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RESEARCH PAPER

Analysis of Practice of Cage Aquaculture System in Toho-Todougba Lagoon, Southern Benin (West Africa)

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Abstract

Aquacultural techniques for floating cage are unknown in Benin that limited the agricultural policies to increase the fish production. This study aims to clarify that situation. Indeed, a questionnaire has been developed and computed in KoBocollect application. The survey's team is 19 fish farmers. The survey took place in the first quarter of 2019 and concerns technical data. Descriptive statistics were presented and PCA was used for statistical analysis. It was concluded that 89.47% of the fish farmers are men and only 03.30% are aquacultural technicians. In addition, it is noticed that 604 cages are operating on the lagoon with 78.95% of the fish farmers who are owners of 01 to 24 cages and 05.26% own more than 100 cages. The most produced fish species is tilapia (78%). Furthermore, 63.16% of the farmer feed their fish twice per day while 26.32% feed three times per day. Tilapia yield varies between 836 kg and 1,220.22 kg compared to Clarias yield which ranges from 825 kg to 850 kg. The simple rate of return is 1.52 and 1.77 for tilapia and Clarias respectively. Density, feeding frequency, year of experience, number of cages and production cycle time influences yield.

Introduction

Aquaculture production ensures an important role in global food security, and particularly for the developing countries (FAO, 2014). However, consumption world fish is estimated at 19.2 kg/cap/year (FAO, 2014). In addition, aquaculture provide employment and then reduces poverty (Hishamunda *et al.*, 2011). It helps to control the pressure on natural fisheries resources, its conservation is facing to global challenges which limit the protection of the environment (Rurangwa *et al.*, 2014).

In Benin, fish production has been capped at around 5,000 tons for several years against a demand of nearly 150,000 tons a year (DPH/MAEP, 2017). To fill this gap, the general policy of the state has defined in its key actions to promote agriculture, promote inland aquaculture to reach at least 20,000 tons in year 2021 with about 18,000 new jobs created. As such, some of programs, projects research and agricultural promotion, while particularly fish farming, have agreed on the development of floating-cage aquaculture, considering the existing river network in the country. Several cage production units have already been set up on several bodies of water throughout the country. However, almost some of the units was installed without authorization (DPH/MAEP, 2017). As a result, the National Agricultural Research System (SNRA) has no idea of the production techniques or practices of these units. Also, the heterogeneity of the fish farmers does not guarantee harmonization of the production techniques and, consequently, of the yield. Lack of

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socio-economic information relative to yield from floating cages can barely allow the establishment of a benchmark of practices which will deliver an optimized yield while respecting the ecologic vitality of the waterbody.

To solve this challenge with the goal of revamping inland floating-cage aquaculture in Benin and favoring the setup of new production units, which is central to an increased yield, an investigation based on cage aquaculture practices was carried out followed by a critical analysis.

Material and Methods

Study Area and Survey Unit

The Toho-Todougba lagoon is located between longitude 6° 23'N and 6° 27' N and latitude 2° 07'E and 2° 13' E (Figure 1) in the municipality of Ouidah. Its is 914.25 ha-wide. It used to be part of a lagoon complex with interaction with the sea through the intermediary of Lake Nokoué in Cotonou. The building of a bridge in the Godomey neighborhood as well as the building of a railway embankment have cut off this interaction with the Nokoué Lake (Chippaux *et al.*, 1990). The Toho-Todougba lagoon complex has then become an isolated waterbody whose salinity has gradually decreased and is becoming more like that of fresh water. The Toho-Todougba Lagoon is now recharged by rain water and runoffs. Vegetation characteristic of lakeside environments has developed there. Socio-economic survey was carried out on floating-cage fish farms where each unit was represented by the technician in charge or by the fish farmer him/herself. Toho-Todougba lagoon is the water body that attracts more fish farmers in Benin Republic (DPH/MAEP, 2017).

Data Collect

This study was carried out during the first quarter of 2019 and has consisted to assess all the production units doing business on the lagoon and especially within floating cages. Data collect was about having production units managers answer a questionnaire and interview the technical and economic records of each producer. The questionnaire was developed and incorporated into the KoBoCollect V1.14.0 smartphone- and tablet-compatible application. This collection tool made it possible to set up a database in which noise in the collected data would only come from the way the questionnaire was handled. All of the 19 units operating on the lagoon have been questioned. Collected data come mainly from the last three production cycles of each unit, ie the last two months of production before our survey, considering variations in the length of the production cycle of each unit. Yield-related data come mainly from tilapia and *Clarias gariepinus* since those are the two species on which technical and economic data are regularly recorded. We note that units that produce red tilapia do not separate red tilapia production from that of *Oreochromis niloticus*. As a result, tilapia production data includes those of both *O. niloticus* and red tilapia.

