fish farming will avert the high cost of feed in intensive fish and poultry farming and avoid the competition between man, poultry and fish in same market for food. Nitrogenous manure inputs in ponds clearly influence the pond water productivity as it supplies the planktons with essential nutrients needed for multiplication and growth inform of fertilizer and these life animals and plants are the natural food for baby fishes. Animal manure contains considerable quantities of nutrients that can serve as feed for fish among which are: non-digested feed, metabolic excretory products and residues resulting for microbial synthesis. Our natural waters have been overfished through the use of obnoxious materials for fishing and catches have reduced as well as infiltration and depletion of our biological diversities. The artisanal fisheries cannot cope with the current fish protein needs and fish importation negates on our foreign exchange earnings. An option available to Africa nations is the integration of poultry and fish farming culture thereby, Africa would have invented a system in wish feeding offormulated feed to fish become extravagant and land conservation would be maintained by replenishment by natural means and biodiversity preservation through the use of organic materials. The system is cost saving, synergistic, complementary and efficient in utilization of resources. Cockerels produced are sold to rural farmers at the end of 6 months fish culturing period to improve the existing crops of less prolific inbred birds found in Africa. The paper proposed the methodological advances on integrated farming, basic requirement inputs and major returns in an integrated chicken cockerel cum fish farming enterprise in a cash flow system for period of 5 years.

Key words: Integration, Cockerels, Fish, Farming, Protein, Cash, Manure.

Introduction

African nations are bedeviled by gross shortage of food, especially animal proteins. There are abject malnutrition, hunger and disease manifestations. The incessant war and corruption (on the side of some of our leaders), famine and environmental disasters; inadequate rainfall, desert encroachment, flooding and other array of predicament infiltrated by the general global warming are facing the continent Africa. There is large number of unemployed graduates from universities and other tertiary institutions. This largest black race must survive despite all odds and predictions. There are abundant natural land mass and water resources for agriculture and fish culture to sustain our population and rid us of the pending disaster. Our inland water bodies are rich in divers' fish species of proven quantities as protein food among which are catfishes, tilapias, carps to mention but a few.

The indigenous poultry, especially local chicken are reducing in size due to inbreeding and loss of vigor (Oluyemi & Robert, 1985). These local species need to be upgraded by the introduction of the improved species of cockerels from our indigenous hatcheries to cross them for better potency.

The cost of feed is a major disadvantage in poultry and fish farming in that; man, livestock and fish compete in some market for food (Eyo *et al*, 2003, Falayi *et al*, 2004). Animal manure has been used in fish production as organic matter to stimulate plankton production (Ovie, 1996) and these little plants and animals are chief natural food for baby tilapia, fishes and cat fishes. Meyer, (1977) reported the nitrogenous manure inputs in ponds clearly influence the pond water productivity as it supplies the plankton with essential nutrient needed for multiplication and growth inform of fertilizer and these life animals(zooplanktons) and plants (phytoplanktons) are the natural food for the newly hatched baby fishes. Poultry manure has replaced normal fish feed up to 50 percent and gave significant growth rate in tilapia *Oreochromis niloticus* (Fasakin *et al*, 2000). Poultry and other livestock manures contain considerable quantities of nutrients for fish pond fertilization. Protein content ranged between 15 and 30 percent depending on what poultry and livestock is in question (Pratt, 1975, Fasakin *et al*, 2000). In addition, soluble vitamins are also synthesized in the rumen and may appear in relatively high concentration in the feces and urine of cattle (Tuleun, 1992). Spataru, (1977) mentioned that the main benefit of manure when fed to 1. Aura was in the production of benthic organisms and the result shows that tilapia hybrids ingest manure directly. In the same vein, Moav, (1977) observed that Chinese carp utilized about 96 percent of the valuable ingredients in poultry manure. Feeding of animal wastes to fish is an old practice in Asiatic countries (Li, 1992, Delinche, 1986, Azziz, 1978,). It has been observed that tropical and silver carp, catfish (*Clarias* and *Heterobranchus* species) and tilapia are most popular and their potentials for utilizing animal wastes is enormous (Meyer, 1977). Rodriguez *et al*, (1996) were apparently among those who utilized animal byproduct meal in tilapia fish practical diets and were able to solve problem of animal wastes management pollution control and protein for man. Livestock manure can be used both as base (during pond construction) and as part of additional food during fish culture. C.T.F.T. (1972) established 154 kilograms weight poultry manure per hectare of fish pond per week as requirement for excellent results for fish protein in Gabon. Animal manure contains considerable quantities of nutrients that can serve as feed for fish among which are: non-digested feed, metabolic excretory products and residues resulting for microbial synthesis (Eyo *et al*, 2003, Falayi *et al*, 2003).

