Revista Gestión y Desarrollo Libre
Year 9, N° 18, july-december 2024, pp. 1-27
ISSN 2539-3669
DOI: https://doi.org/10.18041/2539-3669/gestionlibre.12.2021.8714

ORIGINAL
Research article

Dynamics of the configuration of the fish farming economic activity in Colombia*

Dinámica de la configuración de la actividad económica piscícola en Colombia

Received: November 25, 2023 - Evaluated: February 26, 2024 - Accepted: May 30, 2024

Alexander Quintero-Bonilla**
ORCID: https://orcid.org/0000-0002-9860-4675
Juan Manuel Andrade-Navia***
ORCID: https://orcid.org/0000-0001-9644-0040
Elías Ramírez-Plazas****
ORCID: https://orcid.org/0000-0001-8928-1547

To cite this Article
Quintero-Bonilla, A., Andrade-Navia, J. M., & Ramírez-Plazas, E. (2024). Dynamics of the Configuration of the Fish Farming Economic Activity in Colombia. *Revista Gestión y Desarrollo Libre*, 9(18), 1-27.

Editor: PhD. Rolando Eslava-Zapata

Abstract
This article analyzes the phenomenon of the emergence of a group of organizations (companies) in a specific space and time, generally framed in the idea of economic activity. The case for the companies formed around fish farming activity, with which a new economic dynamic was established in a peripheral region of slow economic development located in the south of Colombia. The study was of a qualitative documentary type, inventorying primary and secondary sources with which the trajectory of the fish farming activity in Colombia and the department of Huila was reconstructed. In conclusion, it can be affirmed that the emergence of fish farming is due to the competition for a policy to promote fish farming carried out by the State, public institutions, and unions of the agricultural sector; the existence of a regulatory framework that allowed the performance of organizations dedicated to the activity; the technological contributions made by multilateral entities and decentralized public entities that promoted genetic and nutritional improvements; and the deterioration of traditional continental fishing that allowed a demand-oriented towards fish products.
Keywords: Economic Activity, Companies, Fish Farming, Business History

* Artículo Original. Research and innovation article. Research article. Work linked to the Universidad Surcolombiana, Colombia.

** PhD. in Administration by the Universidad EAFIT, Colombia. Professor at the Universidad Surcolombiana, Colombia. Email: alequin@usco.edu.co

*** PhD in Agroindustry by the Universidad Surcolombiana, Colombia. Professor at the Universidad Surcolombiana, Colombia. Email: juanmanuel.andrade@usco.edu.co

**** PhD. in Business Administration by the Université Libre de l'Entreprise et des Technologies de Bruxelles, Belgium. Professor at the Universidad Surcolombiana, Colombia. Email: Elias.ramirez@usco.edu.co

Resumen
El presente artículo analiza el fenómeno de surgimiento de un conjunto de organizaciones (empresas) en un espacio y tiempo específico, generando una nueva actividad económica. Se trata del caso de las empresas conformadas en torno a la actividad piscícola con las cuales se estableció una novedosa dinámica económica en una región periférica de lento desarrollo económico, ubicada al sur de Colombia. El estudio fue de carácter cualitativo de tipo documental inventariando fuentes primarias y secundarias con las cuales fue reconstruida la trayectoria de la actividad piscícola en Colombia y el departamento del Huila. Como conclusión se puede afirmar que el surgimiento de la piscicultura se da por el concurso de una política de fomento a la explotación piscícola adelantada por el Estado, instituciones públicas y gremiales del sector agropecuario; la existencia de un marco regulatorio que permitió la actuación de organizaciones dedicadas a la actividad; los aportes tecnológicos y científicos divulgados por entidades multilaterales y entidades públicas descentralizadas que impulsaron mejoramientos genéticos y alimenticios; y el deterioro de la pesca tradicional continental que permitió una demanda orientada hacia productos piscícolas.
Palabras Claves: Actividad Económica, Empresas, Piscicultura, Historia Empresarial

SUMMARY

Introduction

Entrepreneurship has been a subject widely addressed in the economic sciences. Sociology includes it in its research agenda, although recently, with less intensity. These approaches approach the investigative task with a deterministic perspective, according to which structural elements determine the emergence of a group of companies. Furthermore, most economist researchers are interested in this topic as a way of approaching the phenomenon of economic growth rather than for the interest in understanding business itself.

In this regard, there are recent investigations in the literature that seek to identify the dynamics of the appearance of regional economic activities (Acs et al., 2014; Isenberg, 2016; Spigel, 2017). The phenomenon has recently been analyzed in China (Elston & Weidinger, 2019; Hong et al., 2023), Venezuela (Piña & Morales, 2009), Turkey (Cansiz & Tekneci, 2018), Mexico (Molina-Ramírez & Barba-Sánchez, 2021), among others.

Multiple researchers have approached the phenomenon of entrepreneurship from different perspectives, such as “clusters,” “industrial districts,” “innovative environments,” and “regional innovation systems” (Arıkan & Schilling, 2011; Crevoisier, 2004; Delgado et al., 2010; Doloreux, 2002; Marshall, 1890; Piore & Sabel, 1984; Pyke et al., 1990; Tallman et al., 2004).

Therefore, this research proposes a theoretical perspective for the study of the appearance of economic activities and businesses in Colombia. It intends that this theoretical perspective

guide the investigation of a particular case, such as the phenomenon by which a group of organizations (companies) arose that, in turn, configured a new economic activity in the department of Huila in southern Colombia. The specific case refers to companies in the fish farming sector that emerged in the period between 1985 and 1995, and by the year 2022, they placed this Department in the leadership of national production.

Fish production in Colombia has shown remarkable growth over the last decade, going from producing around 67,000 tons in 2010 to producing more than 200,000 tons in 2022 (Ministerio de Agricultura y Desarrollo Rural, 2022). Of the total produced for the year 2022, the department of Huila contributed more than 40% of the national production, which represented more than 80,000 tons mainly of red and silver tilapia, followed by the Meta department with 11%, Tolima with 9 %, Córdoba, with 5%, and Antioquia with 4% (Gobernación del Huila, 2022).

Resolution scheme

1. Research problem

How did the economic activity of fish farming emerge in Colombia?

2. Methodology

This work was approached from a qualitative approach. According to LeCompte (1995), in qualitative research, descriptions are extracted from observations that take, among others, the form of interviews, narratives, photographs, and other artifacts. The investigative process implied a documentary investigation, inventorying primary and secondary sources with which the trajectory of the fish farming activity in Colombia and the department of Huila was reconstructed in order to identify the factors and dynamics that allowed the formation of an environment of opportunity for the establishment of fish farming economic activity, both in Colombia and in the department of Huila. The documentary inventory was made up of press news sources, specialized publications on the subject, and historical archives of the Huila department.

The documentary review was carried out in three steps. First, the location of journalistic sources, government archives, and actors would allow for an inventory of facts related to fish farming in Huila and Colombia. Among these sources were the local and national press (Diario et al.), as well as participating actors in the process of confirmation of fish farming at the regional level. Government archives were also part of this inventory of sources, particularly those of the Departmental Secretariat for Agricultural and Mining Development, together with publications from the ministries and other entities involved in aquaculture and fishing activities.

Second, the collection, classification, and selection of the most relevant documents for the investigation was carried out. Moreover, a careful and in-depth reading of the content of the selected documents was exhausted to extract elements of analysis that offered clues such as patterns, trends, convergences, and contradictions; finally, building from the findings or indications, the comprehensive synthesis on the fish farming activity.

3. Drafting plan

3.1 Approaches to organization formation

From an economic perspective, the appearance and formation of a set of organizations within the framework of a specific activity is the consequence of macroeconomic policies that go beyond the purposes of the actors and of a local or regional community. Likewise, its genesis is attributed to the fact that it has overcome local limitations and obstacles such as low entrepreneurial capacity, financing problems, and human resource deficiencies (Gómez, 2005). According to Smitchz (1995), between the 1950s and 1960s, the creation of new productive organizations was attributed to the protection and substitution of imports. Even another line of thought conditioned this phenomenon to the presence of cultural factors that promoted or hindered the emergence of individuals with a set of skills for business risk.

On the other hand, conglomerates, or the formation of a set of organizations in the field of productive activity associated with economic growth, was initially exposed within the classical theory by Marshall in 1920: "the agglomeration of firms involved in similar activities or related generates a set of localized external economies that reduce costs for the producers that are part of it." In this regard, Krugman, cited by Smitchz (1995), added three reasons or sources of external economy that encourage firms to locate themselves geographically: 1) the concentration of skilled labor; 2) greater access to intermediate inputs; and 3) technological use. Likewise, it should be considered that within this perspective, historical and natural factors play an important role in the establishment and location of organizations. However, the maintenance, development, and, therefore, durability of these will be conditioned by other factors such as the ability to innovate and improve, specialization, and improvement of human capital, to name a few (Gómez, 2005).

3.2 The perspective of the Industrial District

The Industrial District is a concept typical of the field of political economy that, with interpretive variants, has spread to other disciplinary fields. According to Becattini (1988), the concept of the industrial district is typical of Marshall (1890), who foresaw the advantages of external economies that the grouping of small and medium-sized companies presented, subdivided into productive phases, located in a specific geographical area. Thus, the grouping is the result of the closeness and interaction of different agents in processes typical of their economic activity, a situation that Marshall (1890) defined as an industrial environment, which designates the socioeconomic environment from which benefits emerge from processes of imitation, learning, innovation, and technological adaptation. Such processes take shape from the cooperation of the agents (Piña & Morales, 2009).

