

Research Article

Crisis in Modern Aquaculture in Southern Côte d'Ivoire: Case of HYDROFISH, A Super-Industrial Farm in Binger Ville

Kouadio Nanan Kouamé Félix^{1*}, Kouman Koffi Mouroufie²

¹University Honorary Coulibaly/Korhogo, Laboratory Littoral, Mer, Health & Safety Alimentary (LIMERSSAT) Peleforo Gon Coulibaly University, Côte d'Ivoire

²Ecole Normal Supérieure Abidjan, Laboratory Littoral, Mer, Santé et Sécurité Alimentaire (LIMERSSAT), Université Félix Houphouët Boigny-Cocody, Côte d'Ivoire

***Corresponding author :** Kouadio Nanan Kouamé Félix, University Honorary Coulibaly/Korhogo, Laboratory Littoral, Mer, Health & Safety Alimentary (LIMERSSAT) Peleforo Gon Coulibaly University, Côte d'Ivoire. Email: k_felix2008@yahoo.fr

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Abstract

Modern aquaculture in southern Côte d'Ivoire has encountered difficulties in recent decades, resulting in the closure of several production sites. HYDROFISH in Binger Ville, for example, has been shutting down operations since the end of 2015. As a result, it has enjoyed rigorous management, a production system Super-industrial and the collaboration of the Quebec firm HYDRONOV, a world giant of aquaponics culture. The purpose of this study is to identify the determinants of the modern aquaculture crisis in southern Côte d'Ivoire based on the case of HYDROFISH. The working method used is documentary research and a field survey. Investigations show that the shutdown of the farm's activities is linked to malfunctions in its production system resulting in the death of more than 06 tonnes of fish. Inadequacies in the management of the farm were also noted, with thefts of fish sometimes estimated at more than 4 tonnes per day and selling prices deemed too high by consumers.

Keywords : Bingerville; Crises; Côte d'Ivoire, Fish; Modern Aquaculture

Introduction

In the framework of the development of aquaculture activities, Côte d'Ivoire initiated in 1990, industrial practices for the production of aquaculture. This phase was marked by the promotion of modern fish farming with the creation of several commercial farms in the form of Small and Medium Enterprises (SMEs). Introduced into the littoral zone, this production gradually affected the rest of the country, leading to the eruption of corporate farms which contribute to plying the consumer market with 64% of the Ivorian aquaculture production [1]. However, in the horn part of the country particularly, this mode of production has experienced difficulties in recent decades, resulting in the closure of certain aquaculture farms [2] place these drop-outs at over 62%, with production falling from 349.7 to 140 tons between 2001 and 2008. This situation has become alarming with the closure of HYDROFISH, Considered the most important and modern country

farm in the country.189) [3].

Built in 2009, 9 km from the town of Bingerville, HYDROFISH is a fish farm focused on intensive fish farming. In 2014, it produced 1,200 tons of Tilapia and 1,700 tons of catfish [4]. According to Kouadio FKN (2014) [3], this structure which offers the largest share of aquaculture products to the commune of Bingerville, also supplies the surrounding areas in particular the city of Abidjan, the economic capital of the country. Since 2015, it suffers from a recession of its activities marked by the decline in its production. Indeed, many productive and economic losses have gradually led to its closure in 2016. How was this situation reached when there was no indication of such an end for this farm with regard to its features Infrastructure and organization?

The objective of this study is to show the determinants of the HYDROFISH farm crisis, considered the jewel in the fish farms in Côte d'Ivoire. Specifically, it intends to analyze its mode of production, to determine the reasons for its crisis and to identify the stakes of its closure.

Method and Research Tools

This work is based on a literature search and a field survey. The first was to search secondary libraries and documentation centers for information related to the topic. For example, documents relating to aquaculture activity in general and particularly focused on problems in the sector and relations between aquaculture and development in Côte d'Ivoire were consulted. Essentially, the work of Barnabe G (1989) [5], Arrignon J (1980) [6], Anoh PK (2007) [7] is cited.

The second approach consisted of collecting data from the field. Observing variables concerned the way HYDROFISH operated, its production, its technical and administrative staff, its socio-economic impact and its contribution to the supply of fish to populations. In addition, fishmongers and consumers of HYDROFISH aquaculture products were also questioned for their opinion on the shutdown of activities in the plant. The information obtained was reinforced by those of the Fisheries and Aquaculture Department of the city and the Ocean Research Center of the country.

