

**Research Article****SUSTAINABILITY IN AQUACULTURE IN MEXICO, CHILE, AND COLOMBIA, TOWARDS INTERNATIONALIZATION*****V́ctor Hugo Śnchez Sotomayor and Juan Joś Huerta Mata**University of Guadalajara, University Center for Economic Administrative Sciences, Business Management Division,
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Abstract

This article presents a preliminary investigation of the way in which sustainability is worked in the aquaculture sector in Mexico, Chile, and Colombia that are part of the Pacific Alliance, since they normally develop activities related to the primary sector, their focus it is oriented to the legal perspective, it is analyzed from legal systems and its link with the United Nations Sustainable Development Goals (UN, SDGs, 2015). As explained in the document, coastal and inland waters where aquaculture takes place deteriorate rapidly due to pollution; despite the coordinated efforts of public, private, and social actors, progress is being made slowly with establishing commitments that allow increasing care for the environment and stopping the harmful effects that this causes. The research was carried out with a qualitative-descriptive approach; the technique used was content analysis to review documents in scientific databases, pages and electronic portals of the Federal Government in the aforementioned countries, which address the central theme from their different perspectives. This tool allows us to identify the trend of aquaculture sustainability at an international level. The United Nations Organization, in accordance with its Sustainable Development Goals, strives to achieve actions of permanent impact in the medium and long term, and to sustainably use the oceans, seas, and marine resources.

Keywords: Sustainability, Aquaculture, Internationalization, United Nations, Sustainable Development Goals.

INTRODUCTION

The link to the primary sector with sustainability in aquaculture today in terms of care and protection of the environment has become a basic and survival need to be taken into account and immediately solve all the series of problems related to the preservation of our habitat. As far as aquaculture in Mexico, Chile, and Colombia is concerned, the problem regarding pollution in the oceans, seas, and marine resources has been detected. It is necessary to greater importance on its care and development based on international requirements, proof of this is that efforts have been made due to the latent threat to life on our planet reflected in the increasingly intense climate change. An analysis of examples in this regard is made, in addition to highlighting the importance of tourism, its impact on the care of natural resources, as well as its direct relationship with a sustainable economy and the health of living beings. Reference is made to the objectives set for the correct and prompt fulfillment of the same. The Sustainable Development Goals of the United Nations created in 2015 are the backbone of the 2030 agenda, and therefore it is the responsibility of everyone at a global level to ensure that they are met. The methodology used in this research is designed with a qualitative approach, of a descriptive type, not probabilistic or experimental, making use of content analysis consisting of studying and developing the sustainability of aquaculture in a very specific way, as well as its conceptual and operational definitions in the three countries, towards internationalization. The information was collected in databases from various legal and scientific sources, pages, and electronic portals of the three countries.

The essence of its development is that once the problem has been identified, the central idea is to raise awareness to ensure that the objectives set are met as soon as possible given the results obtained and the conclusions obtained.

Problem Statement

From the legal and environmental perspective, Mexico, Chile, and Colombia have been trying to comprehensively carry out their responsibilities by international sustainability provisions for the three productive sectors established by the United Nations with its Sustainable Development Goals (UN, SDGs, 2015) and that according to what was observed from their perspective, the existing problems regarding the levels of waste in the oceans are increasing, therefore, the repercussion is of great environmental and economic impact, since the garbage marine damage harms biological diversity because organisms can become entangled in or ingest debris, die, or inhibit reproduction. A palpable example is the coral reefs. 20% have been destroyed, and there are no solution options. It is estimated that 24% of the remaining reefs are in imminent danger of disappearance due to human activity, and 26% are at risk of disappearance in a longer-term. Additionally, incorrect management of the marine environment causes overfishing to occur. The loss of economic benefits of the fishing sector is estimated at about 50,000 million dollars annually. The United Nations Environment Program estimates that the cumulative economic impact of inappropriate ocean management practices amounts to at least \$200 billion a year. The coasts are very attractive for tourism, as well as recreational activities. Marine protected areas reduce poverty because fish catches increase, therefore income improves people's health. They help to improve gender equality, since women carry out tasks to a large extent in small-scale fishing.

