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Effect of Stocking Density and Feeding Strategy on Zootechnical Parameters and Profitability of Nile Tilapia (*Oreochromis niloticus*) Reared in Floating Cages in Toho-Todougba Complex Lagoon in Benin Republic

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Abstract: This study aimed to compare the growth performance and economic profitability of rearing *Oreochromis niloticus* in floating cages using three feeding strategies (5 days a week, 6 days a week, and 7 days a week) coupled with three stocking densities (20, 40, and 60 fish·m^{-3}). Male monosex fish measuring 6.44 ± 0.18 cm and weighing 3.42 ± 0.7 g were used. The controls were weighed every 15 days from the 35th day of rearing until 185 days to assess zootechnical parameters. BioMar feed (Efico Cromis 832F) was used during the study, and the feed ration was adjusted for each treatment every 2 weeks. At the end of the study, the average weights varied from 293.09 g to 468.41 g for the conditions of 40 fish·m^{-3} with a 5/7-day diet and 20 fish·m^{-3} with a 7/7-day diet, respectively. The yield per m^2 values were between 7.11 kg and 23.17 kg, respectively. On the other hand, the economic profitability was better with the condition of 40 fish.m^{-3} with daily feeding. These results suggest that in the Toho-Todougba lagoon complex, a stocking density between 40 and 60 fish·m^{-3} coupled with daily feeding (three times a day) promotes the optimization of fish production and profitability of fish farming.

Keywords: *Oreochromis niloticus*; stocking density; feeding frequency; financial profitability; Toho-Todougba lagoon

Key Contribution: Profitability of cage aquaculture depends greatly on the proper management of food resources and stocking density of the fish. This research shows that on Toho-Todougba lagoon complex, it is possible to optimize profitability with a skip feed technique (5-days feeding per week) coupled with a high stocking density of 60 fish per m^3 of caged water.

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1. Introduction

Fish farming in floating or fixed cages is gaining momentum in Benin, with more than 600 cages installed in the Toho-Todougba lagoon complex in southern Benin [1]. Several investors are now interested in this production system, which is proving to be the hope for ensuring the country's autonomy in fisheries resources [2]. However, to our knowledge, no study in the country has addressed the economic profitability and optimization of fish production in cages.

In Benin, although the problems of fish strain performance in aquaculture are acute [3], it is also necessary to underline the absence of scientific research on the density and production yield of cage fish farming. Further, the hydrobiological functioning of each water body influences the fish production capacity [4,5] and, by extension, the density that it can support for the production to be economically profitable. Given the variability in density, which is the function of species, researchers have not reached a unanimous consensus on the stocking density in the cages for *Oreochromis niloticus* because of the hydrobiological specificity of each aquatic ecosystem. Hence, Chakraborty et al. [6] recommended an optimal density of 50 fish·m^{-3}, with an initial average weight of 12.5 ± 0.09 g, for Nile tilapia farming in floating cages. Recently, Faye et al. [7] showed that in Lake Guiers (Senegal), an initial density of 500 fish·m^3 with an initial average weight of 10 g would lead to an optimal yield of *O. niloticus*. According to a study on cage fish farming practices in the Toho-Todougba lagoon carried out by Aïzonou et al. [1], the stocking density used by all of the fish farmers varied between 20 and 40 fish·m^3 (initial weight = 23 ± 11.9 g) for a yield of 880 kg to 1500 kg in 8 months of rearing in floating cages.

However, the major constraint to be addressed for Beninese fish farming is the high cost of feed that negatively impacts the economic profitability of aquaculture production units, since it represents 50% to 70% of the expenses [8–10]. At the same time, Agbohessi et al. [11] recommend continuous daily feeding to satiety for rearing *O. niloticus* in ponds, a condition similar to rearing in cages. Unfortunately, this feeding strategy seems to increase the cost of production and can quickly lead to eutrophication of the cage farming environment. To address these issues, Ali et al. [12], and Wang et al. [13] recommended feed restriction when rearing *O. niloticus*, and Bolivar et al. [14] reported that alternating feeding days did not affect their growth. Cuvin-Aralar et al. [15] also showed that a 24-h feed break does not significantly delay the growth of *O. niloticus* in cages compared to continuous daily feeding because *O. niloticus* consume algae to fulfill their dietary needs [12,16]. Further, Aïzonou et al. [1] found that the fish farmers adopted a daily ration of 7 days a week, while farming in the wild allowed the fish to benefit from the natural productivity of the aquatic ecosystem. However, to our knowledge, there is currently no study on the beneficial feeding strategy for cage feeding practices in the context of Benin.