Our natural waters have been overfished through the use of obnoxious methods of fishing and catches have reduced grossly in quantity and species which has resulted to infiltration and depletion of our biological diversities (Abiodun, 2003, Ita, 1982).

The artisanal fisheries cannot cope with the current fish protein needs and fish importation of which quantified foreign exchange are implicated yearly is telling much on our foreign exchange earnings. The only option available to Africa nations with all the aforementioned natural resources for agriculture and aquaculture is the integration of both farming cultures. In that case, Africa would have invented a system in wish feeding of formulated feed to fish become extravagant, land conservation can be maintained by soil replenishment and biodiversity preservation of our floral and faunas through the use of organic manure. Integration of poultry with fish is cost saving in that wastes from poultry serve as fertilizer and feed for fish in pond. A stone would have been used to kill two or more birds. 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 and land space. There are reductions on investment risk through diversification, income generation, family food source, employment opportunities and pollution free environment; due to animal waste management (Williams *et al*, 1998, Roma *et al*, 1998, Nguyan *et al*, 1995, Otubusin, 1986). The integrated cockerels would mature after five months of culture and be sold to the rural farmers to improve the existing crops of less prolific inbred birds which abound our continent.

The paper projects the methodological approach, basic requirements as inputs and major returns as outputs in integrated chicken cockerels cum fish farming enterprise and the cash flow system for period of 5 years.

Methodological Approaches in Integrated Poultry Cum Fish Farming

Pond site location and preparation:

The acquired land has to be cleared and surveyed to provide basic data on the topography of the area for early design of the pond. The reason is to show the layout of the farm, position of the reservoir to supply water to the pond (if any), the pond dyke, or drainage system, drainage canals and spill ways. A simple office is often necessary to harbor staff, feed and equipment.

The volume of the earth to be excavated can be computed from the design and the desired depth of the pond. Normally, the depth should not exceed 1.5 meter at the deepest portion (outlet) and 1 meter at the in-let. The cost of earth movement either manually or by the use of machines can be calculated base on the prevailing cost in that environment.

In summary, pond construction would entail, land preparation, which include: cleaning, pegging, excavation, building of dyke, inlet and outlet (monk) drainage (Okoye, 2003).

Liming:

This operation is carried out both in fresh and old pond before stocking. Liming is done to check the acidity of the soil, reduce turbidity of water entering the pond and enhancement of the primary productivity of the pond. It assists the improvement of available nutrients and release of carbonic ions that positively influencing photosynthesis.

Lime application levels: According to Adeniyi (1996) and Okoye (1996), the rate of application of lime could be as follows:

Agricultural lime (Calcium Carbonate)	-	2270kg/ha
Powdered limestone ($CaCO_3$)	-	1140kg/ha
Hydrated lime $(CaOH)_3$	-	114kg/ha
Quick lime (CaO)	-	200kg/ha

Fertilization of pond directly is done with large volume of dropping into the pond waters. This does not require extra cost of organic fertilizer above.

Pond Management before Stocking:

After excavation, water should be added to about 02-85m level and check for retentions before liming can 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 nutrient. Flooding from inlet system must be screened or filtered to check the size/type of the fauna and flora that enters into pond. The waters must come from good source because of pathogenic microbes and highly carnivorous fishes that may constitute nuisance and have side effects on the productivity of pond (Falayi *et al*, 2003).

