

# The business management of the Chilean salmon farming industry



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## ABSTRACT

This study reviews and explores the salmon farming industry management in an emerging economy context, in the light of environmental responsibility, restorative justice and moral reengagement. Strategic information were gathered, performing in-depth interviews with CEOs and other key senior executives, to analyze the managerial behavior regarding environmental care and moral engagement to industry production standards. The results reveal issues related to firms and government roles on setting industry standards and enforcing them. Firms required to be perceived as renewed in order to receive help from the government and convince the market on their IPOs. Government lack of technical strength and capacity to reestablish order forced the industry firms association to propose a new regulatory standard. But this new order seems not to be satisfactory and this industry will continue to be on the verge of a crisis.

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## 1. Introduction

The Chilean salmon farming industry experienced a dramatic downturn in 2007 while firms were seeking profit maximization through overexploitation of natural resources; the increase of fish density in the cultivation ponds deteriorated water quality and farmed fish welfare [35]. Significant associations were found between management factors and salmon mortality [57]. Also, areas were identified in which good management practices were associated with a reduced disease risk. Lizuka and Katz [35] inferred that the long-term decay in industry performance had been the outcome of a complex process of gradual productivity deterioration that started in the middle of a sustained rise in world prices for salmon. The expansion of global demand for salmon products triggered a production boom but the absence of adequate environmental responsibility was disastrous far outweighing short-term economic gains. Misguided management has resulted in higher costs and diminishing market reliability, weakening the international competitive advantages that firms operating in Chile used to have.

Other countries have experienced similar problems in the past concerning mistaken management behaviors in the salmon industry. After suffering from many pests that resulted in production losses, Norway raised its sanitary operational standards accomplishing environmentally responsible milestones such as low antibiotic usage, high food conversion rate and a smaller egg-to-salmon survival rate. Later, Canada followed in that same direction [10]. Therefore, following these examples, environmental responsible management (ERM) for salmon farming firms in Chile can be seen as the way to solve these problems and achieve higher standards in international competitiveness.

The environmental crisis experienced by this industry was triggered by low sanitary production standards catalyzed by managers who experienced moral disengagement due to a *Tragedy of the Commons* situation [52], where self-regulation and detrimental conduct was the result of a dynamic interplay of personal and environmental influences [3]. In the aftermath, the entire industry suffered a financial debacle that was followed by moral reengagement and the search of restorative justice. This change and the establishment of a new order are considered a key opportunity for achieving better industry standards and competitiveness [43].

The aim of this paper is to explore and discuss the processes of moral disengagement observed in the managers of this industry, and the following moral reengagement and the search for restorative justice in the Chilean salmon industry.

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## 2. Theoretical perspectives

Learning and knowledge accumulation is the base for the proper development of an international strategy, a process aimed to develop skills in foreign markets and the internationalization processes of a firm in several ways [8,46]. An international firm shares knowledge flows with other firms, enabling early and rapid internationalization; the processes of absorptive capacity and open innovation are crucial for international firms to succeed in the international markets. Hence, internal knowledge sharing is also critical for multinational corporations in order to achieve successful strategies [9,39].

### 2.1. Restorative justice, moral disengagement and reengagement

Moral disengagement in business is discussed in the literature regarding the observed behavior of firm managers and key executives when ethical or psychological concerns lead them to perform managerial decisions that are not considered good practice. Rest [48] states that moral awareness is an important feature of moral reasoning and moral decision-making and, therefore, will end in a managerial strategic planning. Moral issues are common in entrepreneurial situations in which different behavioral norms and interests conflict owing to scarce resources and constant competitive pressures, and when choosing between pursuing self-interest and maintaining normative business ethics [6].

Business ethics researchers have tried to study and understand business malpractice and organizational corruption by examining its key factors and proposing models on executive's moral reasoning processes. For instance, Rest's multi-stage ethical decision-making model [48] proposes a sequential process composed of decisional factors such as moral awareness, moral judgment, moral motivation, and moral behavior. Bandura and Cervone [2] propose a model that depicts the mechanisms through which self-sanctions are selectively activated and disengaged from detrimental conduct at different points in the self-regulatory process. Bryant [6] presents a model of self-regulation and moral awareness among entrepreneurs. Barsky [4] presented a theoretical model of the relationship between mechanisms of moral disengagement, participation, and unethical behavior. O'Fallon and Butterfield [44] and Trevino et al. [56] present comprehensive reviews of the business ethics literature.