Hence, there is an urgency to shed light on these important aspects to ensure the profitability of cage fish production and the development of the fish farming sector. For sustainability, it is important to determine the optimum density and best feeding strategy for the production of *O. niloticus* in the Toho-Todougba complex lagoon, which is the most prominent water body in terms of cage aquaculture in Benin [17].

Thus, the following questions need to be addressed: Does the natural trophic condition of the Toho-Todougba complex lagoon allow good growth of *O. niloticus* reared in a floating cage when a 24-h skip feeding frequency is applied, as reported by Cuvin-Aralar et al. [15]? What is the ideal stocking density for the optimal growth in *O. niloticus* in the Toho-Todougba complex lagoon? Does plankton production promote economic profitability? To answer these questions, it is essential to carry out growth tests and experiments where the fish are subjected to different stocking densities and feeding frequencies.

Therefore, the present study aims to determine the optimal density and feeding strategy for the cage production of *O. niloticus* to ensure profitable fish farming in the Toho-Todougba lagoon complex.

2. Materials and Methods

The current research did not require ethical approval.

2.1. Experimental Animals

Monosex male fingerlings of Nile tilapia (average initial weight 3.42 ± 0.7 g), produced at the study site ("Beniel Fish" farm) located at Pahou in Ouidah town in Benin

(6°24.13′ N–2°11.00′ E), were used in this study. The fingerlings selected were vigorous and free from any lesions or whole-body anomalies.

2.2. Experimental Design and Handling

In this study, different stocking densities (Sd) (20, 40, and 60 fish·m^{-3}) and feeding strategies (Fs) (5-, 6-, or 7-day diet) were tested with fingerlings of *O. niloticus* raised in floating cages. The 5-day Fs was applied as 3 days of feeding + 1 day skip + 2 days of feeding + 1 day skip. Regarding the 6-day Fs, it was applied as 6 days of feeding + 1 day skip. Thus, on coupling each Sd with each Fs, nine treatments were obtained (Table 1). Each treatment was repeated three times.

Table 1. Experimental treatments.

Sd (Fish·m^{-3}) / Fs (Day)	20	40	60
	Treatments		
5	20-5	40-5	60-5
6	20-6	40-6	60-6
7	20-7	40-7	60-7

The experimental design was composed of 27 net cages of 5 m^3 (1.67 m × 1.67 m × 1.8 m) each. These were placed in three bigger net cages (75 m^3) to conduct all nine treatments in each of the three large floating cages (nine small cages per large cage). Such a design allows for balanced environmental conditions. The small cages in which the fish were kept were made with net of 2 mm mesh size. The split plot formed by the three floating cages of 75 m^3 was placed in an area with an average water depth of 4 m and the three cages were arranged successively next to each other. The cages were covered with protective nets to prevent loss by predation by piscivorous birds and to prevent wastage of the ration.

The experiment lasted 185 days from September 2020 to March 2021, which is a normal production cycle in the lagoon complex. During the experiment, the fish were fed with the commercial feed BioMar, Vaerkmestergade 25, Denmark (INICIO PLUS, 1.9 mm (49% protein)) for 2 weeks and Efico Cromis 832F (37% protein) after 2 weeks until the end of the study. According to the feeding strategy, the fish were fed at a frequency of three daily meals (at 8:00, at noon, and 17:00). Ten percent of the stocked fish were netted from each cage at 15-day intervals and weighed, and the daily ration was readjusted accordingly. The feeding rates were 10%, 8%, and 6% of the fish biomass for four weeks each and 4% for the rest of the time. These feeding rates provide better results in the lagoon complex (unpublished data). The fish were fed three times on the feeding day throughout the study. At the end of the experiment, each surviving fish was weighed, and the standard and total lengths were measured.