Poultry House/Cage and Stocking birds:

Poultry house can be with metal roofed top and treated wood-walled to 1 meter height level. The remaining portion (another 1 meter height) to the lintel should be wire netting. The house is to be built on standing concrete pillars and erected closed to the dyke towards the deepest part of the constructed pond. The floor of the house should be made up of perforated or spaced wood racks which would allow free movement of staff. Battery cages are then located to accommodate the cockerels of not less than 5 weeks old, the feeders and water troughs which have already been built with the cages.

Cockerels of about 5 weeks of proven qualities and good records from the pedigree are advisable. The common cockerels available in Nigeria include the strains of Babcock, Warren and Black harco and yaffas with complete white or black dotted plumage. They are hardy and can withstand stressful conditions. They must be vaccinated for Newcastle diseases, Gumboro, Mareks and other infectious diseases before they are brought into cages. They can stay from 5 weeks to 25 weeks (5 months) when they shall be ready for market at average weight of 1.5-2.0 kilogram if they are well fed. The target market is to the rural dwellers, to improve the existing rural and under-developed local chicken species. The effect can be seen on the progeny of those local chickens in the next 3 month after release into the locality..

Good feed (Mash) of 14-15% crude protein level and energy levels ranged from 2800-3000 Kilocalories per kg feed weight are advisable. Clean water must be provided uninterupted. Always luck doors to poultry house and engage the service of security men (especially in the night) to prevent predation and theft of either poultry or fish.

Fish Stocking:

A polyculture pond can combine different ratios and up to 2 or more fish species together in a pond. The recommendations for this project are catfishes (Clarias species, Heterobranchus species, tilapias and carp species and Heterotis. The tilapias and carps must first be stocked from fingerlings size and about 8 to 12 weeks before catfish is

introduced. If all fish are stocked the same age, at fingerlings stage, the tilapias and carps would be cannibalized easily by the catfishes. Therefore you should allow tilapia and carp to be in pond earlier or stock growers or brood stock that may be difficult to prey because of their matured spines.

Feed and Food chains
The manure from poultry would serves as source of pond fertilization for planktons and other aquatic plants growth as well as feed for young tilapias and carps produced by their stocked brood stocks or adults. The tilapias and carps fry and fingerlings also serve as source of food to the catfishes to make up for their protein requirement.

Supplementary feeding:
Supplementary feeds such as Maize bran, Wheat offal, Palm kernel cake, Soya bean meal and Groundnut cake can be fed singly or mixed or they can be involved as formulated feed released into the pond intermittently to improve or as additional nutrients to those provided from the manure and tilapia/carp fingerlings.

Water quality and precautions:
Sample pond water monthly in the dry season to prevent pollution from over-nitrification from feed inputs into pond. Continuous or intermittent release of used waters is recommended during the raining season. Test for Hydrogen ion concentration (P^H), Dissolved oxygen in water, Water temperature and Turbidity using the standard methods (APHA, 1990). Avoid water from first rain from entering the pond where dry season is prolonged. This is because of high quantity of carbonic acid and suspended solids the first rains carry which are injurious to fish. Beware of mineralized bore hole water to avoid dissolved solids contents or poisonous gases (Hydrogen sulphide, Sulphur iv oxide) and heavy metals (zinc, mercy, lead, cadmium etc) Use well aerated and de-chlorinated tap water, good flowing rivers, lakes, reservoir are recommended.

Sampling of fish: Sample fish at least every month following the methods of Olvera Novoa *et al*, (2004) to know the progressive increase in the growth of stocked fishes.

Fish harvesting and sales:
At the end of the culturing period of 5 months, the pond can be drained from the monk, the fish harvested, weighed and sold to readily available buyers. You may also smoke and sell. This option command more price because of its prolonged storage due to lowering of the moisture content. The prevailing price in your area and your input cost would determine the selling price.