In this section, *Moral Reengagement* is defined in business terms as the internal process and consequent conduct performed by firm managers when they return to a moral, ethical and self-regulated work behavior from a former moral disengagement period. The accompanying *Restorative Justice* is defined in business terms as the strategy repairing the harm caused by wrongful management; a sort of new order aimed to reorient business operations and performance that is accomplished through cooperative practices that may include all stakeholders.

This section proposes that managers go through a series of internal processes that guide their final decisions. As observed and obtained from interviews, managers endeavored to increase salmon production to its limits, and were able to do so recklessly due to specific conditions in this industry regarding a low or non-existent control from government agencies in the breeding, farming, production, labor, sanitary and other regulatory matters. As stated by Bandura [3], self-regulation and detrimental conduct is the result of a dynamic interplay of personal and environmental influences, and, in this crisis, managers were forced to face these two behaviors responding to different personal and environmental situations.

### 2.2. Environmentally responsible management and international competitiveness

A mix of competitiveness indicators can be used to estimate international competitiveness for the exports of the Chilean salmon industry, but technical considerations arise and different evaluation procedures may give different results [16]. When productive problems appear costs will increase, and that will give an advantage to international rival producers like Norway or Canada.

Nowadays many industries are implementing *Environmental Responsible Management* (ERM) to gain a competitive advantage [14], as operational efficiencies require long-term strategic and sustainable methodologies. However, this is not the only reason why ERM is important for internationalization processes. Many countries are offering environmental product policy instruments like taxes and charges, producer responsibilities, eco-labeling (ISO Type I) programs and environmentally responsible public procurement [33,17]. It is expected that ERM will be an enforced requirement if firms want to enter these markets.

International organizations have also been part of these new tendencies that enforce new development paradigms, which are reflected in the UN Millennium Development Goals. In this sense, Dunning and Fortanier [15] asserted that in order to ensure environmental sustainability, a development strategy should be consistent with the natural environment in which it is embedded. However, it should be noted that there is no consensus regarding the extent of environmental preservation. Some scholars [53] argue this should be practiced only if such activities complement firm strategies and enhance business profitability. Other scholars preach in favor of 'green management' for various reasons including moral or normative perspectives, while people expect managers to use resources wisely and responsibly, no matter if it pays [28,37]. In summary, previous research suggests that industry competitiveness and investment attractiveness need not be pursued at the expense of preserving the natural environment.

Also, academic theories of internationalization are incorporating ERM. In the light of the resource-based view, Hart [28] stated that for some kinds of firms environmental social responsibility could constitute a resource or capability that leads to a sustained competitive advantage. In addition, regarding solutions for environmental issues, business managers require analysis of the actors involved in the business operations. Hence, approaches as the Stakeholder Engagement that gives importance to the identification and interests of all actors affected by the activities of the industry have become critical to enhance ERM [45,5].

Developing a set of good management tools in international network standards allows interaction and easy flow through compliance between manufacturers and distant buyers. Regarding this, the implementation of privately-led standards can be disadvantageous to developing countries because of their limited influence on their self-determination [12]. Madsen [36] suggested that although governments in developing countries face a clear trade-off between attracting investments and protecting local environments, their policy should not be setting lax environmental policies causing degradation of local environments. In this case, a certain level of marine pollution may in fact be economically efficient even considering main externalities and, therefore, in an optimal social balance [24]. Policy objectives for economic development through investment should not be set at the expense of environmental preservation. Murphy [42] proposes that tolerant regulatory standards lead to more environmental degradation which encourages governments to set regulatory standards. Therefore, a special strategy must be developed appropriately to manage this ecosystem, which may lead to a sustainable development [58,50].

Despite these new tendencies in management, most of the firms operating after the ISA crisis in Chile were not eager to perform an ERM in order to increase their international competitiveness. Rather, it may be considered that most of them are in a *survival mode* and, therefore, thinking in a short-term acquisition by another firm or just obtaining revenues to withstand another period.

### 2.3. Research propositions

Based on the theoretical perspectives stated above and on previous research this section presents the following propositions:

P1: In a Tragedy of the Commons situation that affected the environment and, therefore, produced a production collapse and financial debacle of firms, as the case of the Chilean salmon industry, moral reengagement should occur and manifest in the industry managerial context.

