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Social and Environmental Responsibility at Pratigi EPA: Shrimp farming and riverside communities in Barra do Serinhaém - Ituberá-BA

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Abstract*—*Analyze the role of economic agents in Pratigi's Environmental Protection Area (EPA) in order to understand the balance between environmental conservation, income generation, green marketing and entrepreneurship. In particular, aspects of environmental law on environmental damage and Corporate Social Responsibility (CSR) will be observed. The study region comprises the estuarine zone of Ituberá/BA, the socio-environmental aspects of the riverside communities and its relationship with an innovative project for the cultivation of shrimp in cages and canvas tanks in Barra do Serinhaém, conceived by Litoral Sul Maricultura (LSM) in partnership with IFREMER of France. The production model analyzed showed that there is a possibility for private capital to contribute to social entrepreneurship, also generating social and environmental benefits through its Social Responsibility.

I. INTRODUCTION

Since it is everyone's duty to defend and protect the environment from degradation and pollution, Brazilian environmental law defines that it is the responsibility of the Public Authority to protect the environment, and other agents - economic and social - must collaborate in this regard, especially those that most affect the environment, due to the effects of degradation and pollution arising from its production activities. According to Paulo Affonso Leme Machado, "the action of the collectivity, unlike that of the Public Power, is generally optional [...]" (apud SIRVINSKAS, 2012, p. 153), however, economic agents, by virtue of their conduct harmful or environmental damage, must have the environmental responsibility, already provided for in art. 14, § 1 of the National Environmental Policy[1].

The Government's inertia in the face of environmental issues in Environmental Protection Areas (EPA) translates into the difficulty of managing and inspecting an expressive territorial area, with relative demographic density and significant economic activity, all combined in a space of ecosystems endowed with accentuated

[1]BRAZIL. Law no. 6.938/81, of August 31, 1981. Provides for the National Environmental Policy (PNMA).

environmental fragility or that suffered intense anthropic action, therefore, a region that needs the tutelage of the State for the maintenance of environmental services and conservation of natural resources and scenic beauty of its landscapes.

Given this difficulty in reconciling economy with the environment, this article discusses the conceptual basis of social and environmental responsibility of private capital, passing through the understanding of entrepreneurship or innovation, having as object of study a pioneer (and innovative) shrimp farming project (breeding of shrimp) developed by *Litoral Sul Maricultura* (LSM) in *Barra do Serinhaém*, municipality of Ituberá, *Pratigi* EPA, territory of the *Baixo Sul* of *Bahia*.

Therefore, the objective is to analyze, from the development of economic activity of shrimp farming in Pratigi EPA, the impacts on the processes of income generation and environmental conservation, environmental marketing, in addition to reflecting on the process of social entrepreneurship and formation of social capital developed with the participation of the riverside population.

As a methodological approach, a bibliographic review was carried out on the themes of social and environmental responsibility, environmental legislation in areas of environmental protection and business (and social) entrepreneurship in shrimp farming, associated with the generation of income and development of social capital. Other additional information was obtained. in loco during technical visits to riverside communities and the pilot project in *Barra do Serinhaém*, owned by Mr. Eduardo Lemos, as well as obtained through contacts with social agents in the community of *Barra do Serinhaém*.

Therefore, the topic to be addressed in the article will follow the following topic structure: ii) Aspects of Environmental Legislation, Entrepreneurship and Social Responsibility; iii) Social and environmental profile of EPA *Pratigi*; iv) Social and Environmental Liabilities of the *Pratigi* EPA; v) Coastal aquaculture and environmental damage; vi) Performance of private entities in the *Pratigi* EPA and vii) Final Considerations.

II. ASPECTS OF ENVIRONMENTAL LEGISLATION, ENTREPRENEURSHIP, ECONOMY GREEN AND SOCIAL RESPONSIBILITY

Access to an ecologically balanced environment is a right guaranteed in Article 225 of the Federal Constitution of 1988. In order to guarantee the effectiveness of this right, the Government must create protected spaces, called Specially Protected Territorial Spaces (SPTS), which includes any environmental space that provides legal protection for its natural attributes. The SPTS include theConservation Units (CU), considered the best strategy for the conservation of biodiversity and maintenance of environmental services (Leuzinger & Scardua, 2010).

In Brazil, the creation and management of Conservation Units is the role of the State, as defined by the National System of Nature Conservation Units (SNCU), as it is the driver of environmental protection and management policies for these areas.

The SNCU establishes parameters for the creation and management of protected areas in the country, within a system that presents several categories that vary in terms of the degree of protection, ranging from units that do not even allow visitation, to those that include industries and cities in their interior, as is the case of the EPA (Guerra & Coelho, 2009). In its art. 15, defines the EPA as an extensive area with a certain degree of human occupation, endowed with abiotic, biotic, aesthetic and cultural attributes important to the well-being of human populations and which aims to ensure the sustainability of the use of natural resources.

