

The Relevance of the inclusion of fish in the Human Food and Nutritional Diet

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Abstract— This article is an excerpt from the research entitled “Potentialities and Weaknesses of Artisanal Fisheries and Pisciculture in Tanque Rede in the Municipality of Sobradinho-Bahia”, whose objective was to get to know the current reality of family fish farming and business fishing in the Sobradinho lake, specifically in the city of Sobradinho where this practice excels in the sub-middle São Francisco region. It is a quantitative and qualitative research, involving documentary analysis in the fishermen's colony, interviews recorded with the use of forms, both with artisanal fishermen and with businessmen, in order to diagnose their ways of life, work and future expectations. The sample consisted of twenty fishermen and family fishermen and six entrepreneurs who raise tilapia in a net tank, chosen at random. The data were processed by the software SAS - Statistical Analysis System, where the variables were registered in the columns and the observations in the lines, pointing out that extractive fishing is decreasing, due to the reduction of species in the São Francisco River, while fish farming net tank is on the rise in the municipality, given the favorable environmental conditions, with a positive impact on the food security of the riverside population.

Keywords— fishing; food security; network tank; environment; water resource.

I. INTRODUCTION

1.1 Historical Framework

With the increase of the world population, the great challenge for the nations is to produce food in quantity, quality and regularity in a sustainable way, respecting the environment and the culture of the peoples, which is not an easy task, considering that the portion urban in the last ten years has grown at a rate of 1.83%, while the number of family farmers who produce food has remained stable (SILVA et al, 2009). According to data from FAO - Food and Agriculture Organization of the United Nations (2018), the projection is that in the year 2030, the world population will reach 8.6 billion people, demanding from governments effective actions of social and economic inclusion, with public policies aimed at increasing income and consumption.

With the increase in the world population, the great challenge for nations is to produce food in quantity, quality and regularity in a sustainable manner, respecting the environment and the culture of the people, which is not an easy task. which is believed to be viable for Brazil and, more specifically for the northeast and semi-arid region, is

investment in fishing, an activity that throughout history has been used by women and men for their survival, because the Brazil has a maritime coast with 8,500 km and an Exclusive Economic Zone (EEZ) totaling 4.3 million km²; 12% of the fresh water available on the planet; large volume of water held in reservoirs and groundwater; 5 million hectares of flooded land; 2.5 million hectares of estuarine area; 1 million hectares suitable for marine shrimp farming; favorable climatic conditions; availability of labor; strategic location for the flow of production to the Southern Cone, Europe and the USA, and; among others, a large domestic market of different economic classes (XIMENES, Luciano J.F and VIDAL, Maria de Fátima, 2018).

In Latin America, Brazil is the country with the largest area available for mariculture, around 150 thousand km², wind speed and ideal depths for installing cages and longlines, although the high cost of the feed can discourage (XIMENES, Luciano JF and VIDAL, Maria de Fátima, 2018). In the São Francisco River, in almost all its extension, the creation of fish in a net tank has already it is a reality, although much of the fish consumed is the result of artisanal fishing, which consists of an individual or

family activity, whose vessels are precarious and operated by the owner, with the main purpose of maintaining the family's food and supplying free markets and small businesses (FAO, 2012).

The importance of stimulating the consumption of fish in the diet of Brazilians, especially the population of the semiarid region bathed by the São Francisco River, are its excellent health properties. According to Stansby (2012), fish are low-fat and high-protein foods, in addition to being sources of vitamins A, B and B1 and minerals such as calcium, phosphorus, iron, copper, selenium and polyunsaturated fatty acids. Its digestibility is high, above 95%, much higher than that of red meat and milk. Omega-3 fatty acids are related to heart disease. Kris-Etherton et al (2002), gathered epidemiological studies and clinical tests and concluded that EPA + DHA supplementation between 0.5 and 1.8 g per day (both as fish fat and as a dietary supplement), significantly reduced the risk of death from these diseases. According to those authors, clinical tests have demonstrated the relationship between omega-3 fatty acids and the reduction of non-fatal cardiac events, stroke and myocardial infarction and the delay in the progress of atherosclerosis in cardiac patients.

The regular intake of fish contributes to the food and nutritional security of children and adults, and this procedure is thus conceptualized by Law 11.345 / 2006.

“Everyone's right to regular and permanent access to quality food, in sufficient quantity, without compromising access to other essential needs, based on health-promoting food practices that respect cultural diversity and are socially, economically and environmentally sustainable . ”
(Organic Law on Food and Nutritional Security, art. 3, 2006).