During the experiment, the physico-chemical parameters of the lagoon water in the rearing cages were measured weekly with a Hanna multi-parameter electronic probe (HI 9813-6, Woonsocket, RI, United States) and a Hanna oximeter (HI 9146, Woonsocket, United States. The recorded data varied very little over time. Thus, the average temperature was 30.67 ± 0.25 °C, and the average pH and dissolved oxygen were 7.40 ± 0.06 and 5.04 ± 0.3 mg·L^{-1}, respectively.

2.3. Data Processing and Statistical Analysis

The data collected during the experiment were used to calculate the zootechnical and economic parameters using the following formulas:

- Survival rate (SR)

$$SR\ (\%) = \frac{Final\ number\ of\ individuals\ observed}{Initial\ number\ of\ individuals} * 100 \quad (1)$$

- Final mean weight (FMW)

$$FMW\ (\mathrm{g}) = \frac{Final\ total\ weight\ (\mathrm{g})}{Final\ number\ of\ individual} \quad (2)$$

- Daily mean weight gain (DMWG)

$$DMWG\ (\mathrm{g}) = \frac{FMW - Initial\ mean\ weight\ (IMW)\ (\mathrm{g})}{Duration\ of\ the\ experiment} \quad (3)$$

- Specific growth rate (SGR)

$$SGR\ (\%/\mathrm{Day}) = \frac{ln(FMW) - ln(IMW)}{Duration\ of\ the\ experiment} * 100 \quad (4)$$

- Feed conversion ratio (FCR)

$$FCR = \frac{Weight\ of\ feed\ given\ (\mathrm{g})}{Final\ total\ weight\ gain\ (\mathrm{g})} \quad (5)$$

- Yield

$$Yield\ \left(\mathrm{kg/m^2}\right) = \frac{FMW\ \times\ SR - IMW}{Cage\ surface} \quad (6)$$

The economic parameters were the cost of fish production and inputs (feed and fingerlings) used and the estimated benefits per water volume for each treatment. The following formulas were used:

- The selling price of the final product was calculated as follows:
  Sales = Final Biomass × Unit Price
- The expenses included the set of costs borne by the producer during a production cycle per production unit. The costs retained in this study were limited to the acquisition costs of fingerlings (cost 1) and feed (cost 2).
  Load 1 = PU_1 × ni
  Load 2 = PU_2 × QS
  Expenses = Load 1 + Load 2

PU_1 and PU_2 are, respectively, the acquisition costs of one fingerling and 1 kg of feed, ni is the number of fingerlings at the start of the experiment, and QS is the amount of feed served for each treatment during the study.

- Profit ratio measured the impact of the funds invested on the profits generated and the quality of the investment:
  Profit ratio = (Sales − Expenses)/Expenses

These calculated parameters were then comparatively analyzed to determine the best treatment. Thus, the non-parametric Kruskal–Wallis test was conducted to assess the significance of the differences among treatments on stocking density and feeding strategy. Growth curves were plotted for each of the nine treatments.

The weight–length relationship was established to examine the type of growth of the experimental fish using the equation W = a × Lt^b, where W and Lt are the total weight and the total length of the fish, respectively. The constants a and b are deduced from the linearization of the relationship by logarithmic transformation, according to the methods of Lévêque and Paugy [18]. This relationship between fish weight and length is then presented graphically through a power-type regression to show the distribution pattern of the data. The condition factor K is deduced from the weight–length relationship according to the formula K = W/Lt^b × 100. Then, the importance of both the stocking densities and the feeding strategies on the condition factor was assessed using a factorial ANOVA with a significance level set at $p < 0.05$. The statistical analyses were conducted using Statistica v.6.

3. Results

3.1. Survival and Growth

Fish survival varied significantly ($p < 0.05$) among the treatments (Table 2). Thus, the 20-7 and 40-7 treatments had the best survival rates of 73.5% and 70.1%, respectively. On the other hand, the 60-5 and 60-6 treatments had the lowest survival rates of 57.5% and 53.2%, respectively. Values of the same line with different superscripts are significantly different (*Kruskal–Wallis*, $p < 0.05$).