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The marine world made up of a large number of precious species, ranging from single-celled organisms to the largest animal that inhabits the Earth, the blue whale, as well as coral reefs, one of the most biologically diverse ecosystems in the world planet. If immediate actions are not applied to solve the problem, climate change will continue to increase the cost of damage to the oceans by another 322,000 million dollars per year in 2050. (UN, SDGs, 2015). The 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development approved by world leaders in September 2015 at a historic United Nations summit officially entered into force on January 1, 2016. With these new Sustainable Development Goals universally applicable, over the next 15 years countries will intensify efforts to end poverty in all its forms, reduce inequality, and fight climate change while ensuring that no one is left behind.

The SDGs build on the success of the Millennium Development Goals (MDGs) and seek to go further to end poverty in all its forms. The new goals are unique in that they urge all countries, whether rich, poor or middle-income, to take action to promote prosperity while protecting the planet. Recognize that initiatives to end poverty must go hand in hand with strategies that promote economic growth and address a range of social needs, including education, health, social protection and employment opportunities, while fighting against climate change and promoting environmental protection. Although the SDGs are not legally binding, governments are expected to adopt them as their own and establish national frameworks for the achievement of the 17 goals. Countries have the primary responsibility for monitoring and reviewing progress towards the targets, which will require the collection of quality, accessible and timely data. Regional follow-up and review activities will build on analyzes carried out at the national level and contribute to follow-up and review at the global level. (UN, SDGs, 2015)

Goals

Identify the degree of commitment and actions regarding compliance with sustainability standards in aquaculture in Mexico, Chile, and Colombia towards internationalization from a legal perspective. Climate change is clearly a palpable reality in a more intense and overwhelming way as time progresses with all the threats that all this represents for the survival of life on our planet. Therefore, it is considered necessary that all the nations on Earth, not only Mexico, Chile, and Colombia, react with greater intensity, speed and commitment to all tests in the fulfillment of our responsibilities in order to generate the point as soon as possible of vital inflection in comprehensive solutions to preserve life on the planet, as well as return a greater life expectancy to nature and to all living beings. Also according to the (UN, SDGs, 2015) the preservation of underwater life is essential, as well as its sustainable use of the oceans, seas and marine resources for sustainable development.

The oceans provide us with strategic natural resources, such as food, medicine, biofuels, and other products. They make molecular decomposition possible, as well as the elimination of waste, pollution, and their coastal ecosystems, in addition to acting as buffers to reduce the effects caused by rain energy. Preserving the integrity and health of the oceans helps in efforts to adapt to climate change, as well as reduce its harmful subsequent effects. (UN, SDGs, 2015)

METHODOLOGY

The design of this research is with a qualitative approach, descriptive, not probabilistic or experimental. The information was collected in databases of various scientific sources, pages and electronic portals of the Federal Governments in Mexico, Chile, and Colombia, where the central theme of this article is addressed, from the legal perspective. The content analysis tool was used, which consists of reviewing literature related to the subject in question, basically of a legal and regulatory nature, in which the trend of aquaculture sustainability is identified.

The context and/or scenario of what was found in the search for the information required for the research within its thematic universe, content analysis units regarding sustainability in aquaculture in the three countries mentioned in the previous paragraph, the care and environmental protection is with the purpose of identifying tangible proposals that show an immediate solution and quick attention to what is indicated in the statement of the problem, according to the most convenient approach design based on the objectives set, the procedures used for its subsequent data analysis and its subsequent writing in this document.