The concern with the food of the population is not recent, even though the terminology “Food and Nutritional Security” was not yet used. In the 18th century, the English demographer Thomas Robert Malthus (1798), already

defended the theory that demographic growth would surpass the productive capacity of the land, generating hunger and misery, serving as the basis for the Conservative Modernization of the Green Revolution that in the 20th century, between the 1930s and 1980s, transformed the productive system in the world. However, the timeline points to the end of the two great world wars as important moments to think about the countries' autonomy in food production; to face wars; the weather of nature; the unfavorable climate for crops in certain seasons; international conflicts for political, religious or military reasons. Such a discussion came to the fore, as European countries were torn apart by wars, without material and human conditions to immediately redo their productive structures (OLIVEIRA et al, 2010). There were many ideas that emerged to solve this problem, ranging from the creation of an international body with the specific purpose of taking care of the matter, to the establishment of other useful institutions, capable of supporting the reconstruction of their economies, but with regulation. After a wide debate, FAO - Food and Agriculture Organization of the United Nations was created in 1945, with the objective of combating hunger and poverty, promoting agricultural development, improving nutrition, seeking food security and access of all people, at all times, to the food necessary for an active and healthy life, as well as the IMF - International Monetary Fund, with the purpose of helping local economies, with interest rates below those practiced in the market (BELIK, 2003).

In the semiarid, the techniques suggested by the modernization of agriculture brought many possibilities in the generation of work and income; in salaried employment with the implantation of crops irrigated by the waters of the São Francisco River, but leaving a liability for the environment: erosion and salinization of soils by improper water management; excessive use of fresh water from the São Francisco River for agriculture, to the detriment of other uses for human and animal consumption; contamination of water and workers by pesticides; destruction of riparian forests, with negative impacts for native species of São Francisco (OLIVEIRA et al, 2018).

II. THE SÃO FRANCISCO RIVER AND FISH PRODUCTION

The São Francisco River, also called the National Integration River, denomination attributed by the pioneers who in the 17th and 18th centuries penetrated the interior of the country through its waters. It is also known as Rio do Currais, because it was through him that the cattle of the

sertão were transported to other regions of Brazil. It is born in Serra da Canastra - MG, in Chapada da Zagaia, in the municipality of São Roque de Minas, about a thousand meters high. From Canastra, it plummets 200 meters at the waterfall of Casca d'Antas, covering 2,700 kilometers, through the states of Bahia, Sergipe, Alagoas and Pernambuco, receiving 36 tributaries. Around 13 million inhabitants live in the entire region of the basin, which corresponds to 10% of the Brazilian population (MINISTRY OF INTEGRATION, NATIONAL, 2018). Its benefits reach 503 municipalities, which fall into four categories: Alto São Francisco, which extends from the source to the mining town of São Francisco. Middle São Francisco, comprising the stretch between the city of São Francisco to the Bahian city of Remanso. Sub-Middle São Francisco, covering the city of Remanso to Paulo Afonso in Bahia and Baixo São Francisco, which integrates areas from the states of Bahia, Pernambuco, Sergipe and Alagoas, extending from Paulo Afonso to the mouth (MINISTRY OF NATIONAL INTEGRATION, 2018).

Throughout the river, professional artisanal fishing is practiced, involving thousands of families. Currently, however, the situation of fishermen and fisherwomen who live from this activity has been facing difficulties in catching fish, due to the degradation conditions of the river (OLIVEIRA et al, 2010). All the actions implemented on its banks and within it and its tributaries, contribute to the disappearance of native species, which were already more than 150 (ALMEIDA, 1971). Surubim (*Pseudoplatyoma coruscans*), a species highly appreciated for the flavor of its meat and due to its size, sometimes reaching more than 100 kg, it has not been found for many years, except when it is brought from the states of Tocantins and Mato Grosso. The Golden (*Salminus maxillosus*) is still rare; Pacú (*Piaractus mesopotamicus*); Curimatã (*Prochilodus scrofa*); Traira (*Hoplias malabaricus*) and the exogenous Tucunaré (*Cichla* spp), Tambaqui (*Colossoma macropomum*) and Tambacu (*Colossoma macropomum*), brought from other basins by CODEVASF - Development Company of the São Francisco and Parnaíba Valleys, as a strategy for the settlement of the river (OLIVEIRA et al. 2010).

