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Full Length Research Paper

Comparative assessment of the profit margin of catfish reared in concrete tank and earthen pond

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This study was conducted using the same feeding strategies and stocking density to determine the effect of using two different rearing facilities (earthen and concrete) of the same size (10 x 10 x 1.5 m) each on profitability of fish reared to market size in eight months. Results indicated that final mean weight (Initial mean weight 15g/fish of Catfish (*Clarias gariepinus*) fed a monthly adjusted ration based on fish growth was greater in earthen pond (1.1 kg) than in concrete tank (0.9 kg). Despite higher survivability (70%) recorded in concrete tank as against the 60% in earthen pond, results further revealed that the size of fish harvested affected the biomass, which negatively affected the profitability. The earthen pond produced a profit of ₦ 73,000 as against the ₦ 52,000 from concrete tank. Profit margin of ₦ 21,000 realized between the two structures demonstrated that, final mean weight of fish reared to market size was greatly influenced by culture media.

Key words: Catfish, culture media, profitability.

INTRODUCTION

As fish supplies from open water and lagoons continue to fall and human populations rise, fish farming offers an effective way of generating food and income from dwindling land spaces. According to Atanda (2007) fish farming has been recognized as a viable means of increasing domestic fish production. Most recent investment in aquaculture has been targeted towards catfish farming (Abdullah, 2007). Currently, about 90% of farmed fish in Nigeria is catfish which is now a major attraction to private sector investors in Nigeria (Kamthorn and Miller, 2006).

Presently, live catfish attracts premium price in Nigeria with a high ROI (Return On Investment) ranging between 40 – 60% in some very successful enterprise (Atanda, 2007). Investment in cat fish is still growing especially with the renewed awareness being created by the government through the presidential initiative on Fisheries and aquaculture (Miller and Atanda, 2004)

The type of culture medium used and their management have a significant influence on fish farm profitability (Ross and Waten, 1995). According to Hankins et al. (1995) fish culture medium and their accessories add up to a large portion of fish farm capital. Therefore, the need arise to choose the best production system with good operating strategy to optimize fish farm profitability. There are various ways used by fish farmers to raise fishes for sale or for family consumption. Fishes are raised in big bowls, in unused canoes and in depressions that can hold water as well as in constructed tanks and in earthen ponds. Profitability is defined as the net revenue or the difference between the total revenue and total cost (Vanghan, 1987). In this study, gross revenue was considered for earthen pond and concrete fish tank because they are common sources of raising fishes. In this regard, the total variable cost is deducted from the total revenue.

METHODOLOGY

The study was carried out at Success Fish Breeding and Poultry Farm Nigeria Limited, located in Akure, the capital city of Ondo State, Nigeria, The farm has facilities for both the earthen ponds and concrete tanks. A 10 x 10 x 1.5 m each of the earthen pond and concrete tank with a flow through system were stocked with one thousand fingerlings each of farm-raised *Clarias gariepinus* with initial mean weight of 15 g/fish. The catfish were reared for

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Table 1. Mean values for the water quality parameters for the two culture media.