P2: In the search for restorative justice, a new order for the Chilean salmon industry productive platform must be established in which the participation of the industry's key actors and the government are important for the implementation of the change needed.

P3: The Chilean government and salmon farming firms must adopt ERM to enhance and improve their international competitiveness.

P4: Foreign firms' advanced environmental capabilities were not accounted for by Chilean ERM practices and regulations.

### 3. Methodology

To analyze the theoretical model, field research using a multiple case study approach was conducted and then expanded using inductive reasoning [60]. The selected country is Chile, the world's second largest producer and exporter of farmed salmon. Although the use of a case study approach can raise concerns about the validity of the results beyond the borders of Chile, this approach has many advantages, particularly for exploratory research, and is seen as the best fit for this research.

The study was based on a sample of 14 firms, from medium to large size, operating in two regions of southern Chile, and representing more than 80% of the Chilean salmon production. The analysis was based on interviews with key CEOs and marketing directors. Commercial confidentiality prevents disclosure of the companies' names. The respondent companies were mainly located in Puerto Montt, and Chiloe. The high density of productive processing and supply companies located in the same region suggests they are part

of a regional cluster [22]. Each in-depth interview was performed during mid-2010 to mid-2013. The interviews were audio recorded, and a transcript was written; their contents were subsequently organized into the various sections of this paper.

Many of these companies are or were private firms and there are no public reports regarding sensible financial information, which is maintained as confidential. The interviews gathered data regarding strategies about pricing, costs, production positioning, target markets, partnering, programming, distribution, industry settings, collaboration and specific questions on events during crisis considering the managerial behavior, financial strategy, firm property and labor policies. The purposes of these interviews were to unveil and provide context to the events and reasoning behind the observed decisions taken before, during, and after the ISA crisis.

### 4. Analysis of the salmon industry and the Chilean ISA crisis

#### 4.1. Farming in the salmon industry

Over the past thirty years, aquaculture has become the fastest growing sector of the global food market. About 60% of the world's salmon production is farmed; the main type of farmed salmonids is the Atlantic salmon with total world supply of 1.46 million tons in 2011. Growth in global supply of Atlantic salmon is estimated to be 119% in the period 2000–2012, varying between –2% and 13% annually with a compound annual growth rate of 7% [38].

Salmon farming started on an experimental level in the 1960s and became an industry in Norway in the 1980s, Chile started in the 1990s [26]. Therefore, the emergence of salmon farming since the 1970s has changed the rules of the sea-farming sector and, as depicted in Fig. 1, Norway and Chile have been the main producers and exporters since 1997 [32].

#### 4.2. The Chilean salmon industry and the ISA crisis

The Chilean salmon is one of the most important local commodity exports [11]. The industry is composed both of local and foreign companies, the latter mainly from Norway, Scotland and Canada [21]. There are two local trade associations: SalmonChile, composed by large and medium-sized companies with the role to discover and open markets and AcoTruch, the Chilean coho salmon and trout farmers association where most of its members are small to medium-size producers. The Chilean government bases the regulation and governance of the fishing and aquaculture practices and resources on Sernapesca, an agency that depends of the Ministry of Economy.

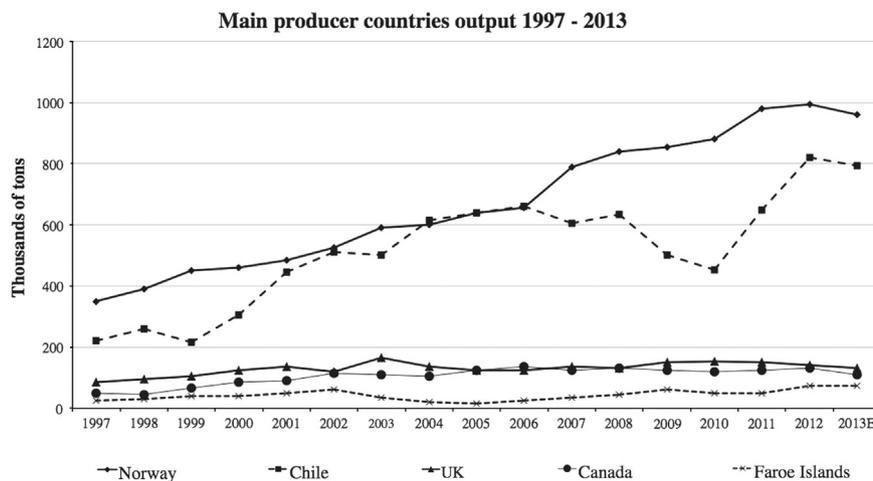


Fig. 1. Thousands tons of farmed salmon in the main producer countries for the 1997–2013 (Estimated) period (Source: Salmon[49]; FAO [20,31]).