Development

The present work has the objective of contributing to the awareness of the relevance of the issue of sustainable responsibility, as well as describing the concepts and objectives in this regard. Identify the characteristics to demonstrate their importance in the current context. In this sense, organizational strategies must incorporate social and sustainable responsibility so that business and human development is possible in a just society. In building the future, people are required to inspire followers in the search for an objective that focuses on sustainability. Entrepreneurs generally do not prefer risk and do not like uncertainties, but the modern world demands practical attitudes, different from those conventional in the business world. A great motivation for pioneering entrepreneurs is to develop companies that play a relevant role in the search for sustainability. Interact in balance to follow the concept. The importance of building a future that includes the sustainability tripod that is growing day by day. Thinking about the world beyond the numbers and playing a significant role in a new economy in which continuous growth needs to be carried out responsibly, with the knowledge and responsibility that this new world requires.

In accordance with the sustainable development objectives in fisheries and aquaculture of the UN (UN, SDG, 2015), the fisheries and aquaculture sector must contribute and contribute to making all the SDGs a reality. Clearly the UN SDG 14 regarding the conservation and sustainable use of the oceans, seas and marine resources for sustainable development. FAO, in its capacity as responsible for four of the 10 progress indicators for SDG 14, is responsible for accelerating the international drive to ensure the health and productivity of the oceans, a drive that will in turn increase with the celebration of the Second United Nations Ocean Conference. (UN, SDGs, 2015). According to the FAO, the scientific advances of the last 50 years have made it possible to greatly improve knowledge regarding the functioning of aquatic ecosystems, as well as international awareness of the need to manage them sustainably. Twenty-five years after the approval of the Code of Conduct for Responsible Fisheries (hereinafter, "the Code"; FAO, 1995), the strategic use of fisheries and aquaculture

resources responsibly is now widely recognized, as well as the prioritization of this objective. The Code has been useful and the basis for the development of international instruments, policies and programs to support responsible management efforts at the global, regional and national levels. (United Nations Food and Cultural Organization [FAO], 2020, pp. vii-2)

According to the (UN, SDGs, 2015) the ocean strengthens the systems at an international level, consequently making the Earth a habitable place for the human being. Environmental conditions and variations of nature such as rain, drinking water, weather, climate, coastlines, most of our food, and the oxygen in the air we breathe are provided and regulated by the sea. The preservation of this global priority natural resource is a fundamental factor in achieving a sustainable future. However, at present there is permanent damage to coastal waters due to pollution and ocean acidification, which is having an adverse effect on the functioning of ecosystems and biodiversity. Additionally, there is a detrimental impact on small-scale fisheries. Caring for and safeguarding our oceans is survival for all living beings. Marine biodiversity is structural for the health of people and our planet. Marine protected areas must be managed efficiently, as well as their resources, as well as establish legal provisions that reduce overfishing, marine pollution and ocean acidification.

The sustainability of open ocean and high seas areas is only possible if there is greater international cooperation to protect vulnerable habitats. Governments at the international level must stipulate systems of protected areas to ensure that they are comprehensive, efficient and equal, as well as preserve biological diversity and guarantee a sustainable future. Legal measures must be taken in greater depth in its regulation and legal scope, as well as decisions in accordance with the care of the environment at all levels, in addition to always taking them into account when purchasing and consuming products of aquaculture origin. Making use of only what is strictly necessary and selecting those that are certified. The reduction of the carbon footprint is key to stopping the rise in sea level, and for this reason it is necessary to make vital adjustments in our daily lives to strengthen a greater attitude and sustainable availability. Reducing the use of plastic is quite a challenge to be able to eliminate it, as well as clean our coastlines and beaches. The dissemination of the transcendent, which is to behave with discipline and respect for the sustainability of the environment and life. Marine protected areas contribute to reducing poverty by increasing income and improving people's health" (UN, SDGs, 2015). Sustainable development must be a priority, in addition to being promoted with program actions that favor it in terms of strengthening productive activities in the native communities, as well as the delivery of support in terms of incentives, resources and technologies with the goal of increasing production. The procedures and mechanisms necessary for the titles or documents to make the concessions and permits valid will be established by the corresponding authority, as well as what is related to the languages of the concessionaires or permit holders of the original communities so that the understanding of their content is guaranteed. From our perspective, the first thing that must be done is to find the origins, the roots of the problem of the current state of the primary productive sector of fishing and aquaculture. Subsequently, highlighting the fundamental importance of the analysis and rational use of financial performance that has been had in the fishing and aquaculture industry with the firm