The EPA highlights the possibility of maintaining private property and the traditional lifestyle, enabling environmental protection programs to be implemented without the need for expropriations. For the Brazilian reality, this strategy has become advantageous, as the lack of financial resources or government inertia limit the implementation and consolidation of other more effective protection programs (Oliveira HH, 1995). However, the EPA is configured as a problematic area due to human occupation and the development of economic activities that, to a greater or lesser degree, bring environmental liabilities. The major obstacle in the matter is to reconcile development with environmental preservation in these areas, bringing problems regarding the management of human activities.One possibility for solving this issue lies in the effectiveness of the duty of social and environmental responsibility of companies, thus contributing to partially meet social and environmental demands, in return for the benefits of environmental marketing.

It is also necessary to consider the forms of appropriation and use of territories in the EPA based on studies of the fragility of their ecosystems and their support capacity. Law 6,902/1981 requires sustainable management of natural resources to conserve or improve local ecological conditions and ensure the well-being of human populations. Carrying capacity is based on the notion of resilience, the concept of which refers to the ability of a system to respond to externalities, through its recomposition or restructuring, establishing, for example,

the relationship between the carrying capacity of an area and its population. To this end, it establishes rules limiting or prohibiting mainly the implementation of industrial activities of high polluting power (Zanoni*et al*., 2000).

Faced with the increase in anthropic pressures on nature and its consequences, society has been demanding a reorganization in the developmental perspective, so that it has a stamp of social responsibility, commitment to sustainable development. The latter brings with it the understanding as the growth of something or the physical or material increase in production, with the purpose of maintaining itself in a continuous manner (Sartori, Latrônico, & Campos, 2014).

Sustainable development in tune with the environment requires a balance in the manipulation of ecosystems, in a way that guarantees their sustainability, their capacity for absorption and recomposition from the aggressions suffered by anthropic actions. Thus, there is harmony between man and the environment, not establishing a dichotomy between them (Meneguzzo, Chaicouski, & Meneguzzo, 2009). In this sense of considering several dimensions in development, the expression Green Economy emerged, which is explained by the encounter between economy, well-being and ecosystem (Abramovay, 2012).

Economic growth is a condition for building infrastructure and offering services that will meet the basic needs of humanity, but it is imperative to change the way in which the content of this growth materializes, setting limits, such as respect for the capacity of ecosystems and ethics in decision-making processes (Abramovay, 2012).

The Green Economy involves three fundamental dimensions which are energy efficiency, use of products and services from biodiversity, and reduction of pollutant emissions. Together they form a new paradigm for economic life, based on the idea that capital and labor can replace what is offered by nature, through eco-efficiency, reducing pressure on natural resources, that is, “increasingly less matter, less energy, less emissions...”, even so, guaranteeing the reproduction of human societies (Abramovay, 2012).

In this scenario, environmental or green marketing emerges, which has become an important tool in the life of corporations, as consumers and society in general have demanded products and services from companies that reflect an idea of environmental and social responsibility, as discussed above. However, consumer distrust will require more than isolated or one-off actions from the company, but responsible business management, respecting above all the consumer and the environment. Actions aimed at improving the quality of life or preserving the environment are no longer exclusive banners of non-governmental organizations. Private initiative discovered in the green wave an excellent locus of business and has now become, many of them, ecological partners of these NGO.

According to Gibbons, from the consultancy Good Business, it is a mistake when companies use sustainability and Corporate Social Responsibility (CSR) programs as communication tools, when in fact they are management tools that help organizations measure their social and environmental impact. The survival of the company today, in the face of the growing ecological movement, must consider its CSR as a management goal and not only as a form of communication. The corporation can take advantage of this issue, but it must satisfactorily meet this new consumer standard, more attentive to changes, demanding, analytical and that expects results and ethical behavior from companies that look after their well-being.

Within a logic in which sustainability is an important challenge in the emergence of a new economy, it seems increasingly sensible and urgent to establish connections between private capital and Social Entrepreneurship and Social Responsibility, thus bringing the ideal of sustainable development.

According to Melo Neto and Froes (2002) apud Andrade (2016), Social Entrepreneurship has the characteristics of being collective and integrated, producing goods and services for the community, focusing on finding solutions to social problems and community needs, its performance it is measured by social impact and transformation, and should generate social capital, inclusion and social emancipation (Andrade*et al*.,2016).