Data Analysis

The collected data was computed in Excel Microsoft. Data analysis consisted to illustrate

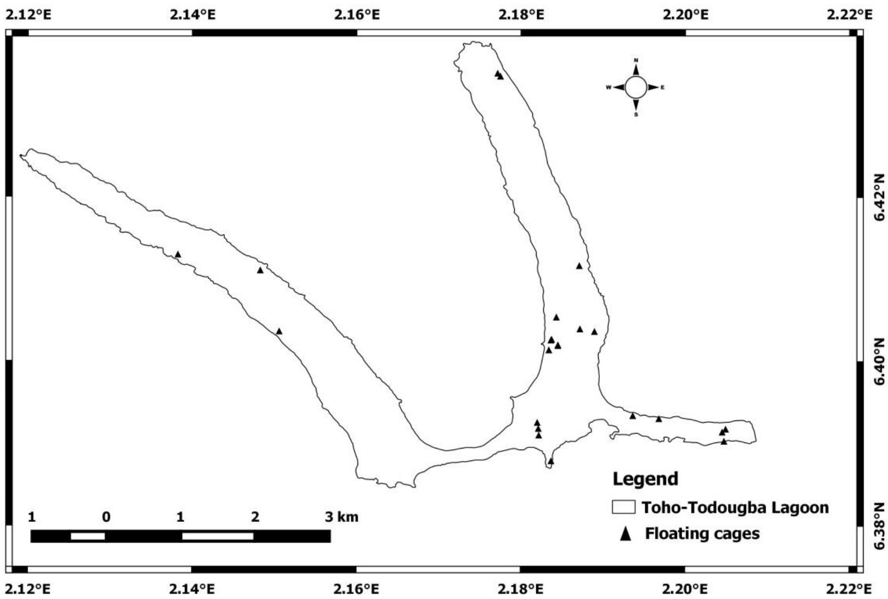

Figure 1. Map of the study area with geolocation of cages.

descriptive statistics using histograms and pie charts. Considered variables are: promoters' gender and education level, number of cage per farmer, species raised, types of fry, feeding mode, origin of the feed, brand of food used, and feeding frequency. Then, production profitability of floating-cage fish farming, as seen through the lenses of simple rate of return calculation, has been evaluated following the formula:

$$Simple\ Rate\ of\ Return = \frac{Income}{Sum\ of\ the\ expenses}$$

It should be noted that for the calculation of the simple rate of return, only data relating to the first production cycle were considered because, beyond the first production cycle, several units no longer enter the second cycle due to financial resources. In this case, considering the average of the yield production for three production cycles, the result obtained will not be biased. The Principal Component Analysis was used to enhance the correlation between the yield production and the technical and social factors of caged fish farming. The Statistical Software version 6, License AXXF410C489011FA was used for this purpose.

Results

Characteristics of Fish Farmers on the Toho-Todougba Lagoon

Frequency distribution reveals that 89.47% of the participants in floating-cage fish farming activities on this lagoon are men while just 10.53% are women (Figure 2). Analysis of the education level of the fish farm's shows that they are literate and remarkably have a university-level education (47.37%). Just 05.26% of the participants have no education. We ought to note that among educated participants and those with a university-level education, only a tiny proportion (03.30%) has special training in aquaculture. The rest generally has no clear idea of the technical procedure involved in aquaculture production and in floating-cage production in particular. On the other hand, the participants are, on the average, 48.8 ± 20.3 years old.

Production Factors of Lagoon Fish Units

Distribution of Number and of Characteristics of Cages Operating on the Lagoon per Fish Unit

Production of fish in floating cages on the Toho-Todougba lagoon began in 2013 with the implementation of the largest production unit which, in April 2019, has 300 floating cages in operation. Upon completion of the socio-economic survey on the lagoon, it was found that the total number of cages operating in April 2019 was 604, spread among 19 production units. 94.4% of the cages on the lagoons have a size of 5m x 5m x 3m (75 m^3) and just 05.60% are 10 m x 6 m x 3 m (180 m^3). 180m^{-3} cages are generally static ones. The spread of cages over the production units (Figure 3) reveals that 78.95% of the farmers have between 1 and 24 cages. Two fish farmers (10.53%) own 50 to 100 cages. Only one fish farmer (05.26%) owns between 25-49 cages and more than 100 cages.

Table 1 shows the number of cages per production unit. In addition, we need to note that most producers have manpower at their disposal, and the size of this manpower is dependent upon the size of the infrastructure as well as on the financial standing of the farmer. Units that have the most cages use motorized canoes to reach cages in use on the lagoon; these units number four.