The speeches of the interviewees in this research, reveal the desolation of those who practice extractive fishing as a survival activity. Fisherman 1: "(...) I've been in this business for over thirty years. I started again, accompanying my father, who was also a fisherman. At that time we lived well. My father built a masonry house with many rooms, a yard that looked like a farm, with plants, fruit trees and where my mother raised pig and chicken. The house fit all the children and more the

grandchildren. Furnished with the furniture of that time. Every son had his own bed and our food was plentiful. I still managed to educate my children and give them a more or less condition. My house is my own and I owe nothing to anyone. I have my own boat, bought with what I got from the river. At that time, the river had a lot of fish. I would go on a journey of three, four days and bring the boat full of surubim, dorado, pirá, curimatã, only good and big fish. I had part of the fish because there was no trade for everything. It was a good time. Today I don't live only on fishing. I have a winery that earns me some money. But the river is a cachaça. We don't forget and I still fish. But it is a sadness. The fish is gone. I bring home five kilos, if anything. And only medium and small fish. Just to eat a fresh fish...".

Younger, fisherman 2, does not have the same memories. He entered fishing for lack of opportunity in another area. Poor, without a family, he saw fishing as an opportunity to at least feed himself. Never studied. He started out as an assistant to an acquaintance, but has been in the business for more than ten years. He didn't get plenty of water in the river, but he notes that the situation is getting worse every day. He says: "I've never been able to do anything in my life. I don't have a home and I live in favor. I have four children and they all studied at government schools. Some dropped out of school, wanted nothing to do with school, but I have one who took the agricultural technician course. This one got a job on a farm. He even helps me sometimes. I only managed to buy a small boat. It's all my wealth. But I can't live on fishing anymore. There's no more fish. What we get, we can barely eat. But I can't quit because I don't know how to read and I wouldn't get a job anywhere."

A very different situation was that of fisherwoman 3, one of the most successful in this male-dominated activity. Divide your time between fishing and agriculture. It has a small area by the river, where it plants onion, guava, acerola and banana. He still wants to plant mangoes and grapes, but for now he doesn't have the money to invest in these crops. He never despaired of the decrease in fish, because he knows that when development arrives, "one side improves and the other gets worse". Your speech is of hope on better days. "(...) I started dealing with fish, just cleaning, treating and salting, and also selling at the fair. It didn't make much money, but it helped with household expenses. But it was too little for me. I wanted more. Then I decided to get my feet wet and go to play the hammock that I bought to provide an acquaintance. Two friends and I rented a boat because none of us had a boat. On the first trip, when we shared the result of the sale of fish, there was a small profit for each

one. But we had to continue if we wanted to be someone. As time went by we learned to know the address of the fish, and things got better, until I got the money to buy my boat. This river is a blessing. He gave me everything I have. My home, my land, my trade. I never wanted my kids involved in fishing, because I wanted a less painful life for them. And I did it. They all study in college. Very true, it was not just fishing that gave me everything, but it was where I started. Today I go fishing every now and then, because my family is already on my way and I have a farm. But I would do it again. For those who are not afraid of work, life always rewards”.

The fisherwoman's simplistic reasoning is an indisputable truth. With the construction of the Sobradinho dam here in the Middle São Francisco, work of great importance for the region, both for the generation of energy and for the control of water, the increase in urbanization, the expansion of commerce and industry, the crops irrigated areas that today are determinants of the increase in the GDP of the cities Juazeiro, Petrolina, Casa Nova, Sobradinho and others, studies carried out by Projeto Áridas (1995), indicate that in the late 90s of the 20th century, 66% of the riparian forests of the São Francisco had already disappeared and fishing production was reduced by 90%. It is also worth considering predatory fishing, carried out by many fishermen in the region, who, when using inappropriate or illegal equipment, disrespect the rules, producing negative impacts on the formation of fish stocks. Even in the closed season, inspection is common to find people fishing with a fine mesh net, not only for their consumption, but also for commercialization (COSTA and COLESANTI, 2011).

As the retired fisherman said 9: “He has a partner who never respects the spawning period of the fish. He lives off that, but he doesn't think that if the fish don't breed, he will be without the goose that lays the golden eggs. Something for those who do not think about the future”. For the solution of the low stock of fish in the river, CODEVASF and other institutions have been fishing with species from other basins adapted to the climatic conditions of the region, but there are risks of diseases brought by these animals, in addition to being predators of native species. .

Even with these problems, artisanal fishing practiced on the São Francisco River remains an activity of socioeconomic and environmental importance, generating work and income for thousands of people and ensuring food for families that have no other alternative for survival. As Diegues (2004) believes, even with rivers and lakes currently compromised by the contamination of their waters and reduction of native species, coastal and

riverside communities make this profession their way of surviving in a capitalist and unequal society, promoting cultural diversity and the economy local, being fundamental in the northeast region.