Social Entrepreneurship is related to third sector organizations or organizations of government actions or entrepreneurs in the social field. Social Entrepreneurship actions emerge at a time of crisis for the State in the face of neoliberalism and the concern to meet social needs. Hence the need for a large number of organizations to adopt tools and strategies from private companies, finding a way to survive, previously subsidized by the government. Private companies, in turn, encouraged the process of transferring knowledge and management tools for social intervention (Oliveira EM, 2019).

Given the understanding of development beyond profit, in the various dimensions it contemplates, companies are required to be Socially Responsible to the community, not limited to meeting only the organizational demands and interests of their employees (Oliveira et al.,2020). In this sense, social responsibility is linked to an action committed to the end of social transformation applied by an innovative management model (Melo Neto &

Brennand, 2004). Therefore, in addition to quality products, companies are required to have their benefits well publicized so that the consumer is interested in the product or service, but also social initiatives, which have in their guiding principles the company's social responsibility, with the environment, inclusion, respect for differences, among other needs. Today's consumers demand information about production, which principles and philosophy of companies.

The legal framework of CSR, as defined by ABNT, brings the ideas of responsibility in the company's decisions and activities, towards society and the environment, ethical and transparent behavior, in order to contribute to the well-being of society. The ETHOS Institute, an organization created by entrepreneurs in Brazil, also supports this understanding, whose vision should not be limited to simple aspects of social marketing or appearance, but a commitment to concrete values and actions (Oliveira EM, 2019).

It is evident the existence of the relationship of Social Entrepreneurship with the third sector and as a CSR movement. private companies, which in turn contributed to the social field by encouraging the process of transferring knowledge and management tools. Despite the ambivalences of CSR, imposed by its process of competition and accumulation, possible connections can arise in working to share knowledge, resources and efforts to achieve the goals of a fair and sustainable society (Oliveira EM, 2019).

In this way, Business Entrepreneurship can connect to Social Entrepreneurship through the so-called CSR by proposing an integration action, meeting common and ambivalent objectives, which somehow generates an innovation process that, despite the market logic, contributes in the social field, benefiting the community and the formation of its social capital.

III. SOCIAL AND ENVIRONMENTAL PROFILE OF THE PRATIGI EPA

The Pratigi Environmental Protection Area currently has 85,686 hectares and is located in the *Baixo Sul* of *Bahia* (Figure 1), covering the municipalities of *Ibirapitanga*, *Igrapiúna*, *Ituberá*, *Nilo Peçanha* and *Piraí do Norte*. It was created in April 1998 and expanded by State Decree No. 8036 of September 20, 2001, with the objective of protecting large stretches of beaches, restingas, mangroves and remnants of dense rainforest (Atlantic Forest), as well as promoting tourism, ecotourism and the ordering of economic activities in the municipalities that are part of it (Bahia, 1998).

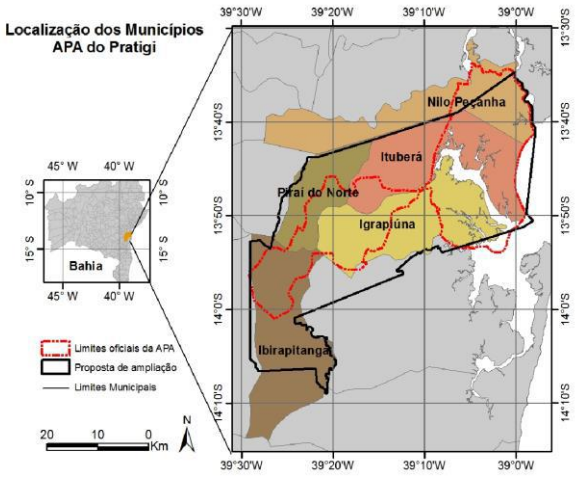

Fig. 1: Location of Pratigi EPA. Source: (Macedo, Oliveira& Rocha, 2010)

Pratigi EPA owns some of the most important Atlantic Forest ecosystems in the country, where one of the greatest biodiversity on the planet can be found, forests at an advanced stage of regeneration, hilltops with numerous springs, hydrographic basins, as well as environments such as restingas, mangroves, estuary, beaches and islands. All this biodiversity has attracted the Federal and State Governments, multilateral development agencies, NGO, private companies and investors, in addition to the local communities themselves, which have been realizing the value of the environmental assets that belong to them. As it is considered a priority area for the conservation of Atlantic Forest remnants, it is included in the Atlantic Forest Central Corridor Project and, therefore, due to its strategic position,was chosen to be the pilot area of the *Bahia BaixoSul* EPA Mosaic Integrated and Sustainable Development Program, with the support of the UN (United Nations) and the IDB (Inter-American Development Bank) (Campos*et al.*, 2008).