Systems and Production Techniques in the Toho-Todougba Lagoon Fish Units

Type of Breeding and Fish Species

According to Figure 4, 63.16% of the fish units produce only *Oreochromis niloticus*, 10,53% produce *Oreochromis niloticus* and *Clarias gariepinus*; then *Oreochromis niloticus* and *Chrysichtys nigrodigitatus,* while 15,79% produce a combination of *Oreochromis*

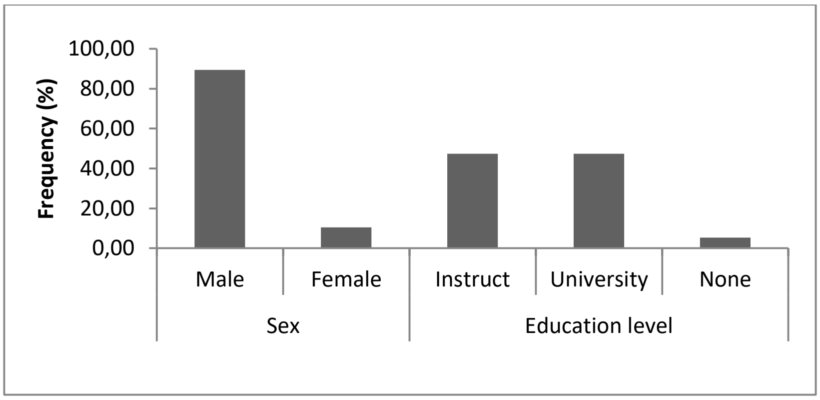

Figure 2. Sex and education level frequency distribution in the fish farmers on the Toho-Todougba lagoon.

niloticus-red tilapia (red tilapia resulting from a cross between *Oreochromis mosambicus* and *Oreochromis hornorum*). It should be noted that the association *Oreochromis niloticus*-red tilapia in aquaculture was initiated on this lagoon, as well as in other parts of Benin, by the largest production unit which owns about half of the total number of cages on the Lagoon. In addition to this producer, other no less important units, including the second largest production unit (100 cages) has also opted to a large extent for the association *Oreochromis niloticus*–red tilapia. The other producers also, every once in a while, do this kind of association. It is essential to note that beside the combination *Oreochromis niloticus*- red tilapia bred in 10,79% of the units of production, which is a form of polyculture, the majority of the other units practice monoculture (just one fish species per cage) although they produce several species.

To a large extent, tilapia fish production (*Oreochromis niloticus* and red tilapia) is mostly based on single-sex production by up to 84.21% of the producers, as opposed to 05.26% for mixed sex production and 10.53% for an alternating rhythm between mixed sex and single sex productions (Figure 5).

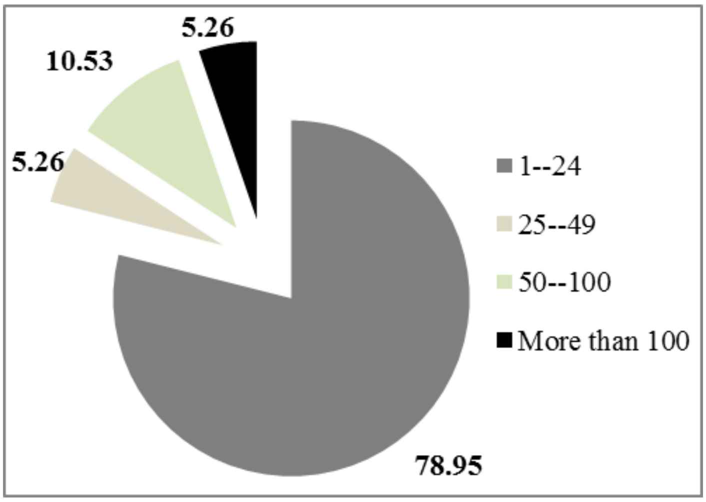

Figure 3. Distribution of number of cages per fish farmer.