The model of analysis used is taken from the fishery system of Corlay JP (1993) [8] whose aquaculture and particularly fish farming is a component. Called the aquaculture geosystem, it can be studied from two systems including the ecosystem and the sociosystem. It consists of a coherent set of elements and processes in dynamic interaction that Dollfus O (1970) [9] describes as an aqua system. Aquaculture-system is not just a production system. It is also a space of life which is localized, charged with stories and possesses a dynamic. It structures space and also fulfills a social and economic role. On this basis, fish farming activities contribute to improving the nutritional and vital conditions of the populations by creating jobs and increasing fish production. On the other hand, the sociosystem, which also includes technical and political factors, implies aquaculture production linked to the action of the populations themselves. Thus, the problem raised in this analysis is well adapted to the theory described above.

Results and Discussion

Hydro Fish, A System of Management and Production Apparently Rigorous

A Relatively Dynamic Workforce and Production Under High Surveillance

HYDROFISH is a fish farm, built on 12 hectares with 11,000 m³ of hangars, housing tanks, offices and warehouses of working materials. It has 48 artificial basins with a magnification of 80 m³, 96 pre-magnification tanks of 8 m³ and 48 rearing basins of 4 m². In total, it has more than 2000 m³ of ponds of artificial reproductions. Its system works in a raceway with automatic feeding of fish (Figure 1).



Figure 1: The raceway of HYDROFISH in the village of Anna to 9 km of Binger Ville. Source : [3]

On the same site, there are plastic and aluminum basins specially fitted to accommodate the fish. According to the promoters, it is an investment of nearly 5 100 000 \$ US (Dollar of United-State) mobilized to meet the needs of the plant. Ultimately, the objectives of HYDROFISH are multiple. These include the breeding or production of fish and other aquatic organisms, including the use of hydroponics technology.

To achieve this goal, the plant is collaborating with HYDRONOV, a Canadian company, based in Quebec and specialized in hydroponic production [4]. It thus imports eggs and fish feed from it. To run its activities, it has a team made up of engineers of various nationalities and employs more than 100 people in the agricultural, technical and administrative fields, including some 50 permanent employees.

For the safety of installations and production, a surveillance system made up of cameras makes it possible to monitor the activities of the workers and technicians and above all to identify any suspected cases including flights. This video surveillance is reinforced by the presence of a security guard positioned at the various entrances and exits of the factory.

A Refined Marketing Approach at the Local and National Level

As a commercial fish farm, HYDROFISH markets its production in order to make its business profitable and to meet its fixed expenses. This distribution is carried out not only on the scale of the commune of Bingerville (zone of localization of the factory) but also at the national or even sub-regional level.

The distribution of fish in the communal area of Bingerville is ensured by fishmongers in collaboration with the promoters of the plant. They receive every day of the week (except Sunday) between 9 am and 10 am; nearly 800 kg of fish supplied by the factory and redistribute them to retailers and consumers. To better organize, they register on the day before the orders of the buyers to transmit them to the commercial service of HYDROFISH. Landing areas along the main thoroughfare of the city are daily stormed

by customers at the time of delivery of the company's delivery trucks (Figure 2 and 3).



Figure 2: A Transport Truck Picture.



Figure 3: Distribution of Fish with HYDROFISH effigy landed by HYDROFISH. Source: [4]

The particularity of this sales system is the loyalty of the merchants (wholesalers and retailers) by the factory. To do so, it assigns to them on credit the products requested, the repayment of which follows a schedule. The aim of this approach is to ensure the continuity of the sales system and to strengthen the confidence between the wholesalers and the commercial department of the company. The clientele, composed mainly of wives of civil servants and restaurant owners, favors the Tilapia, which accounts for nearly 98% of the species marketed in the city of Bingerville.

Beyond the communal limits, the distribution of the fish is regularly ensured by the farm itself thanks to its refrigerated trucks (Figure 2). In Abidjan, several outlets in different communes receive daily deliveries from the farm (Figure 4 and Figure 5).



Figure 4: HYDROFISH fish consumption areas in the city of Abidjan.

With regard to this (Figure 1), there is a relative continuity of the consumption zones of the HYDROFISH fish. Among the ten (10) municipalities in the city of Abidjan, five (5) are affected by the products of the plant; A rate of 50%. However, each consumption zone is marked by a particular place of sale. These are "Siporex" for Yopougon, "Riviera Palmerais" for the commune of Cocody, "Liberté" and Williamsville "Maccaci" for Adjamé and finally the major markets of Marcory and Treichville.



Figure 5: HYDROFISH fish consumption areas in southern Ivory Coast.