It is worth mentioning that the mangroves in the *Baixo Sul* region of the state represent about 58% of the total 110,000 hectares existing in the South Coast and that almost all remain with the original vegetation cover intact. This reality can be justified by the spatial distribution, generally located on islands and areas of difficult access, and of low population density. In terms of preservation, the same happens with the restingas, as they are located outside the municipal seats and many of them on privately owned islands, where extensive coconut and oil palm plantations are developed, and has served as a limiting factor to the implementation of subdivisions (Bahia, 1996). Much of the forest area is still preserved. The location of the *Pratigi*EPA, as part of a mosaic of EPA and inserted in the Central Ecological Corridor of the Atlantic Forest,

makes it serve as a connection between the other forested areas, enabling movement and ensuring the preservation of numerous species (OCT, 2011).

The *Pratigi*EPA region has a population of approximately 89,350 inhabitants (2020 Census), of which 36.4% make up the EAP (Economically Active Population) and need the sustainability of the regional economy for its survival. According to the Agricultural Census (2017), the area of agricultural establishments occupies 127,646 hectares, distributed among 9,830 properties and 8,382 owners, which highlights the prevalence of small production units, operated on a family basis and with extremely diversified agriculture in terms of permanent crops, which include oil palm, rubber, palm hearts, guaraná and cocoa, in addition to other products such as bananas, cassava and pepper. These cultures represent the family income of a large portion of the rural population, and also of urban dwellers who thus complement the family income (IBGE, 2017).

Due to the number of rivers that form eleven hydrographic basins in the *Baixo Sul* of *Bahia*, it is considered as the "water circuit", with the presence of countless waterfalls. Coastal formation, bays and estuaries are favorable environments for the production of fish, shellfish and crustaceans, making this area a great potential producer in this sector. The EPA expansion in 2001 was due to the need for environmental protection of the Juliana River Hydrographic Basin, which is part of an exuberant water complex that includes the Igrapiúna estuary areas to the mouth of the Pinaré River, including the Cachoeira da Pancada Grande, important tourist attraction in the region that is part of a Private Natural Heritage Reserve (PNHR) (CRA, 2004).

IV. SOCIAL AND ENVIRONMENTAL LIABILITY OF PRATIGI EPA

Human activities generate situations of risk and imbalance in natural systems, and due to the degree of environmental fragility, they become more vulnerable to processes that are caused by the inadequate occupation, use and management of these spaces. The coastal and fluvial-marine ecosystems, associated with the biodiversity of its fauna and flora, make the *Pratigi* EPA a region endowed with degrees of environmental fragility and vulnerability.

The environmental liability refers to any negative impact, whether foreseen or not, in the phases prior to the implementation and operation of any undertaking, perceived a posteriori, without having sought to repair it. It reflects the environmental damage resulting from the degradation character of any economic activity, especially industrial.

The initial occupation of the *Baixo Sul* region of *Bahia* is linked to sugar production, which did not achieve the success expected by the colonizers and, as a result of the failure of this activity, became economically dependent on the *Recôncavo Baiano*. Only in the 19th century, with the expansion of the demand for tropical products to supply Europe and the United States, the South Coast shows promise for the cultivation of cocoa. From that period and in the first decades of the 20th century, cocoa farming expanded and the regional economy changed with the replacement of subsistence crops by cocoa, which came to dominate the economic scenario of *Bahia*. And so, with the growing demand for cocoa on the foreign market, the price remains high for a long period, but today it is no longer the main agricultural product in the region, mainly due to the crisis triggered by the witch's broom plague(Macedo, Oliveira, & Rocha, 2010).

In this process of occupation and consolidation of the cocoa culture, the impact on native vegetation took two forms. At first, the replacement was total, with the clearing and burning of the Atlantic Forest to introduce the crop. In the second moment, the forest was partially removed and replaced by dispersed crops associated with subsistence polycultures and pastures in the middle of the forest. But with the intensification of production, the occupied parcels increased at the expense oforiginal vegetation, which today was restricted to scattered fragments. Even so, 41% of the remnants of the original Atlantic Forest remain in this area (Macedo, Oliveira, & Rocha, 2010).

However, these activities, generally associated with inadequate planting techniques, such as the use of fire and disorderly deforestation, made the soil more vulnerable to erosion, accelerating the siltation process of a large part of the riverbeds in this region. According to official data from the Coordination of Agrarian Development of *Bahia* (CAD), there is a large portion of land in the *Pratigi* area occupied by squatters who mostly practice slash-and-burn agriculture for planting bananas and cassava, resulting in a model of vulnerability for families and inefficient use of work and the use of natural resources (Campos et al, 2008).