Table 1. Synopsis of production factors per fish unit on the lagoon

Fish Farms	Number of cages	Manpower	Pirogue
Ahozin Jose farm's	12	2	Handbook
Jean Farm's	10	2	Handbook
Odjo Blanche farm's	3	1	Handbook
Boko farm's	1	no	Handbook
PADA cooperative farm's	5	no	Handbook
Zannou Emmanuel farm's	13	2	Handbook
Akotegnon Claude farm's	6	2	Handbook
Tonon farm's	300	12	Motorized
Finkpon Saturnin farm's	12	2	Handbook
Guidibi Christian farm's	50	5	Motorized
Beniel Fisf farm's	100	6	Motorized
Gbeti Jean Maxime farm's	6	1	Handbook
Clovis Farm's	20	2	Handbook
Merveille du lac Toho farm's	28	2	Motorized
Adjadji farm's	12	2	Handbook
Idohou Patrick farm's	4	no	Handbook
DenakpoClaude farm's	2	no	Handbook
Madougou farm's	13	2	Handbook
Petit poisson farm's	7	2	Handbook

No production unit owns a hatchery on the lagoon. Some production units have two production phases, including pre-enlargement and fattening. Those units represent 15.79% of the producers. However, they hold nearly three-quarters of the total number of cages on the lagoon; that is 450 cages out of the 604 in total.

Loading Fry to the Cages

The mean weight of the tilapia fry (red tilapia and *Oreochromis niloticus*) loaded to the cages is 23 ± 11.9 g. For pre-fattening, fry weighing 2g are purchased from hatcheries and loaded in fine-mesh pocket-shaped nets inside cages at densities generally around 5,000 fry per such pocket-shaped nets of 75-m^3 in size. Pre-fattening lasts two months where the fry reach a weight of around 25 g and then the fattening phase begins. Loading density for tilapia fattening is, on the average, 2,241 ± 870 per 75-m^3 cage. The highest fattening loading density, as practiced on the lagoon, is 3,000 while the lowest is 1,500. Moreover, the observed *Clarias gariepinus* loading weight is generally 30 g. Loading density is 3,000 per 75-m^3 cage.

Fish Feeding

Types of Feed Used and Feeding Mode

From this same figure 5, it appears that 42.11% of producers use a homogeneous diet (a single type of food) as opposed to 57.89% who use a combination of foods. All of the homogenous foods are imported brands with various centesimal compositions while 08.33% of food combinations are locally-produced and 91.67% are imported. The diversity of the mode of feeding used is

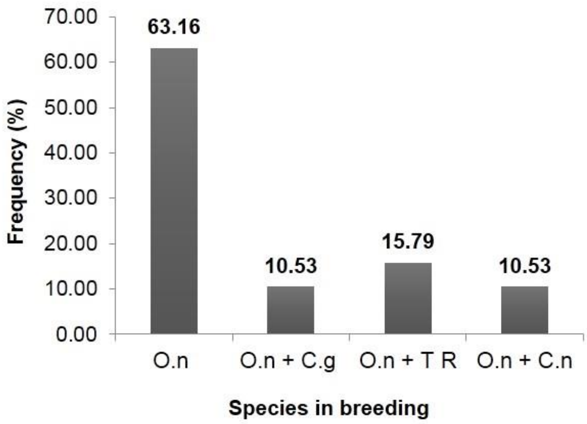

Figure 4. Proportion of the species bred on the lagoon (Key: O.n= *Oreochromis niloticus*, T R= red tipalia; C.g= *Clarias gariepinus*, C.n= *Chrysichtys nigrodigitatus*).

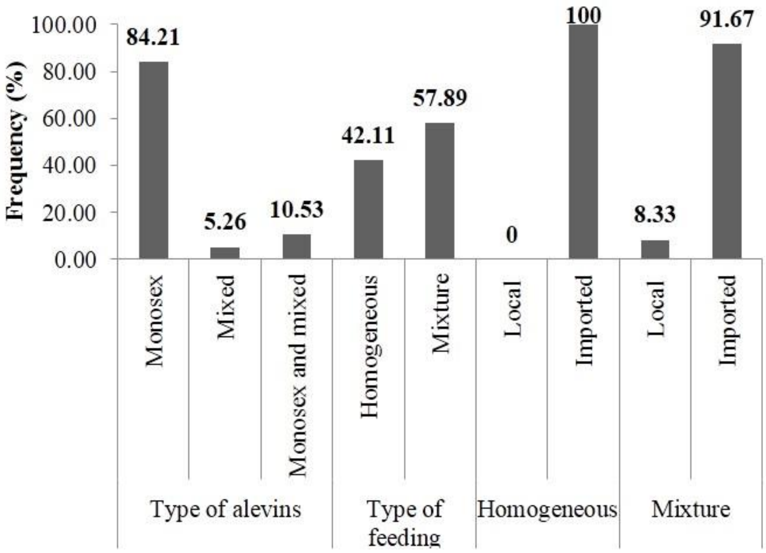

Figure 5. Proportion (%) of type of fry used and feeding mode.

an indication of the diversity of production techniques on the Toho-Todougba lagoon. This will not only impact the individual yield of the production units but also the performance of the waterbody.