The analysis of this (Figure 2) shows the relative continuity of zones of consumption of HYDROFISH fish in the South of the Ivory Coast. In addition, the localities of Afféri, Niablé and Elibou, whose demands are close to 1000 kg per day, are among the highest in the country.

The HYDROFISH fish was also sold in Burkina Faso through Burkinabe importers who were traveling to the factory site. In addition, the company was also specialized in the distribution of fish inputs, in particular fish and finger foods, on the coast and in the interior of the country. These products, imported from Canada, helped improve the production systems of several farms [10]. The mill also marketed large quantities of fingerlings from its hatcheries.

In spite of these multiple opportunities to exploit its products, it has unexpectedly closed its doors in 2015 following a recession of its activities which can be explained by several causes.

The Causes of the Hydro Fish Crisis

Intensive Production Marked by Dysfunctions

The intensive production of fish according to the model proposed by HYDROFISH requires certain standards. Intensive or industrial fish farming corresponds to the maximum production of fish of a given size in a minimum of water [6], of space and time, at the least cost and according to a pre-established schedule. It is also characterized by large-scale production units which should be justified by economies of scale. This type of rearing is based on an artificial feed that can generate high productivity. It involves a significant investment which, once the biotechnical parameters have been mastered, results in a sharp drop in the cost of production [5].

These demands have not always been met by the former giant of aquaculture production in Côte d'Ivoire. Thus, there have been regular problems in the production system, the most striking of which is the death of nearly 6 tons of fish. These losses would be linked to a power cut on the site while generators supposed to take over automatically were failing.

It is difficult to situate responsibilities at this level. However, these shortcomings show the existence of flaws in the management system of the farm.

Flaws in the Plant Management System

Unlike the work of Kouadio FKN (2012) [11], which, based on the apparent production (Raceway, etc.) and surveillance (cameras and private security agents), indicates a strict management of the farm, there is a lack of rigor. Indeed, this system involves numerous flaws arising from the abuse of confidence of the factory workers in general. In spite of the fact that they had a personal consumption of 20 kg / month free of charge, some were engaged in repeated theft of fish sometimes at a rate of 4 tons per day.

The stolen quantities are packed in 50 kg bags, hidden in unfinished houses close to the farm before being recovered in the evening when the thieves take down the service. Sometimes, in order to bypass the supervisors who were present at the farm gate, the latter discharged fish of marketable size into channels reserved

for the discharge of sewage where nets had previously been fixed at the outfalls. Other times, surveillance cameras are simply disconnected by the perpetrators of these misdeeds to cover their packages. These flights affect not only marketable fish but also fingerlings whose surveillance is much more difficult to do.

These uncontrolled releases of aquaculture products have gradually entered into competition on the sales market with the recognized products of HYDROFISH. They were sometimes sold at prices below what the factory officially proposed. As a result, consumers begin to turn away from the official sales channel for clandestine purchases.

Value for Money not Suitable for Consumers

The products offered by HYDROFISH are generally of good quality with regard to the means of investment and the mode of production as evidenced by some consumers met on the place of sale. However, their selling prices are considered too high for these consumers. This situation is contrary to the perception of the intensive production of fish proposed by Barnabe G (1989) [5] which supported a fall in the price of fish in this context. Worse, these prices are continually rising. In 2012, they saw an increase of 0.17\$ US following a change in the purchase price of inputs from fish production.

Thus, it can be noted that Tilapia weighing between 400 and 500 g goes from 2.38\$ US to 2.55\$ US, those of more than 500g become 1,700 instead of 1,600 in the past. As for Wels Catfish, they are sold at 2.31\$ US / kg compared to 2.04\$ US / kg in the past.

The Consequences of the Hydro Fish Crisis

The Decline in Local and National Fish Production

Fish is the most widely consumed animal protein in Côte d'Ivoire according to FAO (2005). It constitutes more than 50% of the consumption of this protein. However, the country produces less than a quarter of this quantity.

The halting of fish production at HYDROFISH reinforces this imbalance, especially in southern Côte d'Ivoire where the highest fish consumption rates are found [7]. Focusing on intensive fish farming, in 2014, HYDROFISH produced 1.200 tons of Tilapia and 1,700 tons of catfish [4]; with a total of 2.900 tons. This value is higher than the national production estimated by ANAQUACI at 2,582 tons in the same year, a figure that did not include that of HYDROFISH at that time. At the level of the commune of Bingerville [3], Estimated its contribution to 83, 23% for a production of 1 495 tonnes out of a total of 1 796.2 tons produced by the municipality in 2010.