III. FISH BREEDING IN REDE TANK - AN EXPANDING ALTERNATIVE IN THE SÃO FRANCISCO SUB-MEDIUM

Law 11,959 / 2009, which institutes the National Policy for the Sustainable Development of Aquaculture and Fisheries, defines this activity as “cultivation of organisms whose life cycle under natural conditions occurs totally or partially in aquatic environment, implying the ownership of the stock under cultivation, equated with agricultural activity and classified under the terms of article 20 of this law”. However, it is in Article 19 of the same law that aquaculture modalities are classified as: commercial, scientific or demonstrative, environmental, family and ornamental recovery (BRASIL, 2009).

In Brazil, the standardization of the use of public waters for fish farming occurred by Decree Law 1,965 / 95, which establishes the rules for the activity, which are:

- Prior authorization
- Environmental impact studies
- Licensing modality
- Inspection
- Monitoring

The aforementioned Decree also provides for technical standards such as location, wind, depth, compatibility with other uses of the area, such as tourism, leisure, irrigation, navigation, not belonging to an environmental preservation area, biological reserve, etc.

Legal order condition for implantation of fish farming in net tanks

Based on Decree Law nº 1,965 / 95, Normative Instruction nº 5, of January 18, 2001, the installation of a farm for raising fish in a net tank, requires:

- Obtaining the Aquaculture Registration at the Ministry of Agriculture.
- Licensing at the State Environment Department (Sema).
- Authorization for the use of water by the Regional Management of Patrimony of the Union (GRPU).
- Mark the cages and inform the Captainty of the Ports, if the location is

navigable.

The extractive production of fish in Brazil has been decreasing for the reasons already exposed, while the aquaculture segment in a net tank is on the rise, mainly due to the need for income for the breeder and the investments that are not so high initially, since this cultivation system dispenses the contribution of resources with initial physical works, which can be implemented in flooded areas formed by hydroelectric reservoirs, rivers, mining areas, weirs and other small dams of different use (MEDEIROS; CHAGAS, 2002). A study by FAO FISHERIES AND AQUACULTURE DEPARTMENT (2016), informs that the production of aquaculture grew on average 12.40% a.a., between 2016 and 2018, while the production of fisheries (extractive capture) was 2.50% a.a. There are other segments to be considered here in the productive chain of cultivated fish, since 70% of the fish farming production costs are allocated to feed, which requires the entrepreneur to have a financial reserve consistent with the size of his business (FAO, 2018).

Net tanks are structures of varying sizes, whose purpose is the confinement of fish chosen according to their adaptability to the environment, consisting of a net or mesh that facilitates the free circulation of water, providing them with ideal growth conditions through adequate food and water of good quality. It is an intensive cultivation system that requires the breeder to master the technology involving density, food handling and nutritional needs of the cultivated species. As it is semi-mobile, it can be moved to other locations, when this strategy is recommended for environmental, economic or legal reasons. An important advantage of this system is its uninterrupted production, starting with the first harvest, ensuring permanent income for the entrepreneur. However, it is not a 100% safe crop, free from damage, and some disadvantageous situations may occur, such as:

- Possibility of partial or total loss of cultivated species as a result of leakage, accidents and theft. In the Sobradinho region, interviewed breeders showed concern about thefts, which are recurrent, demanding an additional expense with hiring night surveillance to avoid such an occurrence.
- Total dependence on good quality feed, adapted to the nutritional requirements of cultivated species.
- Potential impact on the environment, which may change the water quality, due to the excess of food not assimilated by the fish.

- Possibility of causing genetic problems to native populations, in case there is an eventual escape of the cultivated animals.
- Lack of uniformity in the size of the fish in the same net tank (KUBTISA, 2004).
- Failure to comply with legal requirements with environmental agencies.
- Inadequate choice of the species to be cultivated (EMBRAPA, 2009).

The choice of the appropriate species to the climatic and environmental conditions is fundamental for the success of the enterprise. Knowing beforehand, that regardless of the species, the feed cost corresponds to 70% of the total breeding expenses, the chosen species must have a good feed conversion rate. For this, it is recommended the use of balanced diets, adequate to the nutritional requirements of the cultivated species, as well as the adoption of good practices of food management. It is also very relevant to choose species that enjoy preference in the market for their flavor and, to add value to the product, take care of its presentation, with a view to facilitating its commercialization.