The remnants of the Atlantic Forest are the ones that have suffered most from the predatory action of man. The purpose of wood extraction was to supply sawmills, charcoal plants and meet the expansion of cultivated areas. On the main highways that give access to this sub-region, there was a constant flow of trucks transporting wood in logs, originating from primary and secondary vegetation, verified during times of little inspection. In some cases, the

wood was extracted from unauthorized areas, with the contribution of agrarian reform settlements, which became suppliers of wood for sawmills, due to the lack of credit support from financial and government agencies (Bahia, 1996).

According to fishermen's complaint, the closed season was not respected in the coastal strip (temporary interruption of fishing), thus harming the renewal of natural stocks of the various species of shrimp. The estuarine waters and the formation of mangroves in the Southern Lowlands exert ecological and nursery functions for the development of species that have them as habitat or use it as a breeding area, however they have been constantly attacked. The degrading action was related to predatory fishing, such as the use of bombs, the use of trawling boats in the estuarine channels, the use of nets with meshes below the recommended specification, as well as the use of traditional and most harmful cambodies, the so-called line or net camboa, also widely used to encircle mangrove areas in *Maraú* and *Camamu* (Bahia, 1996).

Among other factors that cause environmental liabilities in this sub-region, strongly affecting water resources, the various urban agglomerates that release domestic effluents without any type of treatment into watercourses are listed. It is also common to observe the practice of implanting dumps in spillways in the basins, which act as a permanent source of river pollution. In the city of *Ituberá*, in addition to the *Serinhaém* river, the streams that cut through the city receive sewage "*in natura*", through rainwater drainage, and together with the effluents from the Municipal Slaughterhouse, they drain into the aforementioned river. Finally, it is worth noting the hunting of wild animals, which is a common practice in rural areas, no longer having only a subsistence character and becoming an alternative source of income through illegal trade (Bahia, 1996).

During the surveys carried out for the Management Plan, in 2004, all these environmental liabilities were confirmed, added to others, such as construction of dams and roads, capture of wild animals, contamination by agrochemicals, shrimp farming, which have caused a series of negative impacts causing, for example, damage to fauna and flora, fragmentation of natural habitats, occupation of fragile areas such as restingas and mangroves, increased surface runoff, accentuated erosion processes, siltation and contamination of soil and springs, which together constitute a picture degradation that compromises the biodiversity and natural resources of this region (CRA, 2004).

V. COASTAL AQUACULTURE AND ENVIRONMENTAL DAMAGE

Damage is any injury to a protected legal asset, and environmental damage, in turn, is any aggression against the environment derived from an economic activity of potential pollution and may also be an act of imprudence practiced by any person or by omission resulting from negligence. There is thus a responsibility to repair or indemnify the damage caused as a legal duty. However, some problems arise there, as not every asset can be recovered, and there is also a difficulty in quantifying the environmental damage. In both cases, an indemnity amount should be set for the damage caused (Sirvinskas, 2012).

To understand the idea of environmental responsibility, one must start from the analysis of damage repair theories. As there was a great difficulty in proving the guilt of the cause of the environmental damage, the legislation started to adopt the objective theory, where the demonstration of guilt is not required, just demonstrating the existence of the fact or act. In this way, the agent causing the damage is held liable regardless of having acted at fault. Thus, it has already been established in the doctrine and jurisprudence that anyone who causes damage to the environment or to a third party will be obliged to reimburse him even if the negligent or intentional conduct was committed by a third party. Remembering that every company has risks inherent to its productive activity, and for this reason, it must assume the duty to indemnify the damage caused to third parties (Sirvinskas, 2012).

As mentioned about the difficulty of quantifying or repairing the damage to the environment, given the obligation to indemnify the causer, in the case of economic agents, it is perfectly feasible for this repair or compensation to take place in the form of investments and support for environmental preservation projects, guaranteeing these companies the counterpart of green marketing. Sirvinskas (2012) states that "business [...] can be an excellent partner in protecting the environment, regardless of whether or not it is responsible for the degradation we are experiencing."

As aquaculture is an economic activity that transforms natural resources into products for society, as such, it produces impacts and environmental damage. According to Nascimento (1998), the three biggest impacts are related to the consumption of natural resources, the transformation process of these resources and the production of waste. The author emphasizes that aquaculture modifies the structure and dynamics of the ecosystem to increase the production of selected species, and from an ecological point of view, local modifications of lesser impact may

occur, as well as others on a regional scale, harmful to the point of rendering the natural environment incapable of sustaining this activity. Thus, adequate management is needed to make the activity sustainable, instead of using the ecosystem only as a repository for waste and a supplier of natural resources.

Given the logic of sustainable development, there is a need to take into account the limits of support for the ecosystem, which includes the availability of light and nutrients in the primary production of the cultivated area; the ability to renew living resources; the availability of water that supports organisms in cultivation, oxygen transport and waste removal. In addition to other resources such as land or aquatic space for the installation of marine farms, offspring (larvae) for storage and the food offered, construction material, industrial energy, chemical substances and services (Nascimento, 1998).