Marshall himself indicated, years later, that the population of companies that make up the industry "interpenetrates" with the inhabitants of the territory, who in turn have a set of socio-cultural characteristics suitable for a small business development process. It indicates, on the one hand, that history and geography count in the conformation of the district and, on the other, that the industrial district demands a special symbiosis between productive activity and community life. The productive process carried out within the district must allow decomposition into phases and the possibility of transporting the products between phases in space and time. This situation is what allows the creation of a network in the local market and the subdivision of labor that integrates the members of the community in multiple positions

(Becattini, 1988). Then, based on the idea of an industrial environment, Becattini (1988) associates the notion of the industrial district as he recognizes an identification of the communities of the districts with productive systems.

The theory of Industrial Districts, after Marshall, led to theoretical advances in Italy from the 1970s. A new model of productive systems was incubated in this country in an unforeseen space after the Second World War. The particularity of this new productive system, compared to traditional industrial zones, was the size of the company and the complex relations with the local community. Two approaches can be seen in the theoretical definitions of Italian industrial districts: one that emphasizes the economic dimension of the network of companies that make up the district, that is, the structure of relationships between them, and another that involves socioeconomic elements that embed companies in the local social system.

Bagnasco (1977), cited by Becattini (1988), defines the industrial district as a geographically located productive system based on the intense local division of activities between small companies specialized in the different production and distribution processes of an industrial sector or a dominant activity, with multiple relationships between the company and the local community, both inside and outside the market, relationships based on trust and reciprocity. Following Becattini (1988), the industrial district can be considered as follows:

> A large productive complex in which the coordination between the different phases and the control of its regular operation is not carried out by means of pre-established rules and/or by means of hierarchical mechanisms but rather through the trust in the combination of the mechanized game of the market with a system of social sanctions imposed by the community. Proximity allows firms to enjoy an economy of scale…this explanation does not hold that small firms can be as or more efficient than large ones, but rather that, given the above conditions, a localized population of small firms can achieve, in fractional and variable production, levels of efficiency like those of large companies... (p. 7).

It should be noted that, according to Becattini (1988), it is optional to include within this category a group of small companies established in an area and under the control of a larger one. Urban areas in which small businesses are involved in the same phase of the production system, such as industrial neighborhoods, are also not included. In short, for Becattini (1998), the industrial district is, above all, a socio-territorial entity characterized by the active presence of a community of people and a group of companies located together in a natural and historically determined area in which the Community and companies tend to merge.

For Humphrey (1995), the fundamental characteristic of an industrial district is its organization. That success is not achieved by the advantageous access at the low cost of production factors but rather by the efficient organization of the social and economic aspects in the interaction of the locality with the small business. The organization can vary, but the key element is the existence of strong networks through specialization and subcontracting between the companies themselves. This same author, quoting Piore & Sabel (1984), who specified the experience of what was called the Third Italy model, argues that the vitality of the district lies in the communities of group companies, which is based on competition cooperative between companies and the broad capacities of the working community, which allows the disposition for innovation and the elaboration of a wide range of products in small quantities.

From all this, it follows that a model of an industrial district involves at least a) a delimited territory, b) a community of people, c) a group of small and medium-sized specialized companies, d) division and specialization of manual labor, e) institutional actors, f) competition and cooperation, and g) diversification and innovation in production (Piore & Sabel, 1984; Harrison, 1992).

3.3 The Cluster perspective

According to Gómez (2005), numerous studies can be found on clusters from different theoretical currents, which has led to confusion about their definition and scope. From the theoretical perspective promulgated by Porter (1998), the cluster refers to the geographical concentration of interconnected companies and institutions in a particular industrial activity. It includes suppliers, manufacturers of complementary products, government entities, universities, standard-setting bodies, think tanks, trade associations, research associations, technical support, and even channels and customers (Scott, 1988; Storper, 1995). The cluster represents a kind of spatial organization of markets. It is an alternative form of organization to what Porter calls the value chain. The proximity of the company and the institutions in one place, as well as the repeated exchanges between them, fosters better coordination and trust.

Clusters can equally be seen as processes if they are viewed as a critical mass of geographically connected interdependent firms (Rosenfeld, 2002). It is a physical flow of goods and services, with a constant exchange of information, knowledge, and technology that takes shape over time. That is, this is a way of understanding the way the economy works and organizes its strategies to achieve results. From this perspective, when the cluster promotes specialization, the functioning of networks, horizontal and vertical relationships, and achieves external economies and collective efficiency, it builds competitive advantages. This environment is also a promoter for the emergence of new forms of organization.

According to López & Calderón (2006), an economic perspective has prevailed in the cluster concept, both in the theoretical perspective enunciated by Porter and in empirical work. That is, the cluster focuses on economies of scale and collective efficiency through the processes of complementarity between the organizations in such a way that they generate competitive advantages for the conglomerate. Thus, the focus is on the robustness of the business links in terms of capabilities, as well as the quality and intensity of the economic and institutional relations between the agents of the conglomerate rather than establishing the process that gave rise to a conglomerate of companies. That later integrated the cluster.

3.4 The perspective of Institutionalism

In the last decades of the 20th century, interest in the study of institutions in the social sciences resurfaced. It is a rejection of the neoclassical theory of the economy and the old institutionalism on the basis that both institutional arrangements and social processes are fundamental to understanding society. Neo-institutionalist postulates allow us to address certain organizational phenomena; however, approaching the formation of a conglomerate of organizations from the neo-institutionalist perspective demands overcoming the conflict generated in the very concept of institution, which varies according to the approach taken, be it economic, sociological, or political.

According to Dimaggio & Powell (1999), institutionalism is rooted in the political economy of Veblen and Commons and the sociology of Parsons and Selznick. In the former, they

considered the generating mechanisms of social and economic action. As for sociology, it was trying to understand the interconnections between the organization, the economy, and society. It was also an opposition to the principles of classical economics and its notion of unlimited rationality and utilitarian inclination on the part of economic agents. From there, institutionalism became part of the new institutional economics since transactions –the primary unit of analysis- gave rise to specific classes of economic institutions. In this perspective, institutions impose restrictions on individual behavior, limiting the strategies adopted by the actors to achieve the objectives.

Neo-institutionalism emerged at the end of the 1970s, also as an opposition to the rational approach and the utilitarian vision of human behavior postulated from neoclassical theory and how it deals with transaction costs and property rights. Neo-institutionalism, based on the theory of practical action, will deal with human performance and with institutions, organizations, and the environment. Nature and human behavior will be considered unpredictable, while interests will be determined by institutions (Dimaggio & Powell, 1999).

Therefore, a broad look at the new institutionalism, from a sociological perspective, assumes the existence of a link between human actions, both individual and group, and institutions. Institutions influence actions and are themselves the result of those actions (Scapens, 1994). Individual agents, as well as groups, pursue their respective purposes in a collectively restricted context, that is, in a context of institutions, understood as organized patterns of socially constructed norms and roles, as well as socially prescribed behaviors expected of those who perform such roles, which are created and recreated over time (Goodin, 2003).

From sociological neo-institutionalism, the emergence of a set of organizations from the institutional environment could be interpreted. In this sense, Meyer and Rowan (1977) state that the fundamental notion within the new sociological institutionalism is institutional rules and the way in which they affect the structures and their performance. They define this environment as the approval of the rules of the game, constraints, and obligations accepted by the agents. In turn, the agents assume forms of behavior that are legitimately approved by the medium and internalized as possible acts that are delimited through shared systems of practices that become homogenizing routines. Scott (2008) agrees that the environment can play a role in developing rules and requirements that individuals, groups, and organizations must adhere to in order to obtain support and legitimacy.

According to Jepperson (1991), an institution is a social order or pattern that has achieved a certain status or property. According to Dimaggio & Powell (1999), institutions are the rules of the game in a society. In this same sense, organizations are integrated and makeup what these authors describe as an organizational field. That is, groups of organizations that interact directly or indirectly and that, taken together, constitute a recognized area of institutional life.

The field as a theoretical concept for understanding administrative and organizational phenomena comes from sociology, a concept developed, among others, by Bordieu (1984; 1990). The notion of organizational field adjusted to the study of organizations also refers to that social space in which relationships with similar and complementary groups materialize, which are influenced by institutional pressures that tend to homogenize the behaviors of the agents that make up the organization. Community (Dimaggio & Powell, 1999). From this, it follows that every field has a historical, relational, relative, and complex element. The fields exist to the extent that they are institutionally defined so that the interactions carried out by the organizations and institutions determine the structuring. The existence of organizations as products of human action is limited to institutional development, which ultimately makes their creation possible or impossible.

Apart from the new sociological institutionalism (NSI) previously exposed, the new political institutionalism (NPI) was promulgated, which presents an analysis level in the organizational field, specifically trying to establish the mechanisms that regulate the behavior of individuals in a field, initially understood as the organization. From this perspective, as in the NIS, the rule is fundamental, and it is socially constructed. In this way, the actions of the subjects are institutionalized when the rules have been institutionalized, and this is done through the routinization of practices (another concept developed by Bordieu). Thus, political institutions will be understood as a set of interrelated rules and routines that adequately define actions in terms of relationships between functions and situations (March & Olsen, 1997).