There are three categories of network tanks:

- Fixed - When they are attached to the bottom of the reservoir by means of stakes and / or anchors.
- Floating - When supported by a floating necklace or frame. They are the most used types, having a wide variety of shapes. Some units are rotating, which helps in cleaning the containment structure (nets or screens).
- Submerged - They are net tanks fixed at the bottom of the aquatic environment. Widely used in the cultivation of salmon. With the exception of submerged ones, the others must be positioned at a distance of at least 50 cm from the bottom, in order to allow the free circulation of water, this is because the water at the bottom of the water bodies is of the worst quality, where accumulate crop residues (feed scraps and waste) and the oxygen concentration is lower (EMBRAPA TECHNOLOGICAL INFORMATION, 2009).

As for the shape, they can be square, rectangular or round and the size must be proportional to the number of fish that will be placed in it, understanding that producing the maximum amount of fish in a net tank does not mean maximum profit. The Economic Biomass - BE point (maximum accumulated profit) is well before the carrying capacity is reached. This is because, when the production in a net tank approaches support capacity, the performance indices deteriorate sharply, especially the feed conversion and the daily weight gain. Studies suggest that, in a small volume and high density network tank, the support capacity varies between 500 kg / m³ and 700 kg / m³. In

high volume, low density network tanks, between 80 kg / m³ and 120 kg / m³. In Brazil, there are reports of the production of tilapia in net tanks from 4 m³ to 5 m³, where the best economic return on production was obtained with biomass in a net tank of 150 kg / m³ at 250 kg / m³. The variations in BE depend on the sales value and the cost of production, related to efficiency and scale of production; thus, it is important to evaluate it at each production cycle, in order to allow the maximization of accumulated profits. (EMBRAPA TECHNOLOGICAL INFORMATION, 2009).

The fish should be fed slowly. Scholars such as, (CRESCÊNCIO et al., 2005; RONDÁN et al., 2004; VAN DER MEER et al., 1997) suggest that when feeding tilapia, one should “provide at each meal what fish are able to consume in operation, about 15 minutes”, because fish that eat a lot, convert food less efficiently into meat. Many technicians and researchers recommend fixed amounts of food depending on the weight of the fish. However, the quality of the water must be monitored twice a day, in order to ensure the well-being of the fish, considering that the concentration of oxygen dissolved in the water is what maintains their vital functions. For most species, dissolved oxygen must exceed 5 mg / L. For that, the water must be renewed when necessary; control the temperature; maintain aeration; control water turbidity; repair networks; perform periodic biometrics to adjust the feeding; use feed on the expiration date; avoid stress due to aggression to the fish's way of life (MEYER et al, 2004). The greater the abundance of water, the lower the incidence of problems with intensive fish farming, up to the time of harvesting, which is the partial or total removal of fish from tanks for sale, in street markets, supermarkets, markets. from neighborhoods and at the producer's own establishment to neighbors, friends and the population of the neighborhood, preferably alive, in polystyrene boxes from 500L to 1000L, with water renewal to keep the fish in good condition, until the purchase by customers.

The United Nations Food and Agriculture Organization (FAO) estimates for fish consumption in 2020 in Brazil is 8.3 kg / person / year, which is still little, considering the quality of fish meat for human health and food and nutritional security (FAO, 2018).

IV. MATERIAL AND METHODS

4.1 Ethical Aspects

This study was APPROVED by the Ethics and Research Committee - CEP of the Ethics and Deontology Committee in Studies and Research - CEDEP of the Federal University of Vale do São Francisco (UNIVASF), under protocol No. 3,533,696 CEP / CEDEP / UNIVASF

and respected the ethical principles present in Resolution No. 466/December 12, 2012, of the National Health Council / Ministry of Health, which regulates research involving human beings (BRASIL, 2013); as well as Resolution no. 510/16, which provides for the rules applicable to research in Human and Social Sciences whose methodological procedures involve the use of data directly obtained from the participants or of identifiable information or which may entail greater risks than those existing in everyday life (BRASIL, 2016).

All research volunteers were informed about the project's purpose, methodological character and were invited to participate spontaneously in the study; after acceptance, they read and signed the Free and Informed Consent Form (ICF).

4.2 Description of the Study Area

The study was carried out in the municipality of Sobradinho, territory of identity Sertão do São Francisco, northern region of the state of Bahia, in the fishing colony Z 026 and in the fish farming project Lago de Sobradinho, managed by CHESF (Companhia Hidroelétrica do São Francisco).