Earthen Pond (Size: 10mx10mx 1.5m)					Concrete Tank (Size: 10mx10mx 1.5m)			
Day	**DO (mg/l)**	**PH**	**Temp (^{0}C)**	**NO_3 (mg/l)**	**DO (mg/l)**	**PH**	**Temp (^{0}C)**	**NO_3 (mg/l)**
0	6.81	6.96	26.0	0.19	6.76	6.92	26.0	0.19
30	6.65 ±0.01	6.98 ± 0.01	26.3 ± 0.02	0.20± 0.001	6. 80 ± 0.01	6.95 ± 0.01	26.5 ± 0.02	0.21±0.001
60	6.79 ±0.02	7.10 ± 0.01	26.5 ± 0.01	0.23 ± 0.001	6.83 ± 0.01	7.09 ± 0.01	26.5 ± 0.01	0.22 ± 0.001
90	6.64 ±0.01	6.95 ± 0.01	26.2 ± 0.02	0.21± 0/002	6.75 ± 0.02	6.98 ± 0.01	26.2 ± 0.01	0.22 ± 0.002
120	6.72 ±0.01	7.16 ± 0.01	26.3 ± 0. 02	0.22 ± 0.002	6.78 ± 0.02	7.10 ± 0.01	26.3 ± 0.02	0.23 ± 0.001
150	6.89 ±0.03	6.97 ± 0.01	26.5 ± 0.01	0.23± 0.001	6.84 ± 0.01	7.05 ± 0.02	26.2 ± 0.03	0.23 ± 0.001
180	6.72 ± 0.02	7.10 ± 0.01	26.4 ± 0.01	0.20± 0.001	6.77 ± 0.01	7.15 ± 0.02	26.2 ± 0.02	0.22 ± 0.001
210	6.84 ± 0.01	7.15 ± 0.01	26.6 ± 0.01	0.22 ± 0.001	6.83 ± 0.01	7.10 ± 0.01	26.3 ± 0.02	0.22 ± 0.001
240	6.77 ±0.01	7.12 ± 0.01	26.5± 0.01	0.21± 0. 001	6.75 ± 0.01	7.10 ± 0.01	26.3 ± 0.02	0.23 ± 0.001

eight months before cropped for data generation. Before stocking, poultry waste in Jute bags was used to condition the concrete tank while hydrated lime $Ca(0H_2)$ at a rate of 1200 kg/ha was applied to dry bottom of the earthen pond before water impoundment. Fish were subjected to the same management practices. The same feeding regime in terms of quantity and quality were maintained for the production systems, while water parameters were closely monitored using an YSI Do Meter (YSI model 57), electronic pH meter (Metler Toledo 320 model) and Mercury – in glass thermometer, for dissolve oxygen, pH and Temperature respectively. This was to maintain water quality suitable for the fish. This makes it good enough to compare the profit of the output from the culture media.

RESULTS

Considering the water parameters, it was found that dissolved oxygen (DO), Acidity level (PH), Temperature and Nitrate levels were considered for the two media. It was observed that the parameters were similar for the two media this might be because the experiment was located in the same environment with the same source of water. This implies that changes in the yield and profit could not be attributed to water parameter. This is shown in Table 1.

Table 2 show the results of weight gain, survival rate, biomass and feed weight observed in the two media. The weight gain was not noticeable for the first three months of the experiment. At the end of the fourth month there was 45 g difference in the weight gain in favour of the earthen pond. The concrete tank leveled up the gain in weight by the end of fifth month. But since the end of the sixth month till the end of the experiment there was a consistent weight gain in the earthen pond. Despite the higher weight gain noticed in earthen pond, the percentage of survival was low. For example by the end of the fourth month about 65% survived in earthen pond as against 80% in concrete tank. At the end of the experiment 60% survived in earthen pond as against 70% in concrete tank. The lower survival percentage noticed in earthen pond might be due to more predators like crab, frog and toad which are better controlled in concrete tank. The feeding ratio was based on the weight of the survived fishes; this is noticed in the feeding rate. The biomass weight difference was not pronounced between the two media.

Table 3 shows that more fishes were cropped in concrete tank (700 pieces) but 600 pieces in the earthen pond but the average weight in the earthen pond was 1.1kg as against 0.9kg in the concrete tank. The total expenditure was lower in earthen pond (₦ 191,000), while it was ₦199,500 in the concrete tank. Despite this the income was higher in the earthen pond. The profit in gross margin was ₦73, 000 in earthen pond as against ₦ 52,500 in the concrete tank.

DISCUSSION

For any production system, evaluating the economic viability is expected to be done at the end of such production; it will become clear if such a production system is profitable or not (Ross and Waten, 1995).

The profit for earthen pond in Table 3 was higher despite its higher mortality rate (40%). This was attributed to the fact that, the fish were bigger in size and consumed lesser feeds. The earthen structure, though a confined enclosure as the concrete tank, mimic nature and this may be responsible for its high yield in terms of fish size.