Modus Operandis:
Table 1a and b revealed the capital inputs materials for pond and poultry house. Other related needs equipment: Table 2a, 2b and 2c represent the requirement operating inputs in pond, poultry and general management cost respectively. Table 3a and 3b revealed the output from fish pond and poultry respectively. Table 4a and 4b represent the summary of outputs and inputs while Table 5 revealed the profit and loss accounts of the proposed integrated cockerels, gum fish project on yearly bases for a period of five years.

Cost Model of 1 Hectare Fish Pond and Accessories.

Table1: Capital Inputs (N)

A. **Reservoir Construction With Accessories**

S/N	Items	1st ₦	2nd ₦	3rd ₦	4th ₦	5th ₦
1	Land acquisition in rural area including clearing (1Hectare)	150,000	-	-	-	-
2	Excavation (30,000 per day for 10 days) manual labor	300,000	6,000	6,000	6,000	6,000
3	Inlet and monk construction	150,000	5,000	5,000	5,000	5,000
4	Fencing wire, gate and workmanship	200,000	2,000	2,000	2,000	2,000
5	1 dugout canoe & Paddle	20,000	2,000	2,000	2,000	2,000
6	Sub-massive pump & accessories	50,000	5,000	5,000	5,000	5,000
	Subtotal	870,000	20,000	20,000	20,000	20,000
(B) Cost Model of Poultry House						
7	Poultry House (Metal sheet, Planks, Nails, Net and wooden platform & Rails workmanship)	400,000	5,000	5,000	5,000	5,000
8	6 Standing pillars carrying poultry house (cement, iron and gravel &workmanship)	150,000	-	-	-	-
9	Battery Cages	200,000	-	-	-	-
10	1 Pickup Van	700,000	-	-	-	-
	Contingency (10% of items 1-10)	232,000	5,000	5,000	5,000	5,000
	Subtotal	1,450,000	25,000	25,000	25,000	25,000
	Total (A&B above)	2,552,000	27,500	27,500	27,500	27, 500

2 (A) Operating/Recurrent Inputs (N)

ITEM	1ST	2ND	3RD	4TH	5TH
A. Fish pond;					
1. Fish seeds tilapia	25,000	25,000	25,000	25,000	25,000
(5000xN5)	50,000	50,000	50,000	50,000	50,000
2. Carp (5000x N10)	250,000	250,000	250,000	250,000	250,000
3. Catfish (10,000 x N25)	20,000	20,000	20,000	20,000	20,000
juveniles	500,000	500,000	500,000	500,000	500,000
4. Lime, fertilizers, drug and netting					
5. Supplementary feeding					
Subtotal	845,000	845,000	845,000	845,000	845,000

(B) POULTRY

1.Cockerels(5wksold)	400,000	400,000	400,000	400,000	400,000
(2000xN200)					
2. Home-mix feed for 5	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000
months at 3 kg per					
Cockerel per month at N60	30,000	30,000	30,000	30,000	30,000
per kg. i.e.					
(2000x100x150)					
3.Medication(Vitamins					
Supplements)					
Subtotal	2,230,000	2,230,000	2,230,000	2,230,000	2,230,000

(C) General Operating Costs

Staff salary & allowance					
1. Manager (1)	432,000	432,000	432,000	432,000	432,000
2. Attendants (2)	432,000	432,000	432,000	432,000	432,000
3. Security men (2)	432,000	432,000	432,000	432,000	432,000
4. Driver (1)	216,000	216,000	216,000	216,000	216,000
5. Running cost of 1	120,000	120,000	120,000	120,000	120,000
pickup van					
6.Contingency(10% of	163,200	163,200	163,200	163,200	163,200
items					
1-5 above)					
Subtotal	1,795,200	1,795,200	1,795,200	1,795,200	1,795,200
Input grand total (Capital & Operating Cost	7,422,200	4,897,700	4,897,700	4,897,700	4,897,700