Table 2. Survival, growth, and feed conversion (mean ± SD) of male *Oreochromis niloticus* according to treatments.

Variables	Treatment								
	20-5	20-6	20-7	40-5	40-6	40-7	60-5	60-6	60-7
Survival rate (%)	66 ± 2.7^{ab}	64.3 ± 1.2^{ab}	73.5 ± 1.7^{bc}	66.2 ± 0.3^{ab}	65.2 ± 0.4^{ab}	70.1 ± 2.3^{ab}	57.5 ± 0.1^{ab}	53.2 ± 1.3^{a}	61.4 ± 2.5^{ab}
Initial mean weight (g)	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}	3.42 ± 0.7^{a}
Final mean weight gain (g)	302.17 ± 1.8^{ab}	394.62 ± 2.3^{ab}	464.99 ± 1.1^{bc}	318.49 ± 0.8^{ab}	385.08 ± 2.4^{ab}	452.71 ± 2.1^{bc}	289.67 ± 1.9^{a}	296.77 ± 1.0^{ab}	355.33 ± 3.3^{ab}
Daily mean weight gain (g)	1.63 ± 0.02^{a}	2.13 ± 0.01^{a}	2.51 ± 0.01^{a}	1.72 ± 0.09^{a}	2.08 ± 0.03^{a}	2.45 ± 0.1^{a}	1.56 ± 0.04^{a}	1.6 ± 0.07^{a}	1.92 ± 0.02^{a}
Specific growth rate (%/day)	2.43 ± 0.00^{a}	2.57 ± 0.00^{a}	2.66 ± 0.00^{a}	2.46 ± 0.00^{a}	2.56 ± 0.00^{a}	2.64 ± 0.00^{a}	2.41 ± 0.00^{a}	2.42 ± 0.00^{a}	2.52 ± 0.00^{a}
Feed conversion ratio	1.00 ± 0.01^{a}	1.28 ± 0.01^{a}	1.21 ± 0.01^{a}	0.89 ± 0.01^{a}	1.17 ± 0.01^{a}	1.25 ± 0.01^{a}	0.94 ± 0.01^{a}	1.53 ± 0.01^{a}	1.47 ± 0.01^{a}

Values of the same line with different superscripts are significantly different (*Kruskal–Wallis*, $p < 0.05$).

The individual total weight (Figure 1) increased continuously regardless of the treatment. The best growth profiles were observed with treatments including the two lowest stocking densities coupled with daily feeding (20-7 and 40-7). On the other hand, significant growth retardation was observed in *O. niloticus* under the 60-5, 20-5, and 40-5 treatments. At the end of the experiment, the average weights showed a significant difference ($p < 0.05$), with the biggest fish reaching 468.41 ± 0.8 g and 456.13 ± 1.7 g with the 20-7 and 40-7 treatments, respectively (Table 2). The fish in the 60-5 treatment reached a low weight of 293.09 ± 3.1 g. The average daily gain (1.56 ± 0.04 g to 2.51 ± 0.01 g), specific growth rate (0.024 ± 0.00%/day to 0.026 ± 0.00%/day), and feed conversion (0.89 ± 0.01 to 1.47 ± 0.01) showed no significant difference ($p > 0.05$) from among the treatments (Table 2).