From figure 6, it appears that four brands of imported foods are used by floating cage producers: Biomar, Gouessan, Ranhan, and Topfeed. Biomar is the most-used brand (by 36.84% of producers), followed by the Biomar-Gouessan combination used (by 21.05% of producers). 05.26% of producers use Ranhan and 05.26% use a combination of all four brands. We note that Gouessan and Topfeed are always used in combination with other brands of food.

Feeding Frequency

Most fish farmers in the Toho-Todougba lagoon (63.16%) feed the farmed fish twice a day, 26.32% feed the fish three times a day, and 10.53% go for a single feed per day (Figure 7). This variation in the feeding frequency depends on a number of factors, the most important of which is the availability of sufficient financial resources to conduct the breeding operation to the end.

Growth Control and Fish Harvesting

Growth control is not done in all production units until the end of the production period. However, production units that own a large number of cages (≥ 40) conduct a regular, once-per-month control fishing during the production cycle. This control fishing makes it possible to detect growth dimorphism (heterogeneity of weight and length) and to harvest and sell specimens that have rapidly reached market size. As a result, harvest/sale operations are a continuous operation depending on the rate of growth of the fish. Continuous harvest/sale operation is more common for *Clarias gariepinus*.

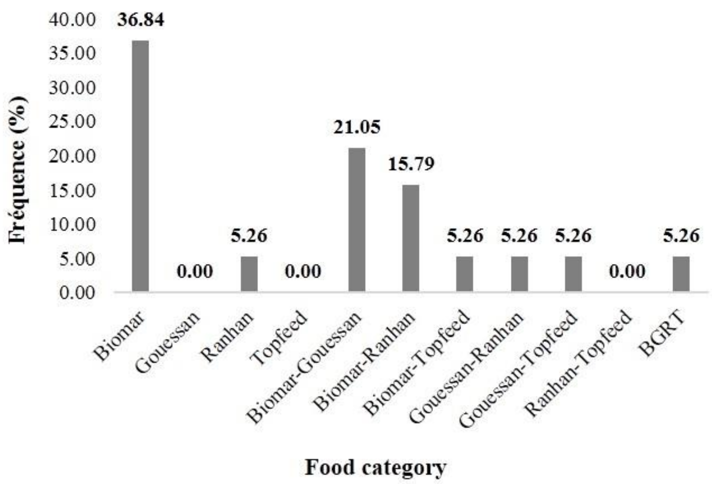

Figure 6. Proportion (%) of use of food brands and food association (BGRT=Biomar+Gouessan+Ranhan+Topfeed).

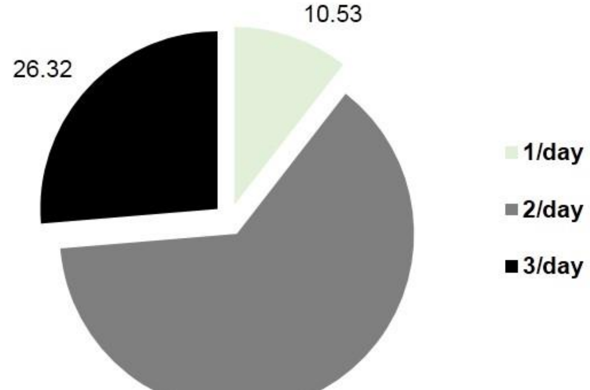

Figure 7. Feeding frequency.

Tilapia and *Clarias gariepinus* Production Yields

Figure 8 shows yield variations over three production cycles for tilapia (*Oreochromis niloticus* and red tilapia) and *Clarias gariepinus*. Analysis of the graph shows that for tilapia production, the efficiency in 75-m^3 cages is, on the average, 836 kg in the first cycle, 1,045.545 kg in the second cycle and 1,220.22 kg in the third cycle over a breeding period of 7.25 ± 1.68 months. The average density was 2,469 ± 882 fry per cage. The average yield for the three production cycles considered in this survey at all production units is 1,033.89 ± 192.328 kg.

As for *Clarias gariepinus*, the average production yield in the first cycle is 850 kg. This yield has increased to 900 kg in the second cycle and dropped back again to 825 kg in the third production cycle. The average density was 2,000 ± 210 per 75-m^3 cage for a 4-month production period. The average yield for the three production cycles is 858.33 ± 38.18 kg.

According to 100% of the fish farmers who practice this type of breeding, *Chrysichtys nigrodigitatus* bred in association with tilapia, on the one hand, and with *Clarias gariepinus,* on the other hand, is not sufficiently tracked with regard to production efficiency. For those interested in it, the reason for producing *C. nigrodigitatus* is to satisfy the sporadic demand for this species. Moreover, larval production and fattening techniques are not yet fully understood in Benin. As a result, fish farmers collect the fry of this species in the lagoon and fatten them in cages. In comparison, the yield of cage tilapia over the three cycles exceeds that of *Clarias gariepinus*, but the duration of production cycle remains a key factor which influences the economic profitability of either of those two species.