For March & Olsen (1997), the interpretation and construction of meaning are fundamental; together, they play a preponderant role in the institutionalization of action and rules. That is, in the NPI, the institution offers a plurality of rules, of which the individual interprets and gives meaning to the most appropriate for a given situation; this is done not based on their individual interests but based on their role. Alternatively, identity that compels him to act in accordance with them. The point is that role and identity are socially determined (Scott, 2008). This approach is completely contrary to the assumptions of rationality, in which individuals make a choice based on preferences, alternatives, and consequences. In the NPI, the rules under which individuals decide to act are set by internalized institutional frameworks, that is, social, cultural, and political experience, to name a few, which are determinative.

3.5 The perspective of strategy as practice

Traditionally, it is accepted that strategy is an attribute of companies, something that organizations have. Contrary to this tradition, a movement has emerged that deals with the making of strategy, known by the name “strategy as practice,” which is distinguished by the abbreviation “s-as-p.” Strategy is also an activity carried out by people, something that people do, and not simply a property of the organization. In this approach, the strategy is conceived because of social activity, something that goes through the actions, interactions, and negotiations of multiple actors, which are based on institutionalized practices (Whittington, 2006). Once again, the “turn” given in the social sciences towards social practices is used, a concept fundamentally developed by Bordieu. In the opinion of Chia & MacKay (2007), the research turned to the “micro-social” practices of the organization.

From the point of view of social practices, the strategy is derived from daily practices, that is, from patterns and dispositions internalized in individuals. In this sense, the strategy is not the result of intentional and deliberate initiatives resulting from goal setting (Chia & MacKay, 2007). According to these authors, the works of Pettigrew and Johnson in the 1980s (The Giant Awakens and Strategic Change and The Administrative Process) formed the basis of what would later be called strategy as practice. Later, in the same decade, this “paradigm” would be deepened with the contributions of Jarzabkowski and Whittington.

4. Research results

4.1 From traditional fishing to artisanal fish farming, and later to commercial fish farming

Fishing activity and fish consumption have a long tradition in Colombia. In Colonial times, the consumption of fish by Spaniards and Creoles gave rise to forms of organization around fishing activity in some regions (Tassara & Rivera, 1991). Even in the 20th century, fishing stood out, to a large extent, for being the banner on which humble subsistence was supported and, in a few cases, the simple accumulation of resources. It was a somewhat marginal trade due to the characteristics and status of those who exercised it (Ben-Yami & Adersen, 1987).

Traditional fishing has been developed mainly in the basins of the Magdalena, Cauca, Orinoco, and Amazonas rivers, remaining linked to the seasonality of hydrological events. Artisanal fish farming in the country as an activity established had its first manifestations in the 1940s. The State, together with international organizations, incorporated models of self-sufficiency and food security in rural areas based on the comparative advantages it possessed. The country. However, the lack of infrastructure, equipment, and technological development caused a slow transition towards its development and modernization, which occurred in 1960, among other reasons, due to the introduction of some varieties of fish (Parrado, 2013).

The nascent artisanal fish farming differed from traditional capture fisheries by using ponds, lakes, and captive-bred species. It also implied rational processes for planning, organizing, and coordinating resources, as well as risk-taking on the part of fish farmers. However, they shared a fundamental similarity as they were subsistence activities since the results were destined exclusively for personal and family consumption.

Towards the mid-1970s, fish production in the rivers exceeded 70,000 tons per year. Although official records of the contribution of artisanal fish farming are not reported, it is estimated that production in this modality did not exceed 200 tons per year for the time (Ministerio de Agricultura y Desarrollo Rural, 2012). At that time, the importance of capture fishing or traditional fishing with respect to the almost non-existent artisanal fish farming was undeniable. The situation did not change until the following decade because of the intense programs for the cultivation of tilapia (silver and red) promoted by State institutions and emerging private initiatives of significant magnitude.

For 1985, the figures reported estimated that exclusively artisanal fish production was close to 500 tons. During the following five years, fish production gradually increased, reaching important figures (Instituto Nacional de Pesca y Acuicultura, 1997). On the other hand, for the same decade, the figures for capture fishing experienced a significant decline. According to the Agenda Nacional de Investigación en Pesca y Acuicultura, the greatest production of the Magdalena River was obtained until 1987; from then on, the phenomenon of decline became evident, presenting a collapse in the ecosystem of the tributary, which is consistent with the decrease in production (Ministerio de Agricultura y Desarrollo Rural, 2012).

From now on, the growth trend in artisanal fishing and the decrease in the catch will continue to accentuate. Artisanal fish farming progressively ceased to be so to acquire a commercial tint, integrating increasingly advanced techniques and technology, which resulted in abundant levels of production, job creation, and business development, compared to a traditional capture fishery that was doomed to abandoned due to its precarious techniques and marginalized due to its derisory contribution to the economy, with fewer and fewer resources available.

The State, which initially promoted the food subsistence policy and the repopulation of tributaries, later established a regulatory and institutional framework, together with the contributions made by international organizations and agencies, which opened the way for fish farming in Colombia. Added to this was the introduction of exotic species with technology developed in other countries, as well as multiple investigations and technical advice from state development organizations, which, in the context of the decline in traditional fishing activity and growing demand, was the incentive for the consolidation of commercial fish farming. The foregoing, based on the documentary review, allows us to affirm that there are two stages in the Colombian fish farming activity.

4.2 A State policy for the promotion of rural food subsistence and the repopulation of tributaries

With the introduction of the first exotic species, whose purpose was to repopulate bodies of water, the participation of the State in the fishery issue began. These first species were the common Carp (Cyprinus carpio) in 1912 and the Rainbow trout (Salmo Gairdneri) in 1939. The first efforts to farm the latter took place in the 1940s (Castillo, 2000; Parrado, 2013). The Colombian State promoted fish farming and fishing at the beginning of the 20th century as a way of alleviating the family basket, counteracting the high prices of meat (El Tiempo, October 14, 1927).

Even though artisanal fish farming was only established in Colombia around the 1940s, it took shape around the 1960s. The Colombian State, in pursuit of peasant well-being, promoted models for the fish repopulation of rivers and self-sufficiency and food security in rural areas based on the comparative advantages that the country had. Fundamentally, the construction of ponds in unprofitable areas, the free or subsidized delivery of fingerlings, low stocking densities, feeding by organic or chemical fertilization, minimal or no water exchange, and technical support were promoted (Parrado, 2013).

The first species of tilapia to appear internationally was Oreochromis mossambicus, known as Mozambique tilapia, Java tilapia, or Black tilapia, native to the east coast of Africa. They were introduced to Colombia in 1957 from Brazil for cultivation at the Instituto Nacional de Piscicultura Tropical. This species was destined for subsistence fish farming, oriented exclusively to the rural sector, without any technical basis. The lack of appropriate technological packages caused this species to escape into the natural environment, losing its value and credibility as a species for consumption due to problems of precocity in the sexual maturation of the species, overpopulation, flavor, size diversity, appearance, low productivity, slow growth, and its aggressive potential towards other species (Castillo, 2000).

Given the experience with the species Oreochromis mossambicus, work was carried out with the Rendallí tilapia, also native to Africa. This species was introduced from the United States to Colombia in 1960 by the Universidad de Caldas. The objective was the investigation and analysis of the environmental impact of the control of aquatic weeds. However, its commercial cultivation did not prosper due to its low growth and high reproductive and predatory capacity by fingerlings and juveniles, reaching double and triple the biomass of the original population. In addition, its indiscriminate consumption of aquatic vegetation (macrophytes) was a concern, as it was not a filter feeder (it does not consume phytoplankton), to which was added the damage to the slopes of ponds, canals, and reservoirs (Castillo, 2000).

In 1979, the Instituto Nacional de los Recursos Naturales Renovables y del Ambiente - Inderena introduced a line of Nilotic or Silver tilapia (Oreochromis niloticus) in the

departments of Atlántico and Huila. This species was used indiscriminately years later for the repopulation of swamps and dams, promotion and rural extension, and semi-commercial fish farming. The species had optimal growth in fertilized ponds, with later sexual maturation and an excellent response to sexual induction (100% males), making it attractive to the first commercial fish farmers. Its acceptance faded with the introduction of different hybrids of red tilapia, which turned out to be more attractive for the national and international markets (Castillo, 2000). This last species was introduced to the country in 1982 by private producers, and since that time, it has been produced at an artisanal and industrial level.

Genetic improvements of the species have been carried out since the 1990s with Cuban advice, finding hybrids according to environmental conditions (Organización de las Naciones Unidas para la Alimentación y la Agricultura, 2005).

4.3 Public institutions and trade organizations at the service of fish farming

The Instituto de Pisciculture Tropical, which has operated since 1956 in the department of Valle del Cauca, became the first organization with a public budget to promote fish farming through research and production of fingerlings in Colombia. The Institute introduced, in 1959, the Oreochromis mossambicus, known as Tilapia Mozambica, Java tilapia, or Black tilapia (Salazar, 2001) from Brazil.

For its part, the Federación Nacional de Cafeteros, a non-profit trade association created in 1927 with the aim of increasing the quality of life of Colombian coffee producers, promoted traditional fish farming by introducing the Rendalli tilapia, an herbivorous species, in 1967, with which he started a program among small coffee growers. Subsequently, its production was no longer encouraged due to low yields and low size obtained (Toledo & García, 2002).