The implantation of marine aquaculture in tropical and subtropical regions takes place in flooded coastal areas, called mangroves. The greatest environmental impact resulting from aquaculture is the degradation of mangroves, especially for the implementation of shrimp farming projects. In Brazil, the biggest degradation factor has been the expansion of urban areas for industrial, port, tourist and housing use. Deforestation in mangroves causes coastal erosion, affects nutrient production and species reproduction. Mangroves have great ecological and socioeconomic value, as they serve as a biological filter for pollutants, store nutrients, recycle organic matter, reduce flooding, prevent sediment deposition, in short, it is a high productivity ecosystem (Nascimento, 1998).

Nascimento (1998) lists the most significant impacts related to shrimp farming: habitat destruction and loss of biodiversity in mangroves; acidification or salinization of coastal soils; use of areas to supply the resources that sustain the activity, estimated to be between 35 and 190 times larger than the area under cultivation; water requirement for replacement in the nurseries and replacement of losses and return in a more degraded form with an increase in the organic load and nutrients (onshore nurseries); threat to natural stocks to ensure the fattening of the offspring. Given this scenario of continuous expansion of aquaculture worldwide, it is necessary to search for clean technologies, in order to mitigate these impacts and ensure the sustainability of the activity (Nascimento, 1998).

Brazil, according to FAO (2007) apud Bessa-Junior (2014), is one of the countries that has shown the greatest growth in aquaculture, whose productivity grew six times between 1997 and 2003, mainly due to shrimp farming, especially in the Northeast, which holds 95% of the national production of shrimp, bringing together the best edaphoclimatic conditions for shrimp farming due to high temperatures and its relative climatic stability. In addition to these conditions, the region is home to a coastal zone with a large number of estuaries and mangroves, providing enormous potential for mariculture. According to the author, the latest census released by the Brazilian Association of Cameroon Breeders shows that the Northeast has approximately 1,428 farms, that is, 92% of farms in the country, totaling 19,610 hectares of arable land, with a production of 69,088 tons (Bessa-Junior, 2014).

Mariculture, in addition to being a relevant economic activity in food production, which has been showing great growth, is also a prominent factor in the income generation within the socioeconomic scenario, which, combined with the region's enormous potential for these activities, can bring onecontribution to local development, including improvements to the lives of fishermen and riverside dwellers. However, it is necessary to guarantee the sustainability of these activities in order to preserve the coastal ecosystems for future generations, as well as to maintain the ways of life of riverside communities and their cultural values.

VI. PERFORMANCE OF PRIVATE ENTITIES IN THE PRATIGI EPA AND SOCIAL RESPONSIBILITY

The option for the LSM shrimp farming project in *Barra do Serinhaém* is due to being the best example of the analysis of the idea of social entrepreneurship, social and environmental responsibility, income generation and local development, involving estuarine communities in Bahia's *Baixo Sul*, a region endowed with enormous ecological potential, but with low human development, mainly in the riverside populations, formed by farmers and fishermen.

O Estuário do Serinhaém faz parte da zona costeira da APA do Pratigi e está dentro dos limites de Ituberá e Igrapiúna, com uma extensão de aproximadamente 30 km (Figura 2)

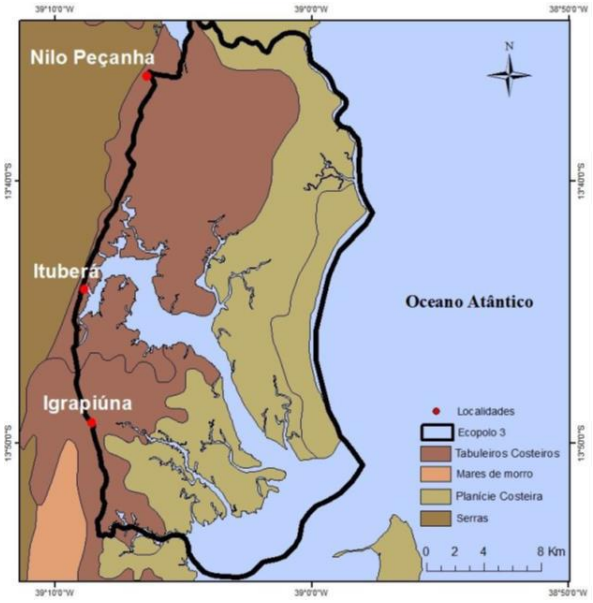

Fig. 2: Location of the Serinhaém Estuary. Source: (Santos & Nolasco, 2017)

The first experiments in the cultivation of shrimp in cages were carried out by Eduardo Lemos, in 1985, in *Rio de Janeiro*, in *Barra de Guaratiba*. The first results led to the creation of the company *Litoral Sul Maricultura* (LSM) in 1988, with KIEPPE Investments as a partner, and thus a pilot station was implemented in *Barra de Serinhaém, Ituberá, Bahia*. In 1991, a cooperative work was established between LSM, Bahia Pesca and IFREMER[2](Ifremer, 1995).