4.2.1 Profile of the Municipality of Sobradinho

Located on the right bank of the São Francisco River, Sobradinho occupies an area of 1238.923 km², having its population in 2019 estimated at 23,191 inhabitants. It is part of the Integrated Administrative Region for the Development of Polo Petrolina and Juazeiro, having the highest GDP per capita of RIDE, as it houses the Sobradinho Hydroelectric Plant. It is assumed that this name originated due to a small townhouse located near the waterfall, for the operation of the locking system which was called Sobrado waterfall or Sobradinho waterfall. Time passed and, in the twentieth century, the 1970s, the site, at the time a district of the municipality of Juazeiro, underwent major changes, due to the dispossession by CHESF, for the construction of the Sobradinho Dam by the Ministry of Mines and Energy. The purpose of this building was to change the course of the São Francisco River to a flow of 2,060 m³ / s, to support the operation of the plants built downstream from Rio, in particular Paulo Afonso. The dispossessed people were relocated, resulting in an episode of impact and social conflicts, due to the inability or non-acceptance of new homes, or the loss of cultural identity suffered particularly by small producers and fishermen. Expropriation is still felt today. This change affected more than 70 thousand people (XIMENES & VIDAL, 2018).

V. DISCUSSION

To answer the research questions, documentary analyzes were carried out at the fishermen's colony in the municipality of Sobradinho to identify the associated fishermen, the annual reports, the contracts with CONAB and other government agencies and the public policies accessed by the associated fishermen. Subsequently, in the second stage of the research, 20 artisanal fishermen were selected at random, for semi-structured interviews, with the support of a form, in order to learn about their way of life, work and their future expectations. The same procedure was used with fish farmers in fish breeding in a net tank, with 6 interviewed entrepreneurs.

Previously observed by Gandra et al (2007), in this research it was also found that the majority of artisanal fishermen have a low level of education and insufficient resources potential, being observed by large businessmen and fish farmers as a form of productive collectivity unfit to face the dispute in the globalized world. They have ages ranging from 18 to 65 years, with greater representation between 40 and 60 years for artisanal fishermen and 50 and 60 for fish farmers. More than half of the participants (80%) are beneficiaries of the Bolsa Família Program and declared to live with an average income of less than half the minimum wage. There is no infrastructure and basic sanitation in all houses and, therefore, many fishermen 77% still live in mud houses and not masonry. 100% of fishermen follow their parents' profession, although not always at will. Economic difficulties make parents want other professions for their children, however, the lack of education and preparation for other activities, determine for them the continuity of the activity with which they have always been involved. Other disadvantages are added to the questions, such as: market integration; family management; productive inefficiency; diversified small-scale production with high costs; intensive work exposure; backward practices; low productivity and weak economic movement; all of this in contrast to the capitalist model that is shown to be integrated into the market and capable of reproduction; responsible management; international incorporation; high-scale production; inexpensive costs; modern technologies, with high productivity and great economic movement.

On the other hand, studies in different parts of the world show that artisanal fishing has a great capacity to generate jobs and distribute income, contributing to the diversification of the use of rural space. Favorable to artisanal fishing, there are several positive externalities resulting from its development, such as: greater distributive efficiency - better income distribution and greater job generation; improvement in food security; reduced

migration from the countryside to the city; small property and food production for the domestic market, among others (GANDRA et al, 2007).

In relation to the surveyed entrepreneurs, there was weakness in the domain of fish handling, fattening and reproduction, fish transport and storage, as this activity is still very recent in the region and there is a lack of technical training for entrepreneurs.

Producing food for the world population, without a doubt, is a general concern. Food security and environmental sustainability issues are among the priorities that international organizations have placed so that countries can incorporate in their programs in the coming years. According to SOFIA (2018), by 2050, it is estimated that the world population will exceed 9 billion people and, to supply this growing demand, the annual meat production will need to expand by 200 million tons. In this scenario, Brazil is expected to be in the international fish market alongside China, the United States and the European Union.

In September 2015, realizing that the economic, social and environmental indicators of recent years were pessimistic about the future of the next generations, the United Nations (UN), proposed that its 193 member countries sign the 2030 Agenda, a global plan composed of 17 sustainable development objectives (SDGs) and 169 goals, in order to achieve sustainable development by 2030. Among these objectives, the second and the fourteenth deal directly with the contribution of fishing to the pre-established goals.

Objective two (2), specifically refers to 'Zero Hunger and Sustainable Agriculture' and aims to end hunger, achieve food security and improve nutrition and promote sustainable agriculture. In this perspective, by 2030, signatory countries must develop programs and policies that can double the productivity of small farmers, including women and indigenous peoples, in order to increase the income of their families. Objective fourteenth (14), which refers to 'Life in the Waters', aims to conserve and sustainably use the oceans, seas and marine resources for sustainable development, and that in 2030 all harmful practices are eliminated and / or illegal fishing activities that damage the marine ecosystem.