intention of knowing the areas where investment should be strengthened in the different processes that are part of it, such as They are infrastructure, training, technology, as well as growth with profitability, and sustainability. The climate change that we have been experiencing in recent years with increasing intensity regarding its effects and consequences in our world is increasingly worrying and threatening to our survival, therefore, the urgent need to apply comprehensive solutions as soon as possible. Sustainable development will be a priority and promoted with program actions that favor it in terms of strengthening productive activities.

Mexico

In Mexico, in accordance with the (General Law of Sustainable Fishing and Aquaculture in force published in the Official Gazette of the Federation on July 24, 2007, latest reforms published DOF on January 19, 2023 in its First Title on General Provisions - Chapter I of the Object, which refers to the objectives of this Law in its article 2.). The objectives of this Law are: I. Establish and define the principles to order, promote, and regulate the integral management and sustainable use of fishing and aquaculture, considering the social, technological, productive, biological, and environmental aspects; III. Establish the bases for the management, conservation, protection, repopulation, and sustainable use of fishing and aquaculture resources, as well as the protection and rehabilitation of the ecosystems in which these resources are found.

In accordance with (Sánchez, V.H. and Huerta, J.J., 2022) based on the current (General Law on Sustainable Fishing and Aquaculture in force, 2018 in its Third Title that refers to the national sustainable fishing and aquaculture policy in its first chapter regarding general principles in its article 17). Interesting, as well as responsible in terms of sustainability, which regulates the third fraction in this sense, which emphasizes conservation, restoration and care in the preservation and protection of the ecosystems where citizens reside, in addition to being binding with their natural strengths of recovery and availability in terms of making efficient use of the resources of the fishing and aquaculture industry. The effort reflected by the corresponding authority is striking in a very significant way, which we can appreciate in the fourth fraction; Amended and published in the Official Gazette of the Federation on January 23, 2014, it refers to the sustainable use of fishing and aquaculture resources regarding scientific and technological research topics in its strategic consolidation in its use, certainty, and development of policies, instruments, measures, mechanisms, and decisions related to conservation, restoration, protection, and sustainable use initially mentioned for attention to solutions and awareness of climate change.

Consequently, in the fifth fraction it is related to the improvement in the diet of the population of Mexico, as well as the production of foreign currency and the recognition of the aquaculture industry as a productive activity that makes the plurality of fishing and the generation viable sources of employment in the rural sector. Regarding and in accordance with the (General Law of Sustainable Fishing and Aquaculture, 2018 in its Seventh Title that refers to fishing in its first chapter related to general provisions in its articles 61 and 62), article 61 highlights the General Law of Ecological Balance and Environmental Protection among others of competence of other authorities regarding the authorizations and permits by

the Secretariat, given the environmental impact provisions regarding its headquarters and fishing activities of various categories, whether fixed or founded in waters under federal jurisdiction, in addition to any adjustments that may arise. The importance of its validity according to the respective permit, as well as its compliance with the requirements established in this Law and the official regulations.

Finally, with respect to article 62, the importance of the actions of the Secretariat, which must act in accordance with the interest of Mexico and the International Treaties and Agreements to which Mexico has adhered, as well as the regulations regarding the determination that in his case, he will declare if there are surpluses by species, in addition to what is related to exceptional cases, if there are surpluses in the participation of vessels of another nationality in the exclusive economic zone with the respective compliance with what is required in a given case and considering the rigorous reciprocity.

