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Evaluation of Catfish Growth Performance in Ponds Vertical Integrated with Poultry Farm

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ABSTRACT

The integration system refers to the blending of various compatible agricultural enterprises into a functional or unified for the purpose of sustainability. It is a no waste low cost and low energy production system in which the by-products of one enterprise are recycled into another as input. This experiment was conducted in earth ponds to evaluate catfish growth performance in pond integrated with poultry farm without feeding the fish against catfish growth in pond (T1) fed with vital feed. The size of the fish at stocking was 16.9 g and the experiment ran for a period of 190 days. Fish were weighed individually at harvest and the average weight of the two groups was compared. The average final weight of (T2) was 250 g and that of (T1) was 195 g. Integrated fish pond with poultry farm results in faster fish growth rate which can be used as a good option to solve the feed challenge facing extensive fish farms system in Nigeria.

Keywords: vertical integrated, poultry, catfish growth, extensive fish culture

INTRODUCTION

According to FAO (2011), over 500 million people depend on fisheries and aquaculture directly or indirectly for their subsistence. As a result of population growth, economic development and changes in food habits, the demand for fish and fishery products is predicted to be on the increase (FAO, 2001). Supply from capture fisheries is expected to remain constant, or even to decline. Indeed, fish supply from the capture fisheries in most countries is believed to have reached or be close to the maximum sustainable yield suggesting that an increase in aquaculture fish supply activities could help mitigate the expected fish shortage. Effective aquaculture will not only make fish available to a wider range of consumers, it can also provide jobs; generate income, increase food security and contributing to poverty and hunger alleviation among rural dwellers.

One of the many constraints of fish farming in Nigeria is feed supply. Under an extensive aquaculture, the challenges of feed supply can be managed under low-cost system and maximized resources utilization by integrating different farms which can supply organic fertilizer to the fish pond. Organic fertilizers are usually animal manures or plant wastes and cuttings ("green manure"). Manure from chickens, goats, sheep, ducks, pigs, rabbits, cattle and horses are excellent fertilizers for fish ponds. Direct use of the waste from livestock production in fish ponds is widespread and conventionally recognized and the practice increases the efficiency of both livestock farming and fish culture (Nnaji *et al.*, 2009. Addition of organic fertilizers like poultry droppings to a fish pond increases fish production (Hoq *et al.*, 1999; Abbas *et al.*, 2004). Moreover, integrated pond management with poultry and fish shown to be excellent approach for sustainable production, income generation and employment opportunity of the resource poor rural households (Alam *et al.*, 2009). Chicken feed and manure contains heavy metals such as Arsenic, Zinc, and Cupper that are added as feed supplements to boost poultry production, these metals may possibly accumulate to unsafe levels in fish tissue when

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fish is cultured in such a system for long period (Nnaji *et al.*, 2011). Adequate measures such as regular monitoring of the metals by testing water, sediment and fish for the metals to be within the permissible limits should be taken to prevent the risk of these metals.

This work was designed so as to find a better, low-cost approach to fish culture that can be practiced among rural fish farmers as a means for poverty reduction, food security, creating employment opportunity and income generation.

MATERIALS AND METHODS

Experimental Ponds

Two earthen ponds of area 20m x 20m having separate water inlet and outlet were used. The ponds were excavated on a gentle slope land near to a water source of main bore hole to secure the permanent water supply. Each of the ponds had capacity to hold water to a depth of 120cm, and have free board of 30 cm above water level. Before stocking the experimental fish, the ponds were prepared by drying for three weeks and liming the bottom to control transmission of any parasite and disease from previous stocks. Pond 2 was vertically integrated. A poultry pen of 4m x 8m dimension was constructed directly on top of the pond 100pieces of point of lay bird was introduced into the poultry pen.

The ponds were then filled with water from the underground water supply and motorized bore hole. The new water was maintained in the ponds for two weeks, fertilized with poultry manure to enable plankton establishment after which the experimental fish were stocked. 1000 pieces of Catfish (*Clarias gariepinus*) initial average weight of 16.9g was stocked in each of the pond. Pond 1 was fed with processed feed [vital feed] while pond 2 was feed with spilled poultry feed and poultry manure. The chicken discharge fresh manure at an average of 96 g/chicken/day (Hoq *et al.*, 1999) which provides 10 kg of fresh poultry manure in a pond every week. Though the chemical composition of manure varies based on the type of feed given to the chicken, age, and their condition. Fresh poultry manure contains about 74-80% water but in the dry matter bases 1.3% is N, 1.1% is P and 0.55% is K (Zublena *et al.*, 1997). Weight gain and water quality parameters were monitored. A random sample of 50fish were sampled bimonthly to take weight data from the ponds. After weighing the sample, all fish were returned back to the ponds. Individual fish weight in the sample was recorded. No supplementary feed was given to the fish in pond 2 integrated with poultry. However, the fish in this pond gets the spilling off poultry feed in smaller amount, difficult to quantify. Fertilization of the pond 2 was by poultry droppings in the integration. The fish were left to grow in the ponds for 190 days and finally harvested.

The relevance of water quality parameters such as pH, temperature, dissolved Oxygen, ammonia, transparency, turbidity, hardness etc. cannot be overlooked for maintaining a healthy aquatic environment. There is need to ensure that the above water quality parameters are properly managed and regulated for fish survival and optimal production

Water quality parameters like temperature, pH, dissolved oxygen, and transparency depth were measured bimonthly during the experimental period. Bimonthly growth pattern of the fish was presented in graph. The fish were harvested after six months of culture period. Total count and measurement were made at the last harvesting day. Daily growth rate (DGR) and survival rates were calculated by using the following formula.