Fishing activity is often based on extractivism and the use of own and natural resources without any planning. This type of work lasted for a long time, while the fishing stock met the expectations of fishermen, however, with the reduction of species due to various reasons, aquaculture is an alternative for the continuation of fish farming for sustainable development.

Following World Bank prospects (2013), more than 60% of the fish used for consumption will be from aquaculture (captive production) by 2030. In this space, the FAO (Food and Agriculture Organization of the United Nations) encourages production, as it believes that Brazil will have a major role in the fishing sector, reaching 20 million tons per year (aa). By 2016, world production exceeded seven hundred million tons (FAO, 2018), while China, which is currently the largest fish producer in the world, reaches over 45 million tons a.a. In South America, only analyzing aquaculture, Brazil is the second largest producer, second only to Chile, which is an important salmon producer.

In Brazil, the best scenario for aquaculture production occurred when the Ministry of Fisheries and Aquaculture was created, an organ that granted various incentives at the time of its existence while it lasted. According to Kubitzka (2015), Brazil has been on the world meat scene, except fish, since 2004, reaching its peak in 2014; period in which the aquaculture sector displaced all meats with growth above all other proteins, with an average expansion greater than 8%, against 5.1% of beef; 4.1 chicken and 2.9 pork. The biggest highlight was the raising of tilapia. While the increase in fish production was 10%, tilapia alone reached more than 14%.

This expansion in the tilapia aquaculture sector in Brazil is far from other protein production chains, however, it indicates the fishing capacity and investment of the agricultural sector. The development of national fish farming has been exploring a variety of species, but with an emphasis on tilapia, tambaqui (their hybrids), carp and pirarucu. National fish farming is a growing field with wide potential due to the country's water resources, continental dimensions, favorable climate and entrepreneurship by producers (PEIXE BR, 2019).

Sustainable territorial development works from the perspective of generating jobs and income, valuing small and medium-sized businesses, fighting poverty, reducing inequalities, providing quality public policy, generally unexpected conditions for communities that passively wait (INSTITUTO CIDADANIA, 2016). Campagnola et. al (2007), proposes that, to be part of economic, social and environmental variables it is essential that the management of the rural-urban space is placed in order to overcome the recent administrative design, with modern planning and implementation at the territorial level. Thus, the rural environment is characterized as a social development, based on social actors and economic agents, in accordance with the interests, objectives, projects and the implementation of

strategies that will enable dynamics in the exploitation of resources or organization of civil society.

Santos (1996), points out that circumstances in the ways of life need, in their measure, how and where they are inserted, and infers that "The citizen is the individual in a place". Therefore, working on special practices in different regions of a different society, is subject to the risk of exclusion or inclusion of your rights.

The Sub-Middle São Francisco, a portion that extends from Remanso to the city of Paulo Afonso (BA), represents an enormous aquatic potential, as it has a high and uniform temperature throughout the year (SOARES et al., 2007). However, the stocks of rivers and reservoirs are declining for several reasons, some of which are the fact that: 1) many native species are migratory and most dams in Brazil alter their habitat, interfering with their life cycle. An example of this are the surubim (*Pseudoplatystoma corruscans*), the curimatã (*Prochilodus argenteus*) and the dorado (*Salminus franciscanus*), which practically disappeared after the construction of the dam. 2) that agriculture dumps tons of agrochemicals on the São Francisco River, contaminating its waters and killing the life there; that 3) domestic and industrial pollution throws its waste directly into the river without treatment, even contaminated with heavy metals; that the 4) closing of the connections between lakes and the river by the great farmers and entrepreneurs, has been contributing for the destruction and pollution of these places; that the 5) settlements of rivers and reservoirs, with exotic species, predators of native species have contributed to the decrease of native species; that the 6) absence of riparian forest has contributed strongly to the silting up of the river; as well as the 7) use of irregular mesh (STANSBY, 2012).

This reality gave way to the emergence of fish farming in net tanks in Lago de Sobradinho, in the confrontation with artisanal fishing, a secular activity in the region, among riverside dwellers. According to Bueno et al. (2011), fish farming is the main growth activity in Brazil, in reservoirs with an intensive system, using network tanks. The prospect of growth of this activity for Brazil is often superior to any other type of animal production, having seen the relation area per kilo produced and also to the misuse of the spaces indicated for aquaculture production in a country that has the largest reserve of fresh water on the planet.