With its vast experience and cooperative work, IFREMER was effective for the project's success, bringing an important contribution to zootechnics, which was a 90% reduction in the cost of cages and an increase in production per m² from 750 g to 2,250 g. improvements ensured the profitability of the project. *Bahia Pesca* together with *Institut Supérieur Technique d'Outre Mer* studied the regional shrimp market seeking competitive advantages of the project (IFREMER, 1995).

The innovative and pioneering experience developed by LSM brought encouraging results, whose final report published by IFREMER highlighted the main advantages and analyzes of the *Barra do Serinhaém* project in terms of productivity, environmental quality and social development. For three years, from 1992 to 1994, satisfactory results can be verified that attest to the viability of the method with good prospects for the domestic market (Paquotte, 1996).

In analysis, biological productivity was high, with yields above 16 tons per hectare, with low negative effects on the quality of the natural environment, and local fishermen also appreciated the new practice in addition to their traditional activity (Paquotte, 1996).

The project's productivity proved to be a zootechnical success, since the yield obtained was four times higher than the average yield of the main producing countries in the world, which confers certain economic success on the innovative experience. The economic analysis showed a forecast of profitability evaluated at 27% and labor costs that reach 21%, but that one can still seek competitiveness beyond production costs, with emphasis on the good quality of the product obtained by the improvement. technical, as well as in the control of the commercialization channels (IFREMER, 1995).

The negative effects on the quality of the natural environment are very low compared to cultivation on land. These farms with floating cages, therefore, had multiple advantages from an environmental point of view: mangrove preservation; structures are mobile and shrimp are not in contact with the sediment, eliminating problems with contact with accumulated organic matter; this type of aquaculture is potentially low polluting and the residues can be consumed by fish; and there was no measurable impact on oxygen balances and organic matter concentrations in the sediment; the cages are mobile offering multiple advantages from an environmental point of view (IFREMER, 1995).

In the social aspect, with regard to the participation of the riverside community, it was found that the project would provide a complementary activity for fishermen on the spot, being practically one of the only possibilities to generate additional income. The traditional fishing activity provides a very low and fluctuating income, in addition to involving a small amount of personal capital. Thus, the work of monitoring the cages is compatible with your daily life as a fisherman, since family members can also collaborate, thus generating a complementary income (IFREMER, 1995).

The communities of the *Serinhaém* river estuary are made up of traditional populations of fishermen, shellfish gatherers and farmers, and their local production is mainly based on shrimp and crab fishing, as well as on the extraction of oil palm, palm heart, coconut, cocoa and latex. Local tourism brings a complementary income

[2]Institut Français de Recherche pour L'exploitation de la Mer (French Institute for Research for the Exploration of the Sea) is an institutepublic of an industrial and commercial nature. It is jointly supervised by the Ministry of National Education, Higher Education and Research and the Ministry of Environment, Energy and Marine Affairs. Ifremer carries out research missions, offers expert advice and acts as a funding agency. Available in:https://www.euromarinenetwork.eu/membership/organisations/ifremer

during the high season in December, but in the estuary region there is a lack of infrastructure in general, except for*Barra do Serinhaém*, whose village has a small network of restaurants, inns and river transport. In general, artisanal fishing has some social and environmental problems such as the impact generated by the use of fine mesh nets and bombs, and fishermen are vulnerable to changes in weather, temperature and tide variations, what affects work and daily productivity. Thus, the low yield and the intense physical wear and tear provided by artisanal fishing end up generating insufficient financial return, as well as health problems arising from poor food and hard work on boats in the sun or rain. Such difficulties also affect young people and minors, who from an early age help their parents with daily tasks.

Based on the previous successful experience, in partnership with IFREMER, LSM sought to innovate once again, expanding the results obtained with the cultivation of shrimp in cages, creating a new experimental technique, also promising, and with less impact on the ecosystem local. Thus, the participation of riverside dwellers was maintained, now with a less exhaustive work, as the tasks include monitoring the shrimp in canvas tanks located in areas with grass and palm trees, in order to create an environment with thermal comfort for the cultivation of shrimp, projecting a milder microclimate from shading vegetation. The technical training of cooperative fishermen and shellfish collectors, with estimates of reaching an average income of up to two minimum wages, will undoubtedly provide a substantial gain in the worker's earnings.