The quantity of fish caught in concrete tank was higher (70%) but the smaller size and more feed consumed, negatively affected the profit margin. High mortality recorded in the two structures was attributed to cannibalistic tendency of the fish as no death of fish was recorded for the rearing period. (Pilfering could not be responsible for the loss of 700 pieces of fish in the two culture media because the experiment was set in a fenced back yard with adequate security in place. With the profit recorded for the two media, it can be said that both are profitable if well managed. Though, better results could be achieved by stocking uniform sized fish of higher initial mean weight to reduce cannibalism and

Table 2. Average weight, survival rate and biomass of catfish (*Clarias gariepinus*) reared in earthen pond and concrete tank for a period of eight months**.** Density: 1,000 pieces/100m^2.

Earthen pond (Size: 10mx10mx 1.5m)													
Day	**Average Weight (g)**	**Survival %**	**Biomass Kg/100m^2**	**Feeding ration g/100m^2/ day**	**Feed ration Kg/100m^2/ 30 days**	**Feeding rate (% body wt / day**	**Day**	**Average Weight (g)**	**Survival %**	**Biomass Kg/100m^2**	**Feeding ratio g/100m^2/ day**	**Feed ration Kg/100m^2/ 30 days**	**Feeding rate (%/body wt/day**
0	15	100	15.0	750	22.50	5	0	15	100	15.0	750	22.50	5
30	60	85	51.0	1,530	45.90	3	30	65	90	58.5	1,755	52.65	3
60	130	70	91.0	2,730	81.90	3	60	130	80	104.0	3,120	93.60	3
90	280	65	182.0	3,640	109.20	2	90	245	80	196.0	3,920	117.60	2
120	370	60	222.0	4,440	133.20	2	120	375	70	262.5	5,250	157.50	2
150	490	60	294.0	5,880	176.40	2	150	460	70	322.0	6,440	193.20	2
180	610	60	366.0	6,588	197.60	1.8	180	530	70	371.0	6,678	200.34	1.8
210	830	60	498.0	7,470	224.10	1.5	210	710	70	497.0	7,455	223.65	1.5
240	1100	60	660.0	Harvest	Total = 990.8kg	Harvest	240	900	70	630.0	Harvest	Total = 1,061.04kg	Harvest

Table 3. Expenditure, income and profit margin of *clarias* in the two culture media

	Earthen Pond	**Concrete Tank**
Cost of fingerlings at ₦15.00 each	₦15, 000	₦15,000
Cost of locally made fish feed at ₦2,500/bag (15 kg/bag)	₦165, 000	₦177,500
Fertilizer/liming/pond preparation/pond maintenance	₦5, 000	₦3,000
Cost of harvesting	₦3, 000	₦2,000
Number of pieces caught (Cropped)	600 pieces	700 pieces
Average weight of fish at harvest	1.1 kg	0.9 kg
Total weight of fish cropped (kg)	660 kg	630 kg
Mortality recorded	400 pieces	300 pieces
Cost of occasional sorting and counting	₦3, 000	₦2,000
No of bags of feed consumed (15 kg/bag)	66 bags	71 bags
Kilogram of feed fed	990.8 kg	1,061.01 kg
Total expenditure	₦191, 000	₦199,500
Gross income	₦264, 000	₦252,000
Profit (Gross Margin)	₦73, 000	₦52,500

Source: Field experiment, 2008.

adopting a rearing systems that allow better feed utilization, higher stocking density and survivability.

Conclusion

The impact of rearing medium can not be underestimated on the over all results of fish production. Profitability in table size fish production is dependent on final weight gain and survivability based on the knowledge and application of the technical management practices acquired by the farmer. The profit margin difference of ₦21, 000 between the two structures despite been subjected to the same condition indicated that earthen pond is more productive than concrete tank. In the Nigeria society of today, big fish commands high market value; hence the emphasis on size by the consumers can not be waived aside.

Since optimal stocking of existing structures often leads to substantial increase in fish production and income, producers are more favored using more sophisticated facility. It is hereby recommended that, those systems that allow per space increase in stocking density with clean and often aerated water should be encouraged.

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