With the creation of the Instituto Nacional de los Recursos Renovables y del Ambiente -Inderena- in 1968, which had among its functions the promotion, administration, research, and promotion of aquaculture, the activity acquired a greater dynamic reflected in the appearance of numerous projects, agreements for human resource training and ambitious development programs.

In this way, the support of international agencies and organizations such as the Food and Agriculture Organization of the United Nations -FAO- (1970-1974), the International Development Agency -AID- (1976-1980), the government of Taiwan (1976-1979), International Development Research Center -CIID- (1980-1990), Inter-American Development Bank -IDB-, Japan International Cooperation Agency -JICA-, Colombian International Cooperation Agency -ACCI- and the Korea International Cooperation Agency -KOICA-, among others, which provided technical assistance, training and subsequently made possible the construction of fish farms such as Repelón in the Atlantic and Gigante in Huila. The stations were oriented to extension programs, seed production, and, to a lesser extent, research.

The FAO - Inderena project, started in 1972, was oriented towards the study and evaluation of fishing potential, the biology of the fish of greatest commercial interest, as well as the identification and evaluation of native species potentially suitable for incorporation into aquaculture. In addition, support was provided in infrastructure and human resource training. Two years earlier, within the framework of the food security policies developed by the United Nations, the FAO had made an estimate of snapper reserves in the Colombian Pacific (Ministerio de Agricultura y Desarrollo Rural, 2012). A decade ago, the FAO sponsored the first course on tropical fish farming (Toledo & García, 2002).

The study developed by the FAO-Inderena was the first formal study that was carried out directly on the fishing activity in the country, which, to a large extent, characterized what is known as the capture fishing activity, ratifying the importance of the Magdalena, San Jorge, and Cauca rivers, as the country's fish pantry. Likewise, since the agreement was signed, the establishment of fish farming statistics began, and until then, there was no data in the country.

The Colombian government, through Inderena in collaboration with USAID (United States Agency for International Development), advanced a program for the development of aquaculture and fishing in 1975. This program referred to capture fishing and advanced by proposing, for the first time, aquaculture as a development model. Through this technical cooperation agreement, the fish farming stations of Repelón -Atlántico- and Gigante -Huila- were built, and the Training Plan for Inderena-Pesca officials was developed to do ten master's degrees at Auburn University -United States-, together with other specialized courses in fishing and aquaculture in the country. Likewise, the Fisheries Assessment Program for the Meta River Basin was advanced (Ministerio de Agricultura y Desarrollo Rural, 2012).

It could be affirmed that this program was, without a doubt, the fundamental pillar on which the state efforts for the consolidation of aquaculture in Colombia were concentrated because it allowed the high-level training of national professionals, in addition to establishing the infrastructure necessary to continue advancing advanced studies on species.

A year later, in 1976, Inderena again made an agreement with the Canadian Agency for International Development (CIDA) to develop maritime artisanal fishing. With this program, bases for maritime artisanal fishing development were established in Cartagena and adjacent areas, with an emphasis on social, technological, and productive development. To reinforce the above, in 1977, an Inderena-FAO agreement was signed again, with the aim of carrying out research on marine shrimp farming. Likewise, in 1978, Inderena and the government of Taiwan established a new agreement with the same objective (Ministerio de Agricultura y Desarrollo Rural, 2012).

That same year, Indiana entered into an agreement with the Japan International Technical Cooperation -JICA, aimed at exploring potential fishing and shrimp resources, both in deep and superficial waters, an agreement that lasted until 1980. In this same decade, an agreement between the Norwegian Agency for Development (NORAD) and FAO made it possible to discover the maritime potential of the Colombian Pacific, highlighting the commercial potential for marine species such as pomfret, serranos, sharks, snappers, and grunts.

Also, in the 1980s, an Inderena - International Development Research Center (CIID Canada) – Universidad del Magdalena agreement allowed the development of some programs around traditional maritime fishing activity (Ministerio de Agricultura y Desarrollo Rural, 2012). Likewise, the PEC - VECEP agreement (Programa Regional de Pesca, agreed between the European Union and Colombia, Venezuela, Ecuador, and Peru) - Inderena - INPA, signed and developed until 1999, through which the national government developed various fishing programs, was developed. Evaluation of marine resources, development of artisanal fishing, credit aspects, business development, and technology transfer. One of the most important aspects of this agreement lay in the fact that it was from these studies that the National Fisheries and Aquaculture Statute was created, with which the Instituto Nacional de Pesca y Acuicultura - INPA was created.

In the 1990s, the FAO once again developed two important projects for national fish farming, to a large extent, in relation to the institutional ordering of the activity. During the period 1993-1994, a project to improve INPA's fisheries management and development capacity was carried out between FAO-UNDP and INPA. Likewise, between 1997 and 1998,

the INPA and FAO deployed the project to analyze strategic components of the Colombian fishing sector for the formulation of policies (Beltrán & Villaneda, 2000).

Different Latin American countries were linked to the development of the fish farming field. Thus, in 1997, the Brazilian government offered training and advice in aquaculture to Colombian technicians in reproductive physiology, nutrition, and fish ichthyopathology. That same year, with the collaboration of the Cuban government, studies were carried out on the cultivation of the mangrove oyster. One year later, the Cuban government once again provided technical advice for the construction of artificial shelters for lobsters in La Guajira. Simultaneously, with the help of Mexican experts, technical training was carried out in the reproduction and cultivation of different species of carp due to their excellent performance and conversion capacity.

Added to the above, the Programa de Desarrollo Rural (DRI), launched in 1976, as a productive component of the Plan Nacional de Alimentación y Nutrición (PAN), included among its objectives to contribute to strengthening the productive capacity of the economy. Peasant farmers, for which reason it included a component to promote rural aquaculture, with valuable achievements in programs aimed at small farmers.

Inderena was liquidated in 1993, giving way to the Ministerio del Medio Ambiente. However, the State continued to ensure fish farming and transferred the functions of surveillance and promotion of fishing and aquaculture to a new specialized institute, the Instituto Nacional de Pesca y Acuicultura - INPA, which, with the formulation of Law 13 of 1990 (General Fisheries Statute), became the national fishing and aquaculture authority. This institute played a very important role in the development of regulations in order for the activity to give projection in rural and agricultural development, in addition to advancing applied research, promotion, training, business, and commercial organization. The institute also worked hand in hand with the DRI to support the emergence of aquaculture in many regions of the country.

On the verge of the 21st century, the infrastructure of fish farming centers and stations in charge of the central level of the State was made up of the Alto Magdalena, San Cristóbal, Berlín, San Silvestre, Oiba, Repelón, Las Terrazas stations, and the fishing research centers of Cartagena, of Tumaco, the Barrancabermeja Artisanal Fishing Center and the Tolú Artisanal Fishing Center (Ley 13 de 1990, Estatuto General de Pesca. Diario Oficial de la República de Colombia, Bogotá, 15 de junio de 1990).

Subsequently, in 2003, the State once again unified the entities that had responsibility for rural development, creating the Instituto Colombiano de Desarrollo Rural – INCODER. It concentrated the functions related to the ownership of rural land, the development and promotion of the irrigation and drainage system, the promotion of rural development itself, and those that corresponded to the fishing and aquaculture authority. A short time later, the Ministerio de Agricultura y Desarrollo Rural created the Dirección de Pesca y Acuicultura with functions related to the formulation of policy instruments to support the development of fisheries and aquaculture at the national level, which subsists together with the Autoridad Nacional de Acuicultura y Pesca (Castillo, 2000).

In the 1980s, traditional fish farming made the transition to commercial fish farming in various entities such as the Corporaciones Autónomas Regionales, Inderena, Comité de Cafeteros, and Secretarías de Agricultura Departamental, among others, which caused confusion both in the management of small producers as well as in the formulation of policies and the development of the sector. Under this scenario, thanks to the financial support of IDRC-Canada, the National Aquaculture Network was created. They were five years of joint work

that sought to unite the official and private sectors with the edition of bulletins, annual meetings in Bogotá (1987, 1990, 1991, and 1992), Neiva (1988), and Cali (1989), all this added to the financial aid for research centers, training of human resources and exchanges.

At the regional level, the Valle del Cauca and Huila departments, through government entities, connected the policy of the central level, giving impetus to fish farming. At the same time, the government of the Huila department, through the Ministerio de Agricultura y Desarrollo Rural, developed, since the late 1970s, actions related to the promotion of traditional fish farming, with the aim of harmonizing state policy and improving the diet of the population through the planting of yellow mojarra and tucunaré or peacock. In coordination with Inderena, the departmental government distributed the Nilotic Tilapia among the peasants at the beginning of the 80s.

Thus, fish farming had taken on its own dynamic in the department of Huila with the announcement of the construction of the Alto Magdalena fish station, which would cost 35 million pesos, co-financed by the Inderena-AID agreement. The work was finished and inaugurated in 1980 when fish farming programs began. In addition to the work in question promoted by the national government, the department carried out others with a similar objective, although of a lesser magnitude.