Economic Profitability and Determining Factors

Table 2 shows the simple rate of return for caged production in the Toho-Todougba Lagoon. It shows that the simple rate of return for the production of tilapia is 1.52 and that that of the *Clarias gariepinus* is 1.77. This suggests that for every CFA franc invested, a profit of 0.52 CFA francs and of 0.77 CFA francs is made, respectively for tilapia and *Clarias gariepinus*.

Figure 9 has shown the projection of several variables (technical and social variables) in the factorial design. It noticed that two groups have distinguished in the factorial design. The first group includes the variables yield production (Yield-P), loading density (LDen), production cycle time (DC), loading weight (ELW) and education level of the actors (EL). The second group consists of the variables cage number (NCage), year of experience (YEx), feeding frequency (FF) and whether or not they belong to a socio-professional group (MOP). The variables age (Age), sex (Sex), fry type (TF) and feeding mode (MF) have be isolated from each other and from the two constituted groups. Axis 1 explains the variables for 37.53% and axis 2 explains 20.32% for a total of 57.85%. It should be noted that the variables constituting group 1 are located in the negative section of axis 1 and the positive section of axis 2 while all variables of group 2 are located in the positive section of axes 1 and 2 (Figure 9). Considering the coordinates of the variables according to axes (Table 3), it should be noted that the loading density and production efficiency variables are more correlated than the other variables in group 1. This said, density influences yield by 0.721117 or 72.1117% (Table 3). Also, although the variables years of experience (YEx), number of cages (NCage) and feeding frequency (FF) have a strong positive correlation with axis 1 (0.660253 ; 0.729252 ; 0.736978 respectively), they have a significant positive correlation with axis 2 of 0.548095% respectively; 45.2054% and 39.8517%. However, they also have a positive influence on production efficiency. The variable length of the production cycle has a positive influence on yield of 33.2133%.

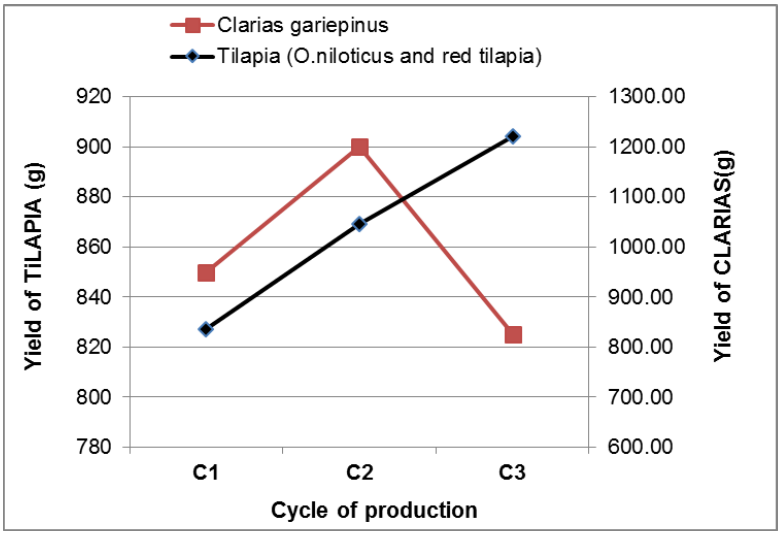

Figure 8. Variations in average yield per production cycle.

Table 2. Economic profitability parameters

	Tilapia (*Oreochromis niloticus* and red tilapia)	*Clarias gariepinus*
First Yield production (Kg/cage)	836	850
Cycle duration (month)	7.25	4
Unit sale price (FCFA)	1550.00	1,500
Income (FCFA)	1,295,800	1,275,000
Other expenses (FCFA)	75,875.00	72,500
Feed quantity (Kg)	847.68	775
Price per Kg of feed (FCFA)	776.1183465	753.2903226
Cost of the feed (FCFA)	657,900.00	583,800
Various expenses (FCFA)	733,775.00	656,300
Gross operating surplus (FCFA)	546,225.00	618,700
Cost of cage (FCFA)	600,000.00	600,000
Lifetime of cage (year)	3.00	3.00
Depreciation allowance per cage (FCFA)	118,750.00	66,666.67
Goss revenue (FCFA)	427,475.00	552,033.3333
Goods off use	0.00	0.00
Net revenue (FCFA)	546,225.00	618,700
Sum of the expenses (FCFA)	852,525.00	722,966.67
Simple rate of return (%)	01.52	01.77