The expansion of the pilot project in *Barra de Serinhaém*, according to the testimony of its creator, Mr. Eduardo Lemos, intended to expand to the installation of up to 300 canvas tanks on properties in the estuary, in order to ensure improved productivity and competitiveness. In addition to the conservation aspect of the mangrove area, in a way guaranteed by the need for thermal comfort maintained by the palm trees and grass, shrimp waste serves as fertigation, used to maintain the project's vegetation cover environment, which reduces impacts if they were returned directly into the estuary channel.

Given the socioeconomic and environmental situation, LSM's shrimp farming project has the potential to remedy part of the region's socio-environmental difficulties, providing less exhaustive work with higher yields, combined with a lower environmental impact in the area, while ensuring local productivity more sustainable. Odebrecht supported the project in expanding the pilot project in Barra do Serinhaém, participating in the infrastructure and training cooperative fishermen and shellfish collectors, also acquiring properties in the estuary region for the installation of canvas tanks. The project combines productivity and efficiency, ensuring a competitive product in the market, with satisfactory and stable financial returns throughout the year.

VII. FINAL CONSIDERATIONS

In general, conventional shrimp farming projects have serious social and environmental impacts in the regions where they are installed. Shrimp farms cause conflicts with artisanal fishermen and shellfish collectors, as they disrupt the extractive productive system, which cannot compete with large-scale production. Business mariculture will also have impacts on mangrove areas, especially on soils and aquatic environments, compromising the sustainability of these fluvial-marine ecosystems with the deposition of waste and deforestation in forest areas. However, the methodology developed by the company LSM has shown positive points by reducing the environmental impacts on the estuary ecosystem and contributing to the strengthening of social capital by generating income and work for local communities.

The possibility of reconciling a shrimp farming project with the work of riverside communities allowed for the development of a business entrepreneurship process, also establishing connections in the social field. Even if the business mission is profit, private capital can collaborate with actionsgeared towards social entrepreneurship, which contributes to the social, economic and environmental quality of life. This posture defines the idea of socially sustainable companies or Corporate Social Responsibility (CSR), bringing other benefits, for example, from environmental marketing, a highly positive and advantageous vision for the public image of the business.

The economic exploitation of shrimp farming in the *Pratigi*EPA with the effective participation of riverside communities in *Barra de Serinhaém* is an innovative business venture in terms of production in cages and canvas tanks, and its proposal is the social commitment to local communities in the generation of income and mitigation of environmental damage in mangrove and sandbank areas. The training of local workers has the advantage of having the experience of fishermen and shellfish gatherers, therefore, they can also add traditional knowledge to the project, in addition to contributing to the creative potential of these individuals, with innovative knowledge and practices that strengthen the social capital of these communities. This exchange of knowledge can be enriching, allowing such communities to still exercise their role as social entrepreneurs.

In this sense, Nature Conservation Units are powerful tools for environmental management and protection, however, the Government, which is responsible by law for ensuring a balanced environment and a healthy quality of life, has become negligent or ineffective in this task, as analyzed in the Pratigi Environmental Protection Area management problem.

Generally speaking, the EPA suffer from the difficulty of managing and monitoring ecosystems in areas of human occupation, where economic activities are also included. As a result, there is a low effectiveness of environmental legislation, thus generating environmental liabilities, mostly resulting from these predatory economic activities and the urbanization process, which has harmed the quality of life of traditional and riverside communities, which suffer directly with the negative impacts.

Economic agents, endowed with technical and financial capacity, can be included in the EPA, through sustainability programs, where they can fulfill their Social and Environmental Responsibility. The Environmental Law understands that every company has risks inherent to its production activity, and for this reason, it must also assume the damages caused to society and the environment, carrying out its due environmental compensation.

Sustainable development is linked to several dimensions such as economic, social, environmental, political, and its practices are imbued with social responsibility, thus these are the guiding principles of companies that must work at EPA *Pratigi*. In this sense, social entrepreneurship is on the way with the aim of guaranteeing the transformation of the reality of the riverside communities surrounding EPA *Pratigi*, such as quality of life, job and income generation and, above all, environmental conservation. Thus, the results of such initiatives can reflect as environmental marketing, attesting that these organizations are concerned with the well-being of society and take care of the environment. In addition, we were able to prove, through the performance of the LSM company, that such income and job generation projects can promote economic growth and local development, taking advantage of the region's potential for mariculture, which makes expansion, maintenance and dissemination of such initiatives.

In this way, Corporate Social Responsibility becomes an important instrument for the protection of the environment, with the potential to contribute to social entrepreneurship in local communities and also serving as a complementary and co-participatory measure, given the low effectiveness of public authorities in actions of environmental protection, complying with what the Federal Constitution recommends about the duty of all to defend and protect the environment.

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