The records of the Secretaría de Fomento Agropecuario y Minero of Huila department show that from the 1980s onwards, spending and investments with public resources tending to promote fish farming intensified. During the years 1985 and 1986, the Yaguará fish stations and the Yamboró farm in Pitalito were built, in addition to the Piedra Pintada experimental farm in the municipality of Aipe, with which four stations were reached in the Department.

Once the fish stations were built, the departmental government contracted a fish farming program with the Hungarian company Agrober that was implemented in the Yaguará fish station. The mentioned contract was carried out between 1986 and 1987 with a cost of USD 308,700, plus USD 144,000, which was added in addition. The program was financed with its own resources and aid from the UNDP (United Nations Development Program) under the UNDP/FAO/COL/83/102 project and contemplated, among other items, the acquisition of a standard incubation and laboratory equipment “Fish Con” for the reproduction of 10 million fingerlings per year. It also included duck production, fish culture in cages on 1,000 m2 surfaces with an annual yield of 7.2 tons, and polyculture fish production on a 1.2-hectare surface with a yield of 5 tons/year.

With the existing infrastructure, the Secretaría de Fomento Agropecuario y Minero of Huila formally established a fish development program, providing services for the construction of fishponds and lakes, in addition to selling sexed silvergill juveniles. The construction and entry into operation of the Betania dam in 1987 generated new conditions for fish production in Huila. In this way, the departmental government, through the Secretaría de Fomento Agropecuario y Minero, contracted in 1993 a technical, ecological, and socioeconomic feasibility study for the intensive cultivation of redgill in floating cages in the Betania reservoir. The study was sponsored by the Corpus Centro Oriente at the request of the departmental government (Diario del Huila, January 10, 1994). After this study, fish farming was intensively developed in the reservoir, and the Huila department occupied important lines in the national context.

It is noted that the agreements with international organizations were reduced from the 90s. However, this situation was compensated with the financial, technical, and investigative contributions of some national organizations, such as Colciencias, and centers of research and technological development, such as Ceniacua in 1993. The formation of trade associations in

different regions of the country, such as Acuanal in 1985 or Acuapez in Huila in 2006, means that producers are currently recognized and considered by the national government in the setting policies, decision-making, coordination of measures, promotion of productive chains, as well as in research, technological development, and the allocation of resources for technological innovation and infrastructure development.

According to what was expressed in the recently formulated National Plan for the Development of Sustainable Aquaculture in Colombia (AUNAP, 2014), aquaculture continues to be a high-priority activity for the Colombian government, which is why the Autoridad Nacional de Acuicultura y Pesca - AUNAP- which, together with the Directorate of Livestock, Fisheries and Aquaculture Chains of the Ministerio de Agricultura y Desarrollo Rural, promote the sustainable development of the activity.

4.4 A regulatory framework for action

The regulations related to fishing activity in the country date back to Decree 2269 of 1953, which assigned the surveillance, control, and issuance of patents and licenses for maritime fishing to the National Navy. The decree was repealed in 1957 by Legislative Decree 0376, which contemplated, for the first time, maritime and inland fishing. This decree was considered the first fishing statute. With the norm, the functions of management and administration of aquatic fauna and flora were assigned to the Ministerio de Agricultura.

However, fish regulations only took shape in the mid-1970s, when the national government, through Decree 2811 of 1974, issued the National Code for Renewable Natural Resources and Environmental Protection, regulated by Decree 1681 of 1978, regarding the conservation, promotion, and use of hydrobiological resources. This was the regulatory framework for the operation of Inderena, which was the entity in charge of guiding matters related to fish farming between 1968 and 1990.

The Subgerencia de Pesca y Fauna of Instituto Nacional de Recursos Naturales Renovables y del Ambiente -Inderena- assumed the responsibility of executing the country's fisheries and aquaculture policy. However, its management was characterized by a clear conservationist orientation and with little emphasis on sectoral development and international negotiation since its mission was governed by a policy of environmental focus (Castillo, 2001).

The aquaculture activity had similar importance in the development plan “Change with Equity,” which was formulated for the period 1982-1986. The plan in question promoted commercial aquaculture activity with an emphasis on shrimp, trout, and ornamental fish. Also, the Social Economy Plan formulated for the period 1986-1990 raised the objectives for the agricultural sector to recover the dynamism of fishing and forestry production. In this sense, it is noted that the 1980s and, especially, the five-year period 1986-1990, was definitive for the commercial development of red tilapia in Colombia, particularly for Valle del Cauca, the department that led this process at the beginning. At the same time, worldwide production of tilapia doubled between 1986 and 1992, which predicted an attractive future for the activity (Castillo, 2001).

In the case of tilapia production, it went from 100 tons in 1985 to 2040 tons in 1990. Because of this fish farming dynamic, in 1989, the national government, with the restructuring of the Ministerio de Agricultura, granted fishing and aquaculture their own scope, locating them within the General Directorate of Production. In that same year, with the help of the National Technology Transfer Program (PRONATA), some technical advisory functions were

decentralized and attached to the recently created Unidades de Asistencia Técnica Agropecuaria - UMATA (Castillo, 2000).

The legal framework formed until the end of the 1980s provided a new perspective on the fish farming activity on the part of the State, which stopped being conceived as a mere work of livelihood and repopulation of basins to be registered within a commercial logic, which demanded actions for the development of infrastructure and incorporation of technological advances that would make it profitable. In fact, during this period, the first private initiatives arose in Huila and Valle del Cauca, such as Castalia Ltda. (although it was created in 1974 in Garzón, Huila, it began cultivating silver gill in 1982); Compañía Vallecaucana de Acuicultura CVA in 1987, Acuicultivos de Cali Ltda. in 1985, the first in the country dedicated to genetic research, interpretation of hereditary mechanisms, improvement and commercial production of red and Nilotic tilapia fingerlings, and Colapia S.A in 1988, which has become the reference company for South America due to the use of the latest technology, in addition to projecting the country as the largest producer of red tilapia in the region (Castillo, 2000).

In this sense, the Compañía Vallecaucana de Acuicultura CVA obtained, through a feasibility study for the intensive production of red tilapia, a development credit from PROEXPO, as well as being a beneficiary of the Vallejo Plan. This allowed it to become the first intensive fish farm dedicated to the commercial cultivation and export of red tilapia (Castillo, 2001). For its part, Castalia Ltda broke into fish farming in 1982 with the advice of Servicio Nacional de Aprendizaje – SENA technicians, within the scope of the Food Security Program, in addition to receiving financial support with credit resources established by the national government of the time.

This political and legal framework allowed the paradigm shift in fish farming from the perspective of the State, which went from conceiving it as a livelihood task and, in this sense, from carrying out promotion actions based on restocking to interpreting it under a rationale business that implied making efforts in technical developments and technological advances that would make it profitable.

In the 1990s, the State continued to strengthen fish farming by establishing a more serious policy with the issuance of Law 13 of 1990, known as the General Fisheries Statute, with which not only did it create the INPA, but the national government formulated the National Fisheries and Aquaculture Development Plan, which provided a new legal and institutional framework for Fisheries and Aquaculture, at a time when an open and aggressive policy of economic opening, revaluation of the peso and search for external markets for products was established nontraditional.

Likewise, at the beginning of the 1990s, the government presented the Comprehensive Rural Development Plan (PDIC), aimed at raising the standard of living in the rural sector and expanding the capacity to generate income for nearly 280,000 small farmers and artisanal fishermen in 9,000 villages of 602 municipalities located in 21 departments. At the same time, it sought to improve institutional mechanisms and procedures and strengthen municipal management capacity in the formulation and administration of rural development programs (Vargas, 2003).

The PDIC was essentially a production-oriented program that had been structured to address constraints that prevented small farmers and fishermen from making better use of resources by concentrating its activities on small farmers with the potential to become agricultural entrepreneurs. The intention was also to meet the enormous demand for basic infrastructure (roads and aqueducts), for which it allocated 56.4% (USD 141.1 million), while the productive

components (technological development, marketing, CESPA, aquaculture, and micro-watersheds) assigned 28% (USD 69.8 million) (Vargas, 2003).

In support of fish farming, the documents CONPES 2723 of 1994 (Agricultural and Rural Modernization Program), CONPES 2745 of 1994 (Rural Modernization Policy and Rural Business Development), and CONPES 2786 of 1995 (Agricultural, Fisheries Competitiveness Policy) were also formulated. And forestry). In addition, Law 99 of 1993, or the General Environmental Law of Colombia, was promulgated, which created the Ministerio del Medio Ambiente and reorganized the public sector in charge of the management and conservation of the environment and natural resources.

The foregoing was complemented, years in a row, with document CONPES 2959 of 1997, which established the policy for the development of fishing and aquaculture, with the aim of revitalizing the fishing and aquaculture sector to adapt it to the processes of economic integration, while taking advantage of opportunities to open markets. The strategies proposed by the national government in the aforementioned document to implement the development of the fisheries and aquaculture subsector were: 1) Research and technological development, 2) Fisheries and aquaculture management, 3) Development of promotion and support mechanisms for the modernization of production 4) Training of human resources 5) Promotion and negotiation in the commercial field 6) Legal and institutional aspects for the ordering and administration of fishing and aquaculture resources (Departamento Nacional de Planeación, 1997).

In the same decade, the Colombian State directed its policy towards the opening of markets and the internationalization of the economy. At that time, fish farming experienced exponential growth in exports, in addition to benefiting from the expansion of the domestic market by achieving acceptance by consumers in areas where, culturally, fish was not in great demand (Castillo, 2000).