Chile

In the case of Chile, from its legal perspective regarding the sustainability of aquaculture, as well as its articulation with the UN SDGs, the General Law on Fisheries and Aquaculture Decree 430, September 28, 1991 in force, with modifications. Last update 06-23-2023 in its Article 1 B establishes from the beginning the importance of sustainability, by stipulating that the objective of this law is the conservation and sustainable use of hydrobiological resources, via the execution of the precautionary approach in fishing regulation and the protection of marine ecosystems in which these resources exist. Additionally, it is also interesting as far as internationalization is concerned, what is established in its Article 7 E of the same legal system. Regulates that measures for the conservation and administration of hydrobiological resources, adopted within the framework of Treaties or International Organizations of which Chile is a party or member, given that upon being admitted by Chile they will be published in the Official Gazette via resolution of the Undersecretariat in full or in extract, according to the extent of the measure adopted. They must be published in their entirety on the electronic domain page of the Undersecretariat. Regarding the Chilean Agency for International Development Cooperation, Chile and Japan, Sustainable Aquaculture is promoted in Latin American and Caribbean countries (AGCID Chile, 2014)

Chile's international cooperation is of interest, which is carried out through development cooperation actions, where its objective is to finance and/or put into practice the cooperation projects agreed between the actors that will make it a reality.

Little by little, Chile has acquired a dual responsibility: as a recipient country of international collaboration and also as a partner that offers cooperation. Chile, despite being classified internationally as an upper-middle-income country, assumes important and complex gaps in development that must be overcome, so the cooperation it receives is essential, as well as its destination to overcome certain areas of opportunity. At the same time, it has become a leading actor in South-South and Triangular Cooperation, and its participation in these forms of cooperation is increasingly required in the region, to share its experiences and strengths. In addition, Chile has consolidated Joint Cooperation Funds, as an innovative financing tool. There are currently five Funds that make it possible to increase and diversify Chilean South-South Cooperation:

- Chile-Spain Mixed Fund.
- Chile-Mexico Cooperation Fund.
- Chile Fund against Hunger and Poverty.
- Pacific Alliance Fund.
- Franco-Chilean Fund to Support Decentralized Cooperation. (AGCID Chile, 2014)

Just as Mexico has done, Chile has made efforts to incorporate sustainability in aquaculture into its legislation, as well as its constant links of internationalization and collaboration with the UN and its SDGs, for example, which makes it more accessible and achievable in regarding the achievement of the objectives set in this regard.

Colombia

In the case of Colombia, Chapter 5 of Law 13 of 1990 (1990, January 15) establishes its regulations regarding aquaculture. In the first of them, its intention towards sustainability stands out, that is, Article 41 stipulates what Aquaculture means as the cultivation of hydrobiological species with adequate techniques in natural or artificial environments and, of course, with control.

In reference to the link from the perspective and legal basis with sustainability and the UN SDGs, towards its internationalization we have that the document (Towards the Sustainability and Competitiveness of Colombian Aquaculture, 2014) results from drawing attention that among the ten largest importers of fishery and aquaculture products are China and other major world producers, which can be explained for three reasons. The first is that in these countries the internal consumption of these products is very high and constantly and rapidly growing; the second is the importance of fishmeal in imports, a structural raw material for the production of food for fish farming, shrimp farming and other industries. In China, for example, fishmeal accounted for 32.7% of its total imports in 2008. Finally, there is attention to consumer preferences; For example, many of the countries that are large exporters eat fish that they do not produce, an example of which is the salmon that they need to import.

World trade in fish products. Currently, international trade in the most produced fish species is significantly low. Therefore, for 2008, the FAO registers 2.5 million tons, which is equivalent to 5.7% of world fish production and 9.1% of the production of the five most cultivated species. Carp, despite being the most cultivated species (60.38% of global fish farming), register a low international trade, of only 1% of exports and imports, as far as salmon is concerned, which occupies the fourth position, barely 5.8% of production, represents 50.2% of trade. The second place in exports-imports is held by catfish (21.4%), followed by tilapia (15.8%) and trout (11.6%). The most significant importers of carp are China (live animals), Romania (fresh chilled) and Ireland (frozen). The leading country in salmon exports is Norway (57%), with Chile in second place (22%), followed by the United States and Canada. Salmon is offered in a wide range of presentations for export, but the dominant ones are fresh and chilled whole or filleted (56%), frozen (26%) and prepared and packaged, salted and smoked (18%).