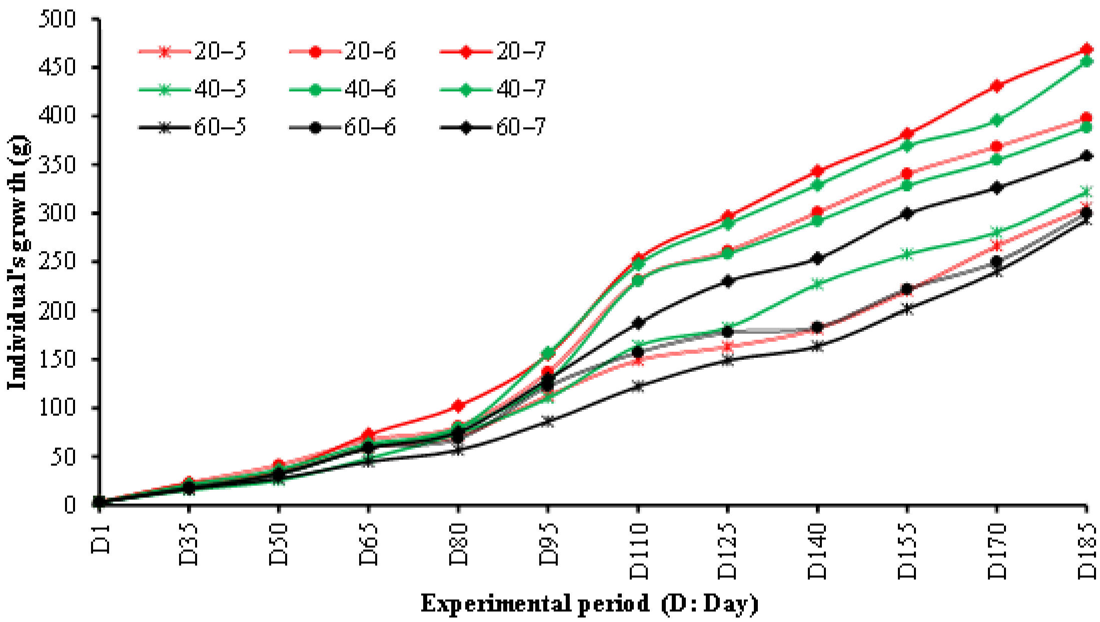

Figure 1. Evolution of the total weight in males *Oreochromis niloticus* according to the different treatments.

3.2. Growth Model and Condition Factor K

Table 3 presents the parameters *a* and *b* of the weight–length relationship for male *O. niloticus* as well as the condition factors. It was observed that the constant *a* of the weight–length regression was positive for all treatments; *b* was statistically identical to the standard value of $b = 3$, which indicates isometric growth for fish populations. Figure 2 presents the plots of this isometric relationship for the different conditions. The close link between the weight and length of the fish was confirmed since the R^2 coefficient of determination was close to 1 for all of the conditions.

Table 3. Parameters of the weight–length relationship and condition factor in male *Oreochromis niloticus* according to various treatments.

Treatment	Growth Parameters			K
	a	*b*	Growth Type	
20-5	0.0191	3.0134 NS	ISO	1.93 ± 0.27
20-6	0.0222	2.9777 NS	ISO	2.22 ± 0.3
20-7	0.0174	3.073 NS	ISO	3.85 ± 0.25 *
40-5	0.019	3.027 NS	ISO	1.91 ± 0.17
40-6	0.0207	2.9915 NS	ISO	2.09 ± 0.24
40-7	0.0193	3.0244 NS	ISO	3.87 ± 0.22 *
60-5	0.0134	3.144 NS	ISO	1.35 ± 0.16
60-6	0.0163	3.0828 NS	ISO	1.64 ± 0.19
60-7	0.0228	2.9687 NS	ISO	2.3 ± 0.39

NS: difference not significant to $b = 3$ (*t* test $p > 0.05$); ISO: isometric growth; *: significant difference to others in the same column (*Kruskal–Wallis*, $p < 0.05$).