With arduous promotional work at the international level, which had the support of State entities, between 1992 and 1995, second place in the presentation of fresh fillets in the United States was achieved, behind Costa Rica as the undisputed leader of the time (Castillo, 2001). The country became so entrenched in the production of red tilapia that this product became the flagship of national aquaculture to the point of reaching 16,000 tons in 1995. The panorama of fish farming in the country since 1996 was nuanced, given that the national production of tilapia (greater than 16,000 tons), especially red tilapia, was supported by medium and small fish farming companies, mainly in the Valle del Cauca, Caldas, Huila, Tolima, and Meta departments.

The strong domestic demand for the product translated into a notable stimulus to production. Tilapia farming was strengthened with the farming projects that began in the second half of the 1990s in the Betania (Huila), Salvajina (Cauca), and Prado (Tolima) dams through the intensive modality in cages and floating cages. As a result, tilapia fish production closed the nineties with a production of 19,842 tons, representing 38% of the total aquaculture production. With Law 13 of 1990, which gave life to the INPA, a state effort arose towards the regulation, applied research, promotion, training, business, and commercial organization of the fish farming activity. As an incentive to the sector, Law 101 of the same year was promulgated, by which the Rural Capitalization Incentive (ICR) was created as a right to an economic benefit granted to a person for the execution of a new project or activity of new investment that entails a technological contribution. This incentive ranges from 20% to 40% of the value of the investment.

In this same sense, it is noted that since the late 1990s and early 2000s, the unions and the departmental government of Huila began joint activities to carry out competitiveness studies. From the first documents (competitiveness series No. 4 and 5), agro-industry and fish farming, along with coffee and fruit trees, were included as key activities for the competitiveness of the department (Corporación Huila Futuro, 2001). In 2004, in compliance with the guidelines of the National Planning Department and what is contained in document CONPES 3297, the productive bets that would strengthen competitive advantages were identified and, with them, defined an internal agenda for the productivity and competitiveness of the country. Agro-industry, and in particular, the formation of the fish farming chain, was included as an activity that would require short and medium-term actions by the national government, territorial entities, and civil society in the department of Huila.

From the Huila Internal Productivity and Competitiveness Agenda materialized in 2005, new formulations were reached, such as the Regional Competitiveness Agreement signed in January 2006, the Regional Competitiveness Plan 2010 (Departamento Administrativo de Planeación Departamental, 2005), Strategic Plan for Agriculture and Rural Development with a vision for 2020 and recently the update of the Internal Agenda for Productivity and Competitiveness of Huila, called the Regional Plan for Productivity and Competitiveness of Huila in 2016. In all these documents, which have been part of public policy, the fish farming chain was included.

In 2015, the Ministerio de Agricultura y Desarrollo Rural and Autoridad Nacional de Acuicultura y Pesca - AUNAP issued Decree 1780 of 2015 and Resolution 2087 of the same year, in which they decreed red and silver tilapia, and trout rainbow as species of domestic and commercial interest, to stimulate the development of national aquaculture. With this measure, the species in question were excluded from the inventory of invasive species in which they were found up to that moment. In general, the growth of aquaculture has had, since 1985, a favorable and sustained trend, except for some sporadic adverse events. Thus, from the 2000s, the department of Huila became, by far, the main fish producer in the country, exceeding 20,000 tons per year, which represents a little more than 50% of the national production.

4.5 The contribution of knowledge and technology to fish farming

The introduction of exotic species, such as trout, carp, and tilapia, undertaken since the second decade of the last century, and their genetic improvement, especially with technology developed in other countries, enabled the development of continental fish farming in Colombia. Added to this process is the reproduction of native species such as bocachico, catfish, white and black cachama, and yamú. In the case of tilapia, the development of farming in floating cages that occurred in the 1990s also had a special impact on increasing productivity (Organización de las Naciones Unidas para la Alimentación y la Agricultura, 2005).

Since 1960, the year in which the FAO sponsored the first course on fish farming, the generation and transmission of related knowledge has not ceased in Colombia nor in the world. In 1965, the Universidad de Caldas established a fish farming program whose objective was the generation of appropriate technology for the reproduction of Rendalli tilapia in the coffee zone of the country (Castillo, 2000). This species would be used years later by the Federación Nacional de Cafeteros in the program to promote fish farming.

In the same decade, at the international level, two works appeared that definitively promoted the production of fingerlings and the culture of tilapia. The first of them was presented by Hickling (1960), in which selective crosses were made between various tilapia species,

achieving 100% hybrid generations between homogametic males and females. Until then, the great difficulty lay in keeping the two lines completely pure. The second, elaborated by Clemens and Inslee (1968), considered the definitive impulse for the commercial production of tilapia, consisted of achieving sexual induction results using masculinizing estrogens, with which overpopulation was avoided, while the areas were reduced. Required for broodstock and fingerlings (Castillo, 2000).

In the first half of the 1970s, the first national aquaculture congresses were organized, which, in addition to dealing with issues related to the species that were being incorporated into the basins and artisanal fish farming, were a point of dissemination for what could potentially it was seen as an important line of the national economy. Experiments with the introduction of new fish species, especially tilapia, were also continued. Red tilapia, as well as other hybrids, including Sterling's red tilapia, have been introduced to the country since 1982 by private producers. As Castillo (2001) explains, genetic research and development processes began in the country in that decade, specifically in Valle del Cauca.

Beginning in 1995, work on the genetic improvement of this species began in the country with the advice of Cuban experts. As a result, some hybrids were identified whose behavior was adjusted to the environmental conditions typical of the producing regions (Organización de las Naciones Unidas para la Alimentación y la Agricultura, 2005). Cuba, since 1990, has exceeded the production of 18,600 tons of tilapia from reservoirs and lakes, having as a novelty the use of supplementary food, a laboratory to produce fingerlings, and the use of ponds for semi-intensive and intensive production (Fonticiella and Sonesten, 2000).

As genetic knowledge progressed, practices were undertaken that generated technologies for the production of tilapia and the consequent transformation of the artisanal fish farming activity to a commercial activity, such as the “pre-breeding or fingerling” cycle, until the 30 grams on average; high management densities of fingerlings in cement ponds and cages (hapas); anti-bird nets or meshes to avoid the enormous predation of the fry by birds and bats; transfers between fattening cycles, standardizing each crop cycle in periods of 4 months, including size selection at each cycle change; continuous change of water, complemented by the use of supplementary aeration with air injection equipment; use of supplementary diets, balanced feed specially manufactured for the commercial production of tilapia, with various levels of protein and size of the pellets; and, plantings month by month, which allowed harvests to be carried out equally on a monthly basis throughout the year (Castillo, 2000).

In more recent decades, the generation and transfer of knowledge have intensified with the participation of government entities such as Colciencias and Incoder, research centers such as Invemar and Ceniacua, and especially, the establishment of training programs in universities in the country, hand in hand with research processes: Universidad de Córdoba (technical and professional cycle in Aquaculture), Universidad de Nariño (Aquaculture Engineering), Universidad de Antioquia (Aquaculture Engineering), Universidad del Magdalena (Fisheries Engineering and Master's Degree in Aquaculture), Universidad Jorge Tadeo Lozano (Biology Marina), Universidad de Los Llanos (Specialization in Aquaculture), Universidad Surcolombiana (technical and professional cycle in Aquaculture), Politécnico Grancolombiano Jaime Cadavid (agricultural technician with emphasis in Aquaculture. In addition to the emphasis that has different veterinary medicine and zootechnical programs).

4.6 The decline of traditional fishing

It is estimated that in 1994, there were a little over 55,000 traditional fishermen in the country in the different basins (these figures do not include the department of Chocó because there are no data in this regard). Of the total number of fishermen identified in the census, more than 50% carried out their activity on the Magdalena River, followed by the Amazon River and other rivers in the Orinoquía (Ministerio de Agricultura y Desarrollo Rural, 2012).

In contrast to artisanal fish farming, traditional fishing began to lose importance at the beginning of the 1990s, mainly due to the progressive decline in its production due to the generalized contamination of watersheds, as they received waste and industrial, agricultural, mining, tourism, and municipal sewage. Added to this was the deforestation of the riverbanks, the over-harvesting, and improper use of fishing gear and methods that caused the decrease in the average capture sizes (TMC) and the average sizes at maturity of the species (Ministerio de Agricultura y Desarrollo Rural, 2012).

In 1974, the main basins (Magdalena, Cauca and San Jorge rivers) contributed 78,847 tons of fish, compared to 7,182 tons in 2008, which meant a reduction of more than 90% over the course of three decades. In this same sense, some studies affirm that the period of decline in the production of the Magdalena River, and in general the country, began in 1987 (Ministerio de Agricultura y Desarrollo Rural, 2012). This year coincides with the entry into operation of the Betania reservoir in Huila.

At the same time, the apparent consumption of fishery and aquaculture products in the country showed a positive, although not satisfactory, behavior. According to AUNAP (2014), the apparent consumption in 1991 was 1.19 kg/person/year. At the beginning of the 21st century, it reached 3.12, and in 2011, it reached 4.54; that is, it multiplied by 4 in just over 20 years. In this way, the fish consumption market needed someone to replace the products that capture fishing or traditional fishing did not produce. In this context, it is noted that the critical situation of traditional fishing ended up strengthening artisanal fish farming and the emergence of commercial fish farming, which, as stated, was on the rise thanks to the incorporation of techniques and technologies that increased the levels of production, which added to state support and demographic development.