The most important salmon importing nations are: Sweden (17% of the total), the United States (13.7%), France (8.2%), China (6.8%) and Japan (7.7%), which together represent 55%

of the total. Worldwide. In contrast to the very high concentration of exports, imports are available in a large number of countries. (Towards the Sustainability and Competitiveness of Colombian Aquaculture, 2014)

According to (OECD, 2016):

The Colombian government acknowledges that the current management framework is not sufficient, in addition to being obsolete for the responsible and sustainable management of Colombian fisheries (AUNAP, 2013a). He has participated in the development of the Comprehensive Policy for the Sustainable Development of Fisheries in Colombia (FAO/MADR, 2015) and in the management bill it acquires some of its objectives to strengthen the AUNAP mandate for sustainable management. (OECD, 2016)

RESULTS

A series of very worrying results are observed in the development of this academic research work and which, according to the (UN, 2015) stipulates the following:

- The oceans make up three quarters of the Earth's surface, are made up of 97 percent of the planet's water, and represent 99 percent of the habitable surface area of our habitat by volume.
- More than three billion people depend on marine and coastal biodiversity for their livelihood.
- Internationally, the market value of coastal and marine resources and their industry is estimated at \$3 trillion per year or approximately 5 percent of world GDP.
- The oceans are made up of almost 200,000 identified species, but the actual numbers may be in the millions.
- The oceans absorb approximately 30 percent of the carbon dioxide produced by humans, buffering the effects of global warming.
- The oceans are efficient as the world's largest source of protein. More than 3 billion human beings depend on the oceans as their main source of protein.
- Marine fishing directly or indirectly employs more than 200 million human beings.
- Fishing subsidies are contributing to the rapid depletion of many species and impeding efforts to save and restore the world's fisheries and related jobs, causing ocean fisheries to generate US\$50 billion less per year than they otherwise could.
- Open ocean spaces show that current acidity levels have increased by 26 percent since the start of the Industrial Revolution.
- The waters belonging to the coasts are deteriorating due to pollution and eutrophication. Without coordinated efforts, coastal eutrophication is expected to increase by 20 percent of large marine ecosystems by the year 2050. (UN, 2015)

Conclusion

Aquaculture activity is a strategic activity for the socioeconomic development of the countries, therefore, various axes of economic policy of the different administrations over the last few years have basically been directed by four economic models: industrialization by substitution of imports, shared development, accelerated economic growth and neoliberal, consequently have had a significant impact on the development of public policies, but

the lack of follow-up, as well as its impact on the productive sector and its development is have been reflected in the non-compliance in an integral way in their proposed sustainability objectives. The aquaculture sustainability system in the case of Mexico has been associated with fishing and aquaculture, so it is evident to observe what has been said from the Fishing Law of 1925 to the General Law of Sustainable Fishing and Aquaculture of 2007, as well as in the Chilean case, it is the General Law of Fishing and Aquaculture of Chile Decree 430, September 28, 1991 and in Colombia Law 13 of 1990. (1990, January 15). Because there is great potential for the development of fishing and aquaculture activities both in our country and in Chile and Colombia, it is essential to continue emphasizing the importance of the fishing and aquaculture sector and its relationship with the world with the objective that it is possible to better observe proposals and adaptations that allow the development of comprehensive programs that give greater sustainability to such significant economic activity, as well as compliance with the UN SDGs. Fishing and aquaculture globally are stipulated as an activity of great importance, and contribute a high percentage of the world's fishery products oriented towards food, always respecting the foundation of sustainability towards internationalization.

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