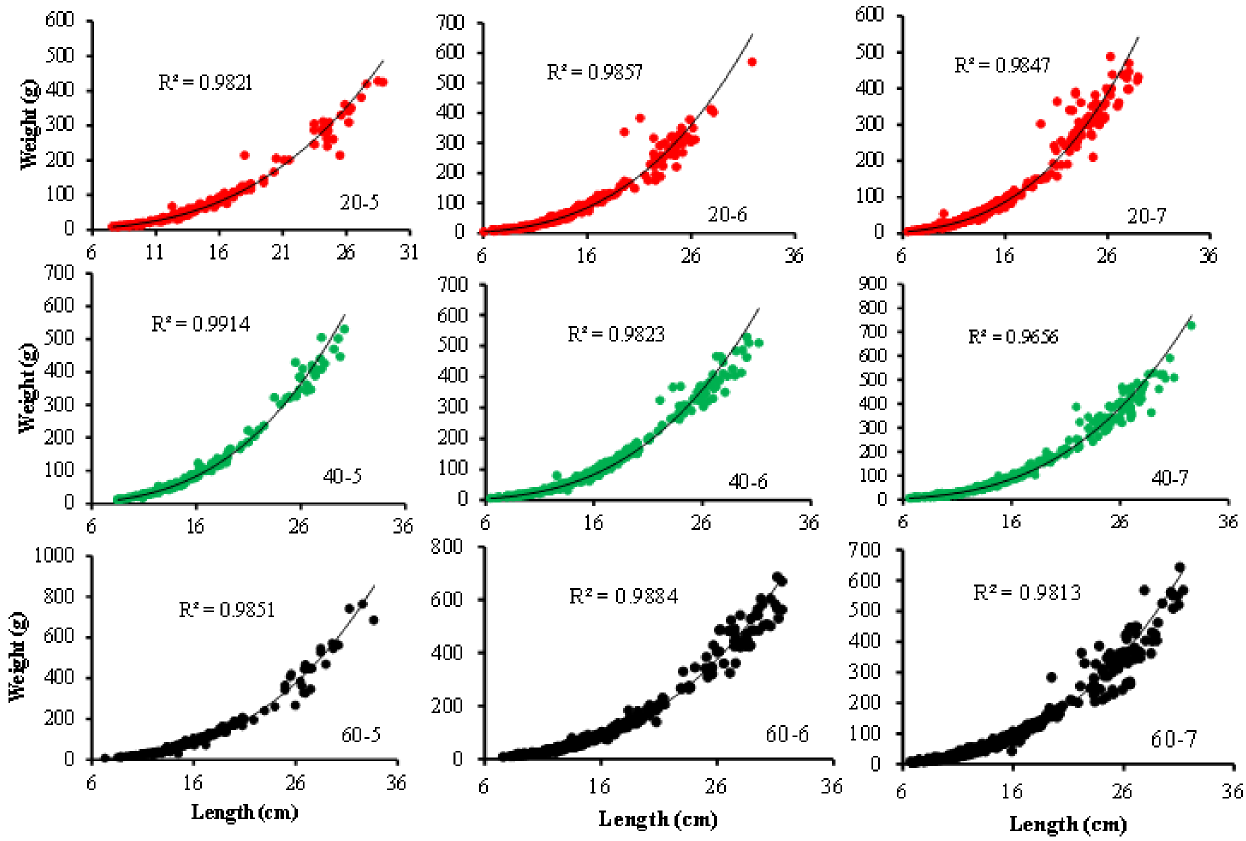

Figure 2. Regression of the weight–length relationship in male monosex *Oreochromis niloticus* according to the various treatments. Red color (Sd 20), green color (Sd 40) and black color (Sd 60).

As for the condition factor, a significant difference was observed among the conditions ($p < 0.05$); the fish subjected to the 20-7 and 40-7 treatments were in a better condition than those subjected to other treatments (K = 3.85 and 3.87, respectively). The factorial ANOVA shows that both factors (Fs and Sd) had a significant effect on the condition factor (Table 4). The 7-day Fs provided a better reared condition than the Sd factor (Figure 3). However, coupling the 7-day Fs with the 60-day Sd led to a reduced condition.

Table 4. Significance of the feeding strategies and stocking densities on the condition factor of fish reared. * means significant difference ($p < 0.05$).

Effect	SC	DF	MC	F	*p*
Fs	13.6	2	6.798	1111	0.000 *
Sd	4.62	2	2.309	377	0.000 *
Fs ∗ Sd	1.41	4	0.353	58	0.000 *