In Sobradinho, fish farming was developed with the help of agencies such as Bahia Pesca, a company linked to the Bahia Department of Agriculture, Irrigation and Agrarian Reform - SEAGRI, and the São Francisco and Parnaíba Valleys Development Company - CODEVASF,

linked to the Ministry of National Integration. However, production capacity is still far below its full potential. The Sobradinho reservoir, according to Suassuna (2008), has a storage capacity of 34.1 billion cubic meters in its nominal quota of 392.50 m, constituting a large artificial lake, one of the largest in the world. However, the large fluctuation in the level of the dam, depending on the rainfall regime, the seasons and the need for electricity generation, can be a major complicating factor for regular activity. Currently linked to Bahia Pesca, the Sobradinho Fishing Terminal has already operated, in the 1980s, with about 50,000 kg / fish per month, but with the construction of the Sobradinho Dam there was a considerable drop in the region's fishing production. Allied to this, the lack of inspection was not able to restrain predatory fishing that contributed to the extinction of several species of fish in the São Francisco River (BAHIA PESCA, 2008).

The state of Bahia already contributes 7% of the Brazilian continental aquaculture production, focused on the cultivation of tilapia and tambaquis (BOSCARDIN, 2008). And there is, according to CODEVASF (2005; 2011), a great potential for expansion of this activity in the area of Lago de Sobradinho, reaching up to 779 thousand tons / year with the use of only 0.1% of the lake area; besides being able to generate more than 3 thousand direct jobs. The quality of the waters of the São Francisco River is a prominent factor, enhancing production in the region (CODEVASF, 2006).

In Brazil, the per capita consumption of fish is on average 9.7 kg / inhab. / Year. This average consumption is below 12 kg / inhab. / Year recommended by the World Health Organization (WHO). However, the consumption of fish by the population studied is at least three times a week, and for most, consumption is daily in more than one meal, exceeding the WHO recommendation by more than three times. Despite the considerable consumption of fish, the studied population presents inadequacies regarding protein needs, due to the absence in the diet of other components necessary for nutritional balance.

VI. CONCLUSIONS

The concept of Food and Nutritional Security is a concept in permanent construction, as society's expectations and the power relations of the segments that make it up are constantly evolving. Since the beginning of the 90s, a strong movement towards the reaffirmation of the Human Right to Adequate Food has been consolidated in the world, as provided for in the Universal Declaration of Human Rights.

Human Rights (1948) and the International Covenant on Economic, Social and Cultural Rights - PIDESC (ABRANDH, 2010). More recently, other dimensions have been associated with the term, such as the sovereignty of peoples, in the perspective that each nation defines policies that guarantee the food and nutritional security of its people, including the right to preserve traditional food production practices for each culture. (VIA CAMPESINA, 2003).

The FAO report (2018) removes Brazil from the hunger map, due to the social policies of income transfer that are being implemented in the country, as well as the fact that Brazil produces food in quantity, quality and regularity to meet the demand of its population. However, due to lack of income, many families become part of the nutritional risk framework, due to the absolute financial condition of acquiring them, which is why Food and Nutritional Security policies must address the need to provide access to food for the poor. insecure groups, meeting the needs of food consumption as citizens. The artisanal fishing activity, in addition to being a source of income and family subsistence, is an important cultural tradition for local commerce, in addition to the traditional knowledge of fishermen being a source of information for management projects related to environmental preservation. With regard to fish farming, stimulating the increase in domestic production is essential to increase the food and nutritional quality of its population, in addition to expanding external marketing, considering the favorable environmental conditions and the technology available for increasing productivity.

The nutritional superiority of fish compared to other products of animal origin, especially because it is a source of proteins of high biological value, of the considerable amounts of fat-soluble vitamins, phosphorus, iron, copper, selenium, iodine, as well as omega-polyunsaturated fatty acids -3, constitutes a strong reason for this food to become part of the diet of Brazilians in greater quantity, especially those residing on the margins of water resources, to obtain them at a lower price, thus ensuring health. Although artisanal fishing is declining on the São Francisco River, for reasons that accumulate leaving an irrecoverable liability, aquaculture, which includes the cultivation of aquatic organisms, is considered one of the most efficient ways to reduce the deficit between demand and demand. offer of fish in the market (CAVALLI; FERREIRA, 2010). For using natural, manufactured resources and human, this activity according to Valenti (2002), can be sustainable, without harming the environment and promoting social development.

From the research findings, it can be concluded that Brazil lacks effective public policies to leverage artisanal fishing, a relevant segment for the food security of vulnerable populations, as well as greater contributions to fish farmers, in the perspective of opening external fish-consuming markets, expanding their profits and making them competitive nationally and internationally with the largest producers in the industry.

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