Currency used is the CFA Franc

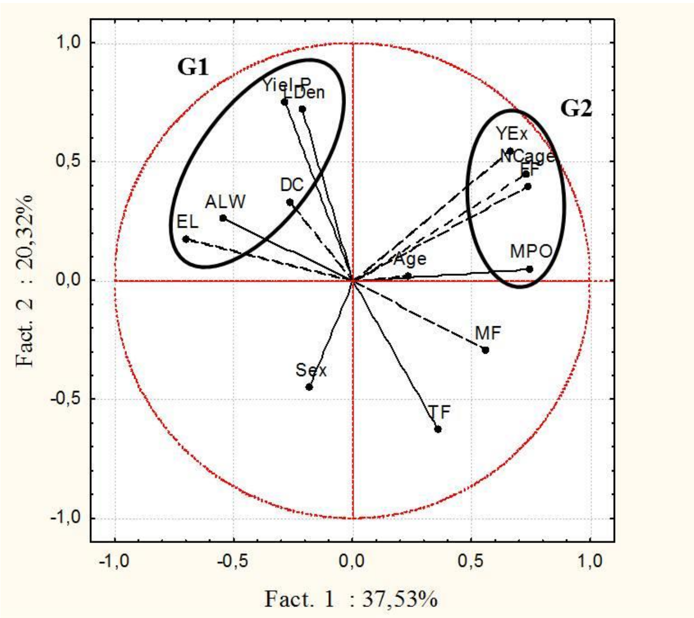

Figure 9. Projection of variables on factorial level (Sexe (Sex), Type of Feeding (TF), Education level (EL), Mode of feeding (MF), Memberships of Producers Organization (MPO), Age (Age), Years of Experience (YEx), Number of Cage (Ncage), Frequency of feeding (FF), Loading density (LDen), Yields of production (Yiel-P), Average loading Weight (ALW), Duration of cycle (DC)).

Discussion

Aquaculture is an integral part of agriculture and contributes an active role for the food and social security, in developing countries. Some of the aquaculture sectors, women are the least active workforce. We noticed that the sub-sector in Benin which is in charge of the floating-cage aquaculture is represented by the women with 10.53% managers in fish production units. It is due to the lowest participation of the women as the agricultural business in developing countries (FAO, 2019). This lowest percentage of business women is uniform to the developing countries and which resumes from their education level (Yao *et al.*, 2016). The same remarque has been observed in this study where 94.74% of the leaders are educated (N'dri *et al.*, 2016) it is capital that the leaders in agricultural business have the good baselines knowledge's in agriculture area so that it will be easy for them to understand seminar courses in agricultural rural development (Christoplos and Kidd, 2001). The predominance of men like agricultural leaders for fish farm in floating cage in Benin, is led to the lowest access

Table 3. Coordinates of variables along the axes

Variables	Fact-1	Fact-2	Fact-3
Sex	-0.18115	-0.44603	-0.127134
TF	0.355629	-0.624262	0.432604
EL	-0.7014	0.17623	-0.373228
MF	0.561327	-0.29418	-0.474244
MPO	0.742531	0.051247	0.120796
Age	0.235263	0.022189	-0.765216
YEx	0.660253	0.548095	-0.116915
Ncage	0.729252	0.452054	-0.096788
FF	0.736978	0.398517	0.388199
LDen	-0.209493	0.721117	-0.117281
Yiel-P	-0.287897	0.754667	0.241467
ALW	-0.546408	0.26139	0.503495
DC	-0.263167	0.332133	-0.378554

Sexe (Sex), Type of Feeding (TF), Education level (EL), Mode of feeding (MF), Memberships of Producers Organization (MPO), Age (Age), Years of Experience (YEx), Number of Cage (Ncage), Frequency of feeding (FF), Loading density (LDen), Yields of production (Yiel-P), Average loading Weight (ALW), Duration of cycle (DC).

of findings of the women due to several socio-cultural factors (Doubogan, 2016).

African fish farming in general, and the Beninese one in particular, is dominated by two key species: *Oreochromis niloticus* tilapia and *Clarias gariepinus* (Amoussou *et al.*, 2016; Rurangwa *et al.*, 2014). At the very least, this was the conclusion reached in the floating-cage production units of the Toho-Todougba lagoon where tilapia and the African catfish dominate productions. Those species whose production techniques are fully mastered adapt themselves to tropical climate conditions better. This is what justifies their abundant production in most of the tropical region.