Table 3: Output

(A) Fish Pond Output Projection for 5 years

Items	**1st**	**2nd**	**3rd**	**4th**	**5th year**
i. Tilapia (adult) less 20% of initial no (4000x300g) 1200kg at N350 each.	420,000 1,620,000	420,000 1,620,000	420,000 1,620,000	420,000 1,620,000	420,000 1,620,000
ii. Carp (adult) less 10% of initial No (4500x1kg) at N450 each.	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000
iii. Catfish (adult) less 10% Clarias (9000x11x450)					
Sub total	6,540,000	6,540,000	6,540,000	6,540,000	6,540,000

(B) Poultry Output Projection for 5 years

Adult Cocks less 10% of initial no stocked. 1800 at ₦ 2,000 each.	3,600,000	3,600,000	3,600,000	3,600,000	3,600,000
Subtotal	**3,600,000**	**3,600,000**	**3,600,000**	**3,600,000**	**3,600,000**

Summary of Fish Pond and Poultry Output for succeeding 5 year period

Output (fish pond)	6,540,000	6,540,000	6,540,000	6,540,000	6,540,000
Output poultry	3,600,000	3,600,000	3,600,000	3,600,000	3,600,000
Grand total, (A+B)	10,140,000	10,140,000	10,140,000	10,140,000	10,140,000

Table 4(a)

Summary of Input

1a Poultry (capital)	1,682,000	7,500	7,500	7,500	7,500
1b Fish pond (capital)	870,000	20,000	20,000	20,000	20,000
Operating/Recount :					
2 (a) Poultry	2,230,000	2,230,000	2,230,000	2,230,000	2,230,000
(b) Fish	845,000	845,000	845,000	845,000	845,000
General Operating	1,795,200	1,795,200	1,795,200	1,795,200	1,795,200
Grand total input	7,422,200	4,897,200	4,897,200	4,897,200	4,897,200

Table 4(b) Summary output

Items	**1st**	**2nd**	**3rd**	**4th**	**5th year**
Poultry	3,600,000	3,600,000	3,600,000	3,600,000	3,600,000
Fish pond	6,540,000	6,540,000	6,540,000	6,540,000	6,540,000
Grand total output	10,140,000	10,140,000	10,140,000	10,140,000	10,140,000

Table 5: Profit and Loss Account

Items	1st	2nd	3rd	4th	5th year
Output	10,140,000	10,140,000	10,140,000	10,140,000	10,140,000
Input	7,422,200	4,897,200	4,897,200	4,897,200	4,897,200
Profit	2,718,000	5,242,800	5,242,800	5,242,800	5,242,800

Total Net profit for 5 years = ₦23,689,200
Twice a year will give double of the above net profit which is equal
Total = ₦47,378,400

The project can be carried out twice in a year of well regulated and at the end of the whole exercise for 5 years period, a net profit of about twenty eight million, eight hundred and ten thousand naira would be realized doubling what is available on the

Conclusion and Recommendation

An integrated cockerel cum fish farming is viable, cheap and achievable as revealed in the modeled or proposed project above. The outputs surpass the inputs in materials and considerable net profit was obtained even after the loan and repayment were deducted. The project can be repeated twice in 12 months calendar year and yield double of the proceedings recorded. The surplus takes care of loan and interest repayment within six months.

In the quest for more sources of proteins for Africa nations, the integration of cockerels cum fish farming establishment and management is proposed in this paper based on available information and technologies on the symbiotic relationship between poultry wastes (manure and dropped feed) and fish. The matured cockerels that would be raised at the end of every five (5) months of production would go a long way in mating the local female chickens and cause improvement in the qualities and quantities of the local chicken progenies and thereby increasing the qualities and quantities of animal protein food in Africa. The projected model in this system of farming is recommended for big time farmers, NGO's, government agencies, active and or retired civil and military men and women (who kept their legitimate and ill-gotten wealth from Nigeria and kept the money abroad) and the young graduates roaming about for white collar jobs in Africa. The integrated culture when involved in real estate form can provide job opportunities to our numerous jobless graduates and no graduates in the nation.