Conclusions

The objective of the research was to establish the characteristics of the emergence of the economic activity of the fish farming agro-industry in a peripheral region of Colombia. Thus, it is noted that the configuration of this economic activity is not part of any of the theories analyzed, nor is its appearance like that of processes that have arisen in other latitudes, emerging as a phenomenon very typical of developing countries. Indeed, the emergence of fish farming is due to the competition of a policy to promote fish farming carried out by the State, public institutions, and trade unions in the agricultural sector; the existence of a regulatory framework that allowed the performance of organizations dedicated to the activity; the technological contributions made by multilateral entities and decentralized public entities that promoted genetic and nutritional improvements; and the deterioration of traditional continental fishing that allowed a demand-oriented towards fish products.

The emergence of economic activity because of the appearance of a group of companies constitutes a phenomenon of high importance because it generates well-being and development in a region with the generation of employment, income, and taxes, in addition to stimulating

the dynamics of other activities. Related economics. The case of Fish farming is a phenomenon that is hardly part of the theoretical proposals related to the literature and is widely exposed in the first part of this document.

Compared to the industrial districts described by Becattini (1988), marked differences are noted, especially because the companies that emerged in fish farming did not have a strong link with the community in which they emerged; that is, a special symbiosis was not visualized between the activity productive and community life. Rather, their role went unnoticed in much of the community in which they developed, experiencing some resistance at first and then going unnoticed for the past two decades.

On the other hand, the local phenomenon is little related to the cluster because the main condition, in the words of Porter (1998), refers to the geographical concentration of interconnected companies and institutions; that is, suppliers and product manufacturers must coincide with organizations, government entities, universities, standard-setting bodies, think tanks, trade associations, research associations, technical support, and customers. For fish farming, it has been difficult for a large part of these links and actors to coincide in the same geographical space, having to generate strong links with supplying companies and clients, and external research centers to reach markets and satisfy technology needs, infrastructure, specialized knowledge, and inputs necessary for the operation. During the last decade, an articulated effort by the national and regional governments has succeeded in stimulating the creation of certain industries in the same geographic space to support fish farming agro-industrial activity; however, the efforts have yielded discreet results.

Some contributions from the neo-institutional perspective seem to be closer to the reality of the activity analyzed to the extent that the action and practices of multiple agents within the framework of certain organizations gave life to the institutional dynamics (Dimaggio & Powell, 1999) that, later, it was configuring an economic activity. Under this logic, the neo-institutionalist dynamic can partially explain the origin of the fish farming agro-industrial activity. In addition, it can be considered that the business agents of said activity were acting in such a way that they configured simple but effective strategies to take advantage of opportunities in the environment, probably based on the actions of the State and other market forces.

The phenomenon analyzed has very particular connotations typical of developing economies. Its Genesis was given by the interaction of a policy to promote fish farming carried out by the State, public institutions, and unions of the agricultural sector; the existence of a regulatory framework that allowed the performance of organizations dedicated to the activity; the technological contributions made by multilateral entities and decentralized public entities that promoted genetic and nutritional improvements; and the deterioration of traditional continental fishing that allowed a demand-oriented towards fish products.

Indeed, it is then possible to identify a phenomenon that has a starting point in the national and international market, with a high level of demand for fish products. This demand that is presented is driven by the consumption of important cities at a national and international level, which, by the end of the 1990s, were the urban centers with large consumption par excellence, where the supply was widely exceeded, and a need arose. From there, the state begins to generate beneficial conditions for the appearance and growth of companies linked to fish farming agro-industrial processes. Aspects such as development programs, articulating and financing laws of companies for technological development processes, overinvestment subsidy projects, technical production, and exploitation studies were the tools and means used by State institutions for said purpose. The state motivated local initiatives to take place, and from the

second half of 1990 to the beginning of the year 2000, many agro-industrial companies emerged that later placed the department as the first fish producer in such a way that finally, the local business agents, aware of unsatisfied markets and detecting a series of favorable conditions in the environment, decide to venture to allocate modest sums of capital to said businesses. Subsequently, state institutions finance modernization and adaptation processes for machinery and equipment, especially processing and production plants. In addition, carrying out ambitious international promotion programs and business roundtables, together with international trips and seminars and the involvement of international experts for local projects, generated many incentives for the activity.

The emergence of economic activity because of the appearance of a group of companies constitutes a phenomenon of high importance because it generates well-being and development in a region with the generation of employment, income, and taxes, in addition to stimulating the dynamics of other activities. Related economics. The case of Fish farming is a phenomenon that is hardly part of the theoretical proposals related to the literature and is widely exposed in the first part of this document.

Compared to the industrial districts described by Becattini (1988), marked differences are noted, especially because the companies that emerged in fish farming did not have a strong link with the community in which they emerged; that is, a special symbiosis was not visualized between the activity productive and community life. Rather, their role went unnoticed in much of the community in which they developed, experiencing some resistance at first and then going unnoticed for the past two decades.

On the other hand, the local phenomenon is little related to the cluster because the main condition, in the words of Porter (1998), refers to the geographical concentration of interconnected companies and institutions; that is, suppliers and product manufacturers must coincide with organizations, government entities, universities, standard-setting bodies, think tanks, trade associations, research associations, technical support, and customers. For fish farming, it has been difficult for a large part of these links and actors to coincide in the same geographical space, having to generate strong links with supplying companies and clients, and external research centers to reach markets and satisfy technology needs, infrastructure, specialized knowledge, and inputs necessary for the operation. During the last decade, an articulated effort by the national and regional governments has succeeded in stimulating the creation of certain industries in the same geographic space to support fish farming agro-industrial activity; however, the efforts have yielded discreet results.

Some contributions from the neo-institutional perspective seem to be closer to the reality of the activity analyzed to the extent that the action and practices of multiple agents within the framework of certain organizations gave life to the institutional dynamics (Dimaggio & Powell, 1999) that, later, it was configuring an economic activity. Under this logic, the neo-institutionalist dynamic can partially explain the origin of the fish farming agro-industrial activity. In addition, it can be considered that the business agents of said activity were acting in such a way that they configured simple but effective strategies to take advantage of opportunities in the environment, probably based on the actions of the State and other market forces.

The phenomenon analyzed has very particular connotations typical of developing economies. Its Genesis was given by the interaction of a policy to promote fish farming carried out by the State, public institutions, and unions of the agricultural sector; the existence of a regulatory framework that allowed the performance of organizations dedicated to the activity; the technological contributions made by multilateral entities and decentralized public entities

that promoted genetic and nutritional improvements; and the deterioration of traditional continental fishing that allowed a demand-oriented towards fish products.

Indeed, it is then possible to identify a phenomenon that has a starting point in the national and international market, with a high level of demand for fish products. This demand that is presented is driven by the consumption of important cities at a national and international level, which, by the end of the 1990s, were the urban centers with large consumption par excellence, where the supply was widely exceeded, and a need arose. From there, the state begins to generate beneficial conditions for the appearance and growth of companies linked to fish farming agro-industrial processes. Aspects such as development programs, articulating and financing laws of companies for technological development processes, overinvestment subsidy projects, technical production, and exploitation studies were the tools and means used by State institutions for said purpose. The state motivated local initiatives to take place, and from the second half of 1990 to the beginning of the year 2000, many agro-industrial companies emerged that later placed the department as the first fish producer in such a way that finally, the local business agents, aware of unsatisfied markets and detecting a series of favorable conditions in the environment, decide to venture to allocate modest sums of capital to said businesses. Subsequently, state institutions finance modernization and adaptation processes for machinery and equipment, especially processing and production plants. In addition, carrying out ambitious international promotion programs and business roundtables, together with international trips and seminars and the involvement of international experts for local projects, generated many incentives for the activity.

References

Acs, Z. J., Autio, E., & Szerb, L. (2014). National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy, 43*(1), 476-494. https://doi.org/10.1016/j.respol.2013.08.016

Arıkan, A. T., & Schilling, M. A. (2011). Structure and governance in industrial districts: implications for competitive advantage. *Journal of Management Studies, 48*(4), 772-803. https://doi.org/10.1111/j.1467-6486.2010.00951.x

Autoridad Nacional de Acuicultura y Pesca – AUNAP (2014). *Plan Nacional para el Desarrollo de la Acuicultura Sostenible Colombia*. BOGOTÁ. http://aunap.gov.co/wp-content/uploads/2016/04/Plan-Nacional-para-el-Desarrollo-de-la-Acuicultura-Sostenible-Colombia.pdf

Bagnasco, A. (1977). *Tre Italie: la problematica territoriale dello sviluppo italiano*. Bologna: Editeur Il mulino.

Becattini, G. (1988). *Los distritos industriales y el reciente desarrollo italiano. En: Distritos industriales y pequeña empresa*. España: Siglo Veintiuno.

Ben-Yami, M. y Adersen, A. (1987). *Centros comunitarios de pesca: pautas para su fundación y operación*. FAO.

Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*. London: Routledge & Kegan Paul.

Bourdieu, P. (1990). *The Logic of Practice*. USA: Stanford University Press.