We have found that the preferred choice of producers in terms of breeding is the privileged production of tilapia male monosex fry. This choice is due to the fast rate of growth in the male monosex (Ahmad *et al.*, 2002; Khalil *et al.*, 2011). Growth is a determining factor in agricultural economic profitability and therefore justifies the choice of producers for the monosex. The choice of a limited number of producers to go for mixed fry may be explained by the lack of financial resources to acquire monosex fry from hatcheries authorized for this purpose. This causes them to mate the broodstock spawners in their own facility, to recover the fry, and to proceed with fattening.

Feed based mainly on imported foods is due not only to the search for the best nutritional quality but also to a preference for physical properties which allow the said feed to stay afloat, to last in the water, and to be attractive to the fish for it to feed on (Le Gouvello and Simard, 2017). Producers who use local feed in combination with imported ones do so to compensate for the lack of resources, especially at the beginning of the production cycle. The different feed brands used in the combinations we've noticed can be expected to diversely influence the growth rate of fish being fattened because of variations in their percentage composition. Also, resistivity will vary depending on the brand of feed, which implies that the extent to which the water is rich in organic matter will differ depending on the brand used, since feed used in cage aquaculture is a source of organic pollution (Gorlach-Lira *et al.*, 2013). This means that mixing brands will not be without drawbacks on the ecologic performance of the lagoon when it comes to phytoplankton production.

The tilapia simple rate of return is 1.52 vs. 1.77 for Clarias. This 0.25 difference in the rate of return is mostly explained by the duration of fattening, which is more than 7 months on average for tilapia and 4 months clarias. In other words, at equal fattening durations, the worth of clarias is greater on the market than that of tilapia. It is just that production needs to meet the demand, according to (Dury *et al.*, 2017). Futhermore, tilapia is a fish not known to be a totem and is, therefore, more consumed in Cotonou, Calavi, and surroundings as opposed to the African catfish (*Clarias gariepinus*) which is consumed only by fringe populations in Benin and Nigeria. That justifies the high production of tilapia although the production of clarias brings more return on investment.

Yield production determines the economic profitability of all agricultural production. Indeed, the yield production of cage fish farming on the Toho-Todougba lagoon is significantly dependent on stocking density. Fish farmers depending on their understanding use various densities. This is due to the variability of the related scientific data (50 individuals.m^{-3} (Chakraborty and Banerjee, 2010) ; 5 kg of biomasse.m^{-3} (Faye *et al.*, 2018); 63 - 188 individuals.m^{-3} (Blow and Leonard, 2009; Ofori *et al.*, 2010) for the specie *O. niloticus*. The year of experience in fish farming also influences production performance. This shows the need to set up socio-professional groups to share experiences in order to boost yields for all producers. The number of cages, feeding frequency and length of the production cycle are factors that incidentally influence production yield.

From the analysis of the latter, it should be noted that the factors feeding frequency and production cycle duration depending on the managerial capacity of the managers of the production units and the number of cages factor depend on the financial capacity of the farm promoter to install. As noted by (Atsé *et al.*, 2013) frequency of feeding impacts on fry growth and therefore on yield. Especially for the species O. niloticus, it should be stressed that continuous feeding unnecessarily increases the cost of production insofar as it exploits natural feeding (periphyton) and as such reduces the consumption of the food served. For the valorization of their herbivorous diet, (Cuvin-Aralar *et al.*, 2012) proposed feeding skipping 24 hours (served every 48 hours). However, studies could go as far as a 48-hour skipping feed (served every 72 hours) to evaluate its effect since it will provide more economic profitability if it does not reduce the average daily gain Cycle length, while influencing production yield, is also influenced by the genetic characteristics of the strain in use. Faced with the diversity of strains of aquaculture species in Benin (Rurangwa *et al.*, 2014), a modest production cycle time enhancing economic profitability must be achieved through genetic improvement of aquaculture species (Gangbé *et al.*, 2019).

Conclusion and Perspectives

Analysis of the cage-farming system on the Toho-Todougba lagoon reveals that few women are involved and that the majority of those practicing it are educated. Bred species are mostly *Oreochromis niloticus* and *Clarias gariepinus*, then, as a secondary production, the red tilapia and *Chrysichtys nigrodigitatus* raised in association. The majority of floating-cage fish farmers own anywhere from 1 to 24 cages with a production preference for tilapia monosex and a large use of imported feed. Based on the collected data, production of *Clarias gariepinus* (African catfish) is more profitable, unlike tilapia. But the permanent demand for tilapia causes the producers to invest more in the production of it. Several factors influence profitability, mainly loading density and secondarily feeding frequency, year of experience, number of cages and production cycle time. It would be beneficial to conduct research on these different parameters with the objective to optimize the yield and economic profitability of cage fish farming in Benin.

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