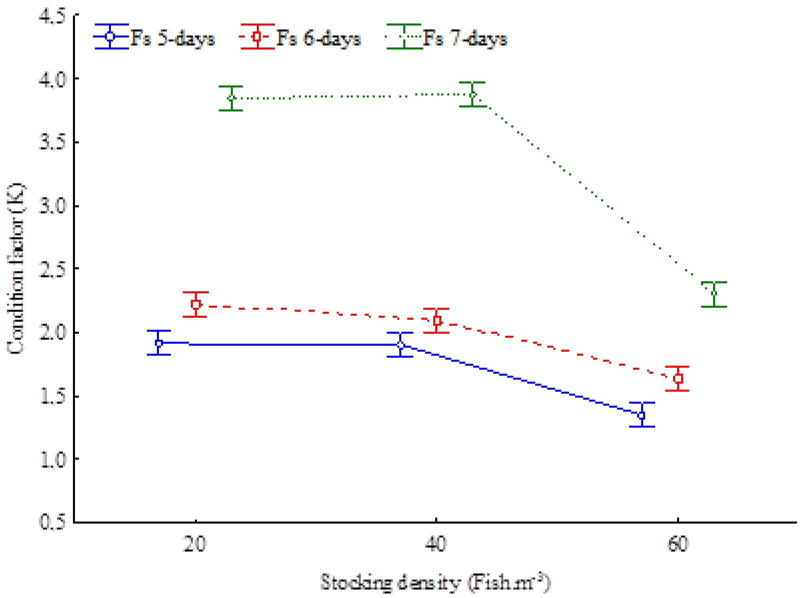

Figure 3. Evolution of the condition factor according to the feeding strategies and stocking densities for the reared fish.

3.3. Yield and Financial Profitability

Considering the acquisition costs of fingerlings and feed as the only expenses, Table 5 shows that the greatest net profits were obtained with the 40-7 and 60-5 treatments (21,894.20 XOF and 21,031.88 XOF per m^2 of cage surface, respectively). Considering the profit ratio, the feeding strategy appears more meaningful. Treatments with 5 days (20-5, 40-5, and 60-5) of feeding gave the best results (ratios of 1.28, 1.63, and 1.93, respectively).

Table 5. Yield and economic profitability of rearing male *Oreochromis niloticus* in floating cages according to different treatments.

	Treatments								
	20-5	**20-6**	**20-7**	**40-5**	**40-6**	**40-7**	**60-5**	**60-6**	**60-7**
Yield (kg·m^{-2})	7.11	9.01	12.14	14.99	17.86	22.65	17.60	16.75	23.17
Sales (XOF)	14,218.47	18,023.28	24,276.19	29,981.80	35,728.06	45,304.03	35,205.56	33,492.93	46,344.62
Fish juvenile expenditure (XOF)	717.13	717.13	717.13	1434.26	1434.26	1434.26	2151.39	2151.39	2151.39
Feed expenditure (XOF)	5517.55	9022.29	11,398.80	11,401.90	17,330.57	21,975.57	12,022.29	15,986.43	26,436.86
Net profit (XOF)	7983.79	8283.86	12,160.26	17,145.65	16,963.24	21,894.20	21,031.88	15,355.11	17,756.37
Profit ratio	1.28	0.85	1.00	1.63	1.06	1.06	1.93	1.09	0.75

4. Discussion

The water temperature in the cages varied from 28.9 °C to 32.3 °C throughout the experiment. These variations met the ecological requirements of *O. niloticus*, as described by Lazard [19]. The mean temperature of 30.67 ± 0.95 °C is within the 27–32 °C range suggested by Pandit and Nakamura [20] for the survival and growth of *O. niloticus*. Similarly, the pH varied slightly from 7 to 7.8, and the average dissolved oxygen value was

5.04 ± 1.23 mg·L^{-1}; hence, the ecological conditions required for the studied fish were fulfilled [21,22], and the water quality in the experimental site was favorable for the growth of *O. niloticus*.

This experiment with *O. niloticus* confirms the fact that stocking density is an essential factor for fish growth [23–25], and feeding strategy also appears to be an important factor for good fish productivity in the Toho-Todougba lagoon complex. A good feeding strategy can reduce the production cost, as confirmed by the treatment of 20 fish·m-3 with a 5/7-day diet, yielding an average final weight of 305.59 ± 3.1 g.

By comparing the production yields of different conditions, it appears that the stocking density of 20 fish·m^{-3}, despite the especially high growth with the 7-day Fs (464.99 ± 1.1 g), is not recommended for economic profitability when all costs related to the production cycle are taken into account. Stocking densities of 40 and 60 fish·m^{-3} coupled with a 7/7-day diet proved to be the most favorable for the cage rearing of *O. niloticus* in Toho-Todougba. These results confirm those of Yi and Lin [23], who obtained a good yield with a stock of 50 fish·m^{-3} and 7/7-day diet. Moniruzzaman et al. [25] also observed that a density of 50 fish·m^{-3} and a 7/7-day diet with two daily services led to a good yield in terms of biomass and financial return. This also highlights the importance of splitting the daily ration during feeding.