In addition, with 1,700 tons of production, the factory is the largest producer of catfish or catfish. It thus participates in the valorization of the production of a species little consumed because

presented as mystic by certain Ivorian peoples [12]. Outside Bingerville and Abidjan, the majority of the species marketed by HYDROFISH within the country are Wels Catfish.

Moreover, in addition to its strong production, the company offers the largest share of aquaculture products marketed in the town of Bingerville with more than 800 kg of fish distributed daily. It also participates in the supply of the surrounding areas of the city, the remote communities of the south and even the country as a whole. The areas affected by its products are relatively numerous in the image of (Figure 2). The analysis of the products confirms the role of the plant in the quest for food self-sufficiency and the fight against food insecurity advocated by The Ivorian authorities. With a fish volume estimated by our surveys at nearly 1000 kg for each locality in the country, more than 60 000 kg of fish escape from these areas each week following the closure of the plant.

The city of Abidjan with more than 4 million inhabitants, according to the RGPH (2014), is not left behind in the demand for fish from the plant. On average, it was almost 7,500 kg of fish produced by the plant that were marketed daily in this agglomeration.

The Increase in The Poverty of the Populations

Unlike other production sites in Côte d'Ivoire, HYDROFISH recruits many employees. Its production system requires agents trained in aquaculture techniques or in the management of administrative tasks and agricultural workers in school or not. Unlike artisanal and semi-industrial farms, it recruits agents at each stage of production. These include administrative staff, including secretaries and sales agents, technical staff of nursery, fish feeding and monitoring units. It employs 50 permanent workers and more than 50 other temporary workers for spontaneous activities. Out-of-school women are in the wholesale trade of fish and earn relatively high incomes. Indeed, for a sale of 700 to 800 kg fish per day and a gain of 0.17\$ US on each kilogram, they obtain an average profit of 119\$ US; or 3570\$ US in the month. In their tasks, they are assisted by young boys, especially at the level of the weighing of the products before the sale (Figure 6). The latter are paid in the amount of 85\$ US per month for the permanent staff and 2.55\$ US to 3.40 \$ US per day for day laborers.



Figure 6: Young Boys Weighing Fish Before Sale.

Source : [3]

Since the plant's closure, more than 50 direct jobs and 1,500 indirect jobs have been lost. Former officers encountered in the town of Bingerville have difficulty reintegrating into the social fabric. Young people recruited from the rural area of Anna (the area where the farm is located), sometimes left to their own devices, return to the city in search of employment.

Crisis Risks for Small-Scale Producers in The Country

The aquaculture sector in Côte d'Ivoire suffers from a lack of inputs, particularly food and fry. These products, sometimes of bad quality, are often considered expensive by fish farmers. Moreover, they are inaccessible to the producers generally of the rural areas of the country with roads impracticable especially in times of rain.

One of the objectives of HYDROFISH was to overcome this lack by offering quality fertilizer to other farms in the country. These Canadian-sourced products were redistributed by the mill to desirable farms. This project has contributed relatively to the improvement of the production of small producers according to Kouadio FKN, et al. (2017) [10]. The delivery of the products was made directly by the factory which had means of transport adapted to the movement of the fry. These fertilizers, which originally affected only the coastline, reached almost all the most remote production areas of Côte d'Ivoire (Figure 7).



Figure 7 : Les zones desservies en intrants piscicoles d'HYDROFISH en Côte d'Ivoire.

Fish fertilizers proposed by the plant have also been used by state farms, particularly Natiokobadara in Korhogo (Figure 3). According to Kouadio FKN, et al. (2017) [10], the reasons for this important demand for products offered by the factory are multiple. Beyond the quality of the species produced, HYDROFISH had the distinction of associating them with quality food. Thus, with each number of species purchased by a breeder, correspond to an amount of food. This approach has improved the fish feeding system and promoted the matching of fish and food in the distribution of fish inputs.

Conclusion

This study showed the difficulties of developing modern fish farming in southern Côte d'Ivoire. Through the case of the HYDROFISH super-industrial farm, our research has identified the factors of the farm crisis as well as the issues related to this recession. The results obtained insist on the dysfunctions of the management system, production and sale of fish. The consequences of this crisis are the decline in local and national production of fish, the deterioration of the living standards of the populations following the loss of direct and indirect jobs and the risk of recession for small aqua culturists initially supplied with fish inputs by the factory. Given the importance of this undertaking in the production of farmed fish at national level, actions by the structures in charge of the question are desirable in order to relaunch its activities.

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