References:

Abiodun, J.A. (2003): Evaluation of Fisheries catch trend on Lake Kainji,Nigeria 1995- 2001. Journal of Applied Sciences and Environmental Management: Vol. 7 (2) 9-13.

America Public Health Association (APHA) (1990): America Water Works Association, Water Pollution Control Federation. Standard Methods for the Examination of Water and Waste Waters. 15th Edition. 113pp.

Azziz S. (1978): Rural development learning from China: Macmillan Press Ltd. London basic street Dolp.

C. I. F. T. (1972): Contribution 'al'etude de c'utilisation of de la future organigne en pisciculture tropics, Annex No.6, cited by Ita (1980) Centre Technique Forester Tropical (CIFT) Gabon.

Eyo, A. A; Ayanda J. O; Falayi B. A; Adelowo E. O. (2003): Integrated fish cum livestock production and management in Nigeria.

Falayi, B. A. (1998): Inclusion to poultry manure in a complete ration for tilapia O.niloticus fingerlings. Thesis submitted to the Dept. of Fisheries & Wildlife, Fed. Uni. of Tech. Akure, in partial fulfillment for the award of P.G. Diploma in Fisheries and Wildlife Management.

Fasakin, E. A; Falayi, B. A; Eyo, A. A. (2000): Inclusion of poultry manure in a complete feed for tilapia o. niloticus (1) Journal of Fisheries Technology, Vol. 2: 51-56.

Falayi, B.A., Balogun A.M. O.T. Adebayo and C.T. Madu (2003b): Comparison of seven locally prepared Starches with Sodium Carboxyl-methyl-cellulose for Water stability in African catfish (*C. gariepinus*) feed. Journal of Sustainable Tropical Agriculture Vol.9. 104 – 108.

Falayi, B.A., Balogun, A.M, O.T. Adebayo, A.A. Eyo and C.T. Madu (2004): Leaching of feed Nutrients, economic losses to fish farming. Journal of Aquatic Sciences. 18(2): 119-123.

Falayi, B.A. and Adesulu, E.A. (2011): A Review on Integrated Agriculture Packages (IAP) for rural and urban dwellers in Tropical Afro-Asian World for wastes Recirculation. Journal of Environtropica VOL. 8 161-172 ISSN1597-815X.

Ita, E.O. (1982): Biological indices of over fishing in Kainji Lake and the Management proposal for the Lake Fishery. Kainji Lake Research Institute Technical Report Series, No.8.

Li, K. (1992): Rice-fish farming systems in China; past, present and future. P. 17-26 in C. R. dela Cruz, C

Nguyen, T. C. Q and Duong, X. T. (1995): Integration of Agriculture and fish farming in Vietnam. In J. J. Symoens and J. C. Micha (eds). RAOS/CTA/FAO Seminar Proc. 1995 pp 279-296.

Oluyemi, J. A; Robert K. (1985): Poultry production in the tropics university press ltd.

Otubusin, S. O. (1986): A proposed integrated livestock-rice0poultry-cum-fish culture in enclosure system. FISON Conf. Proc. 1986. Pp 319-326.

Olvera-Novoa, M.E., G.S. Campos, G.M. Sabido and C.I.A. Maritinez Palacious (1990): The use of alfalfa leaf protein concentrates as a protein source in diets for tilapia (*O. mosambicus*). Aquaculture: 90: 291-302.

Ovie, S. I. (1996): Raising zooplankton for food larval and post larval stages of fish in hatcheries. NIFFR Extension guide series No. 2.

Pratt, P. F. (1975): Utilization of Animal manure and sewage sludge's in food and fiber production. News from the Council and Agric. Science Tech. (CAST) Vol. 3 Pp23-25.

Spataru, O. (1977): as cited by Smitherman R. O. and William, J. C. (1977): Production of tilapia hybrids with cattle manure as diet in fish culture pp 43-54.

Tuleun C. D. (1992): The utilization of heat-treated poultry manure in chicks diets. Paper presented at the 17th annual conference of the N.S.A.P. Abuja, 23rd -27th March, 1992.