Survival rate % = $No.\ of\ stocked - No.\ of\ death\ /No.\ of\ stock\ X$ 100%

DGR (g/fish/day) = $Final\ weight - initial\ weight\ /Number\ of\ culture\ days.$

Growth in terms of weight was calculated for catfish in both treatments. The difference in mean value of fish weight among T1 and T2 was compared using two sample t-test at significance level of 0.05.

RESULTS AND DISCUSSION

Water Quality Parameters

Water is the physical support in which fish carry out basic life functions like feeding, swimming, breeding, digestion and excretion (Bronmark & Hansson, 2005). The quality of water is determined by several physio-chemical and biological factors. Physio-chemical and biological factors may affect the quality of water directly or indirectly and by extension the suitability of the water for fish survival and growth.

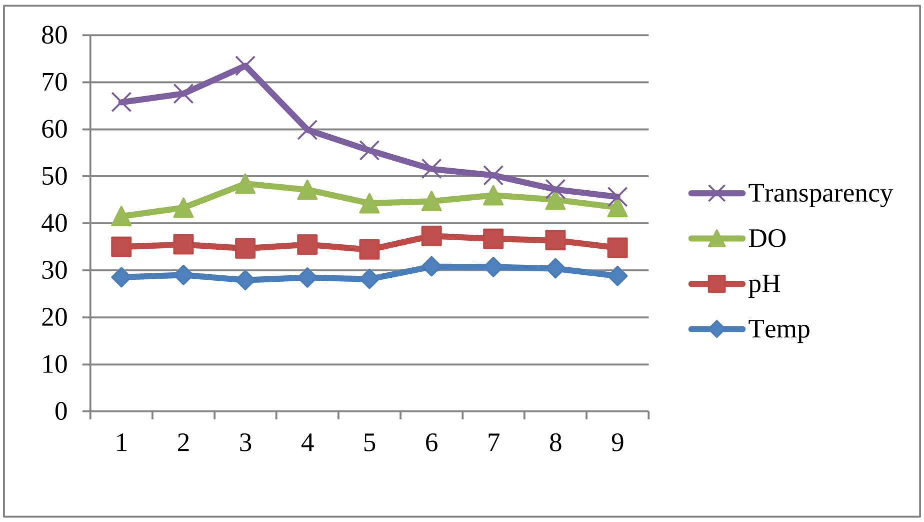
Different water quality parameters were monitored throughout the experimental period. Bi weekly of water quality parameters are given in Table 2 and Table 3 for vertical integrated and non- integrated pond. Water temperature for both treatments was almost the same throughout the rearing period with a mean value 28.66^{0}C and 29.10^{0}C respectively. pH fell in pond with none integrated while it maintained a mean value of 7.01 in vertical integrated pond. Dissolved oxygen (DO) increases slightly in both vertical integrated and non-integrated systems throughout the culture period (Table 2 and 3). Transparency (Turbidity) decreases as the culture period progresses in both vertical integrated and non- integrated culture systems.

Table 2: Water Quality Parameter for Vertical Integrated Pond

Vertical integrated				
Weeks	**Temp**	**pH**	**DO**	**Transparency**
1	27.75	6.50	7.60	23.25
2	29.00	7.00	7.80	24.6
3	27.20	7.10	13.40	5.25
4	27.75	7.50	8.60	5.32
5	27.65	7.00	11.00	5.20
6	31.10	7.50	9.20	3.30
7	30.20	7.00	8.90	2.20
8	28.80	7.00	8.60	2.20
9	28.5	6.5	9.2	2.2
MEAN	28.66	7.01	9.37	8.17

Table 3: Water Quality Parameter for Non-Integrated Pond

Non-integrated				
WEEKS	**Temp**	**pH**	**DO**	**Transparency**
1	28.50	6.50	6.50	24.25
2	29.00	6.50	7.80	24.25
3	27.90	6.75	13.77	25.05
4	28.45	7.00	11.67	12.75
5	28.15	6.25	9.86	11.25
6	30.80	6.50	7.40	6.87
7	30.70	6.00	9.25	4.22
8	30.40	6.00	8.60	2.20
9	28.80	6.00	8.60	2.20
MEAN	**29.10**	**6.39**	**9.27**	**12.56**



The pH measured in the treatment ponds and the inlet water was within the 6.5 to 9.0 acceptable ranges for fish culture (Zweig *et al.*, 1999).

Fish Growth

The *clarias gariepinus* were stocked in to ponds at an average weight of 16.9.0±7.51 g per fish at a density of 1.5 catfish per square meter.

Table 4: Harvest Data for Fish in Pond under Vertical Integrated and Non-Integrated System

Treatment	No stocked	No harvested	Gross yield (kg)	Average weight at harvest
Chicken Droppings	1000	880	220	250
Commercial diet (Vital Feed)	1000	820	160	195

Table 4 shows record of yield at the end of the culture period, 1000 post fingerlings of *Clarias gariepinus* was stocked in each of the pond, a total of 880 and 820 table size fish was harvested in vertical integrated and non-integrated respectively. The average weight of the fish at harvest was 250g and 195g for vertical integrated and non-integrated respectively. A total Biomass (Gross yield) of 220kg and 160kg of table size fish harvested.

From the Table 4 above, it was observed that the rate of recovery was higher in treatment under vertical integrated system compared to non-integrated. So also, the gross yield at harvest was higher in pond with vertical integrated (250kg) while non- integrated was 195kg. This significant difference observed between the treatment could be attributed to the regular supply of poultry dropping from the vertical integrated pond which generate live food (plankton) fort the fish.

CONCLUSION

Fish reared under integrated system exhibited higher growth rate and Gross yield thus higher income than those reared under non-integrated system. In order to increase overall farm yields and promote aquaculture as an income generating business it is hereby recommended that more emphasis should be put on integrated fish farming.

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