Cansiz, M., & Tekneci, P. D. (2018). Innovative and technology-based women entrepreneurs in Turkey: Capital and performance. *Journal of Economy Culture and Society, 57*, 151-183. https://doi.org/10.26650/JECS372449

Castillo, L. (2000). *La importancia de la tilapia roja en el desarrollo de la piscicultura en Colombia*. Asociación Red Cauca, Alevinos del Valle.

Castillo, L. (2001). *Tilapia Roja 2001. Una evolución de 20 años, de la incertidumbre al éxito doce años después*. Memorias. https://ag.arizona.edu/azaqua/ista/Colombia/TILAPIA_ROJA.doc

Chia, R., & MacKay, B. (2007) Post-Processual Challenges for the Emerging Strategy-as-Practice Perspective: Discovering Strategy in the Logic of Practice. *Human Relations, 60*, 217-242. http://dx.doi.org/10.1177/0018726707075291

Corporación Huila Futuro (2001). *La Meta, la Estrategia, las Acciones y el Marco Institucional para la Competitividad*. Serie de Competitividad No 4 y 5. Colombia: Neiva.

Crevoisier, O. (2004). The innovative milieus approach: toward a territorialized understanding of the economy? *Economic Geography*, 80(4), 367-379. http://dx.doi.org/10.1111/j.1944-8287.2004.tb00243.x

Delgado, M., Porter, M.E., & Stern, S. (2010) Clusters and Entrepreneurship. *Journal of Economic Geography*, 10, 495-518. http://dx.doi.org/10.1093/jeg/lbq010

Departamento Administrativo de Planeación (2005). *Agenda Interna de Productividad y Competitividad del Departamento del Huila*. Colombia: Neiva.

Departamento Nacional de Planeación. (1997). *Política para el desarrollo de la pesca y la acuicultura*. Colombia: Neiva.

Dimaggio, P., & Powell, W. (1999). *El nuevo institucionalismo en el análisis organizacional*. México: Fondo de Cultura Económica.

Doloreux, D. (2002). What we should know about regional systems of innovation. *Technology in Society*, 24(3), 243-263. https://doi.org/10.1016/S0160-791X(02)00007-6

Elston, J. A., & Weidinger, A. (2019). Entrepreneurial intention and regional internationalisation in China. *Small Business Economics*, 53, 1001–1015. 10.1007/s11187-018-0114-5

Fonticiella, D., & Sonesten, L. (2000). Tilapia aquaculture in Cuba. In: Costa-Pierce BA and Rakocy. JE (eds) *Tilapia Aquaculture in the Americas*, 2, 184–203. https://www.researchgate.net/publication/284899147_Tilapia_Aquaculture_in_Cuba

Gobernación del Huila. (2022). *El Huila se consolida como potencia piscícola de Colombia*. https://www.huila.gov.co/publicaciones/11992/el-huila-se-consolida-como-potencia-piscicola-de-colombia/

Goodin, R. (2003). Las instituciones y su diseño. *En Goodin R. E., Teoría del diseño institucional*. España: Gedisa.

Gómez, M. (2005). C*ompetitividad y complejos productivos: teoría y lecciones de política*. Estudios y perspectivas N° 27. Buenos Aires: Cepal, Naciones Unidas.

Harrison, B. (1992). Industrial districts: old wine in new bottles? *Regional Studies,* 26(5), 469-483. https://doi.org/10.1080/00343409212331347121

Hong, M., Ge, Z., & Wu, C. (2023). The emergence of entrepreneurial ecosystems by capital, habitus, and practice: A two-phase model based on Bourdieu's approach. *Frontiers in Psychology*, 13, 987485. https://doi.org/10.3389/fpsyg.2022.987485

Humprhrey, J. (1995). Industrial reorganization in developing countries: from models to trajectories. *World Development*, 23(1), 149-162. https://doi.org/10.1016/0305-750X(94)00104-7

Isenberg, D. J. (2016). Applying the ecosystem metaphor to entrepreneurship: Uses and abuses. *Antitrust Bulletin*, 61(4), 564-573. https://doi.org/10.1177/0003603X16676162

Jepperson, R. (1991). Instituciones, efectos institucionales y la institucionalidad. En: P. J. Dimaggio & W. W. Powell, *The New Institutionalism in Organizational Analysis*, Chicago: University of Chicago Press.

LeCompte, M. D. (1995). Un matrimonio conveniente: diseño de investigación cualitativa y estándares para la evaluación de programas. *Relieve*, 1(1), 1-13. https://doi.org/10.7203/relieve.1.2.6322

López, L., & Calderón, G. (2006). Análisis de las dinámicas culturales al interior de un clúster empresarial. *Estudios Gerenciales*, 99, 13-37. http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0123-59232006000200001

Marshall, A. (1890). *Principles of Political Economy*. New York: Maxmillan.

March, J. G., & Olsen, J. P. (1997) *El redescubrimiento de las instituciones. La base organizativa de la política*. México: Fondo de Cultura Económica.

Meyer, J. W., & Rowan, B. (1977). Institutionalized Organizations: Formal structure as myth and ceremony. *The American Journal of Sociology,* 83(2), 340-363. https://www.jstor.org/stable/2778293

Ministerio de Agricultura y Desarrollo Rural. (2022). *Producción pecuaria con referencia anual periodo 2010-2020*. https://www.agronet.gov.co/estadistica/Paginas/home.aspx?cod=64

Molina-Ramírez, E., & Barba-Sánchez, V. (2021). Embeddedness as a differentiating element of indigenous entrepreneurship: insights from Mexico. *Sustainability, 13*, 2117. https://doi.org/10.3390/su13042117

Organización de las Naciones Unidas para la Alimentación y la Agricultura –FAO- (2005). *Visión general del sector acuícola nacional Colombia*. http://www.fao.org/fishery/countrysector/naso_colombia/es

Parrado, Y. (2013). Historia de la Acuicultura en Colombia. *Revista Científica de la Sociedad Española de Acuicultura*, 37, 60-77. http://www.revistaaquatic.com/aquatic/pdf/37_9.pdf

Piña, J., & Morales, A. (2010). Aloe en Venezuela: de la cadena de valor al Distrito Industrial. Problemas del desarrollo. *Revista Latinoamericana de Economía,* 41(160), 187-208. https://www.redalyc.org/pdf/118/11820132009.pdf

Piore, M., & Sabel, Ch. (1984). *The Secortd Industrial Divide. Possibilities for Prosperity*. Nueva York, Basic Books.

Porter, M. (1998). Clusters and the new competitive economy. *Harvard Business Review,* 76(6), 77-90. https://hbr.org/1998/11/clusters-and-the-new-economics-of-competition

Pyke, F., Becattini, G., & Sengenberger, W. (1990). *Industrial districts and inter-firm co-operation in Italy*. Geneva: International Institute for Labour Studies.

Rosenfeld, S. (2002). *Creating Smart Systems: A Guide to clusters strategies in less favored regions*. USA: Regional Technology Strategies, Carboro, North Carolina. www.rtsinc.org

Salazar, A.G. (2001). *Consideraciones generales sobre la acuicultura*. Fundamentos de Acuicultura Continental. Instituto Nacional de Pesca y Acuicultura. Colombia.

Scapens, R. W. (1994). Never mind the gap: towards an institutional perspective on management accounting practice. *Management Accounting Research,* 5, 301-321. https://doi.org/10.1006/mare.1994.1019

Schmitz, H. (1995). Collective Efficiency: Growth path for small-scale industry. *The Journal of development studies,* 31(4), 529 – 566. https://doi.org/10.1080/00220389508422377

Scott, W. R. (2008). *Institutions and Organizations*. California: Sage.

Scott, A. J. (2006). *Geography and economy*. Oxford: Oxford University Press.

Spigel, B. (2017). The relational organization of entrepreneurial ecosystems. *Entrepreneurship Theory and Practice*, 41(1), 49-72. https://doi.org/10.1111/etap.12167

Storper, M. (1995). The resurgence of regional economies, ten years later the region as a nexus of untraded interdependencies. *European Urban and Regional Studies*, 2(3), 191–221. https://doi.org/10.1177/096977649500200301

Tallman, S., Jenkins, M., Henry, N., & Pinch, S. (2004). Knowledge, clusters, and competitive advantage. *Academy of Management Review*, 29(2), 258-271. https://doi.org/10.2307/20159032

Tassara, C., & Rivera, J., (1991). *Movimientos sociales, medio ambiente y pesca en Colombia*. Bogotá: ECOE Editores.

Toledo, S., & García, M. (2002). *Nutrición y Alimentación de Tilapia Cultivada en América Latina y el Caribe*. Cuba: Centro de Preparación Acuícola Mamposton, Ministerio de la Industria Pesquera.

Vargas, R. (2003). *Colombia: el Programa de Desarrollo Integral Campesino (PDIC). En: La pobreza rural en América Latina: lecciones para una reorientación de las políticas*. Serie seminarios y conferencias No. 27. Santiago de Chile: Naciones Unidas, Cepal, RIMSP FAO.

Whittington, R. (2006). Completing the Practice Turn in Strategy Research. *Organization Studies*, 27(5), 613–634. https://doi.org/10.1177/0170840606064101

Agradecimiento

Los autores agradecen a la Facultad de Economía y Administración de la Universidad Surcolombiana por el apoyo recibido en el desarrollo de la investigación.