However, significant mortality was observed in the various treatments applied. Only 70.1% and 61.4% survival rates were observed, respectively, with the treatments that yielded the best yields (biomass produced), namely, 40 fish·m^{-3} with 7/7-day diet and 60 fish·m^{-3} with 7/7-day diet. These results are the most similar to those of 62% to 68% obtained for the same species by Nouman et al. [26] in the Jabal Awlia reservoir. However, in that study, the stocking densities were from 120 to 360 fish·m^{-3}, so the effect of stocking density on the observed mortality was minimal since the survival rate in the most favorable treatment (20 fish·m^{-3} and 7/7-day diet) was 73%. Such a survival rate is low compared to those obtained by Kunda et al. [27], which ranged from 96.83% to 98.17% for Nile tilapia reared in floating cages in Bangladesh. Regarding the techniques and infrastructures used in this trial, the observed mortalities may not be related to the experiment protocol. Consequently, the mortality could be linked to one or more of the intrinsic factors of the lagoon. High mortality rates (several tons) of fish have been recorded in the fish farms installed in the lagoon; the causes so far are unclear. Therefore, in-depth studies are urgently needed to determine and correct, if possible, the factor(s) responsible for the high mortality of farmed fish in the lagoon complex.

The feed conversion ratios obtained from 0.89 to 1.53 with 40 fish·m^{-3} and 5/7-day diet and 60 fish·m^{-3} and 6/7-day diet, respectively, suggest that for all nine treatments, the feed was well converted and the difference was significant among the treatments. The growth parameters showed that the conditions of 20 and 40 fish·m^{-3} with a 7/7-day diet yield more favorable zootechnical results. Our findings are similar to those of Daudpota et al. [28], who claimed that increasing the frequency of feeding positively influences the growth of *O. niloticus*, especially when they are small. However, in economic terms, the results indicate that the conditions of 20 fish·m^{-3} with a 5-day diet, 40 fish·m^{-3} with a 5-day diet, and 60 fish·m^{-3} with a 5-day diet provide the greatest benefits with respective profit ratios of 1.28, 1.65, and 1.93. It is then possible to apply a 24-hour skip feeding strategy to farm Nile tilapia in floating cages on the lagoon complex, but such a technique may lead to lower individual growth. In this case, a stocking density of 60 fish.m^{-3} is the best regarding both the utilization of space and the farming economical return. Even though other treatments have good profit ratio, they seem to be less economically acceptable regarding the gross yield.

5. Conclusions

This study of the effect of stocking densities and feeding strategies on the zootechnical parameters and economic profitability of *O. niloticus* farmed in floating cages in the Toho-Todougba lagoon complex showed that such activity on the lagoon complex could be optimized, but needs additional in-depth study for the better management of fish survival in floating cages. In terms of zootechnical performance, stocking densities of 20 and 40 fish·m^{-3} coupled with daily feeding promoted good fish growth. On the other hand, the more restrictive feeding led to better economic profitability, as the lower feed expenditure overcame the lower fish growth parameters.

This study fits well with the action program of the Beninese government, which dedicates significant resources to promote aquaculture in Benin. For fish farmers installed on the Toho-Todougba lagoon complex and other water bodies in Benin and in the sub-region, the results of the current study can be used to optimize the profitability of their production. The choice of a stocking density of 60 fish.m^{-3} must be coupled with a diet of 5 days out of 7. Even though the final length and weight of the fish are relatively lower, such a technique will optimize the food use (with a feed conversion ratio of 0.94). Thus, the economic performance of the activity will be improved. In terms of political decision making, the results of this study can serve as a capacity building tool and contribute to the establishment and/or strengthening of support policies for the sector. These results also call on scientists and other actors to work harder to solve problems that slow down cage fish farming in the water bodies of Benin. It will therefore be a question of working towards the better management of the problems of fish mortality in cages and to define tools and measures for the sustainable management of the concerned ecosystems in collaboration with political decision makers.

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