Salmon farming companies that operate in Chile are typically vertically integrated, it is so extensive that in cases it may start on one end by sharing ownership with a fishing company also associated with fishmeal plants, various suppliers, egg suppliers, hatcheries, processing plants and even export companies. Firms' managers indicated that each of those vertically linked companies was treated as separate entities, and the only advantage was to provide lower risks associated to variability in quality, price and supply volumes.

The Chilean salmon industry as a system has three main problems. First, the structure is criticized as salmon farming is considered an important industry and should have a higher authority in charge. In this sense, Buschmann et al. [7] propose that the regulatory structure in Chile is outdated and based on insufficient science.

Second, the Chilean salmon industry is dominated and managed with an engineering, financial and commercial view; its executives are mostly civil engineers rather than aquaculture biologists. Hence, this industry is tremendously efficient in processing fish, developing new products, and creating new markets, but very inefficient in the breeding and sanitary aspects. This situation has led to overexploitation of farming pens, overcrowding the environment with smolts, salmon, fishmeal, vaccines and antibiotics, and the resulting degradation of the sanitary conditions of the area, and the weakening of the fish; allowing pests to appear and letting the sea currents infect distant farming centers of the same or other firms.

Third, the Chilean farming system is different from the other systems used by the farming industry in other countries. In Scotland, Norway and Canada, due mergers or strategic decisions some large firms perform their operations on vast geographic zones isolated from other firms determining a *one company per zone use*; thus enabling these firms to self-determine its own operating sanitary conditions and risk level. In contrast, in Chile there are several players sharing zones, with the result that none of them has an incentive to do things right and care for the common good within their respective zones [27,35].

The major sanitary threats present in the Chilean salmon industry include bacteria, and virus related diseases, such as the Infectious Salmon Anemia (ISA), Furunculosis (*Aeromonas salmonicida*), Pancreas Disease (PD), Salmon Rickettsial Syndrome (SRS), Caligus (Caligidae sea lice), and many others. These threats became a reality when, in 2007, an ISA disease crisis emerged in Chile and had catastrophic effects on the entire productive platform, killing almost all fish and leading to a financial debacle that stopped most of the production until 2010. Almost all firms in this industry, salmon firms and suppliers, ended in great debt, owing banks a total of USD 4 billion, with some individual farming companies indebted in amounts up to USD 380 million [40]. The resulting fall in exports incurred between 2007 and 2010 is easily noticeable in Fig. 1. It is important to note that the high export levels of 2008 were made possible because of the frozen stored forced harvest from 2007.

#### 4.3. The new order

To understand and control this type of crisis, an ecosystem management that includes all ecological and productive variables like sea conditions, species involved and industry operations influence must be established. Therefore, a special strategy must be developed to appropriately manage this ecosystem [58,50]. However, creating an ecosystem with these characteristics is difficult. Open sea farming operations are exposed to each other despite long distances [47], which makes a sea farm plant in good sanitary conditions vulnerable to distant threats, especially from *free rider* firms that will neglect basic sanitary measures in order to produce more fish. To identify a firm's contribution to the degradation of the marine ecosystem, and identify which firms either directly or indirectly suffer from the pollution is a near-

impossible task [24]. Hence, cases of pests' spreading in the open sea and channels will normally end infecting the fish centers and consequently spread to other centers due to an infection cascading effect. Thus, the *free rider* problem may prevent the implementation of a reliable pollution control system [24].

A key factor to create an Ecosystem management that includes all ecological and productive variables is setting the appropriate standards. Regarding the salmon industry in Chile, Lizuka [34] reported firms having difficulties in complying with global standards. However, also Lizuka [34] assessed that most firms in this industry strive to follow the required global standards, evolving them into local standards, which can be considered as an early stage of the creation of a proper ecosystem management scheme.

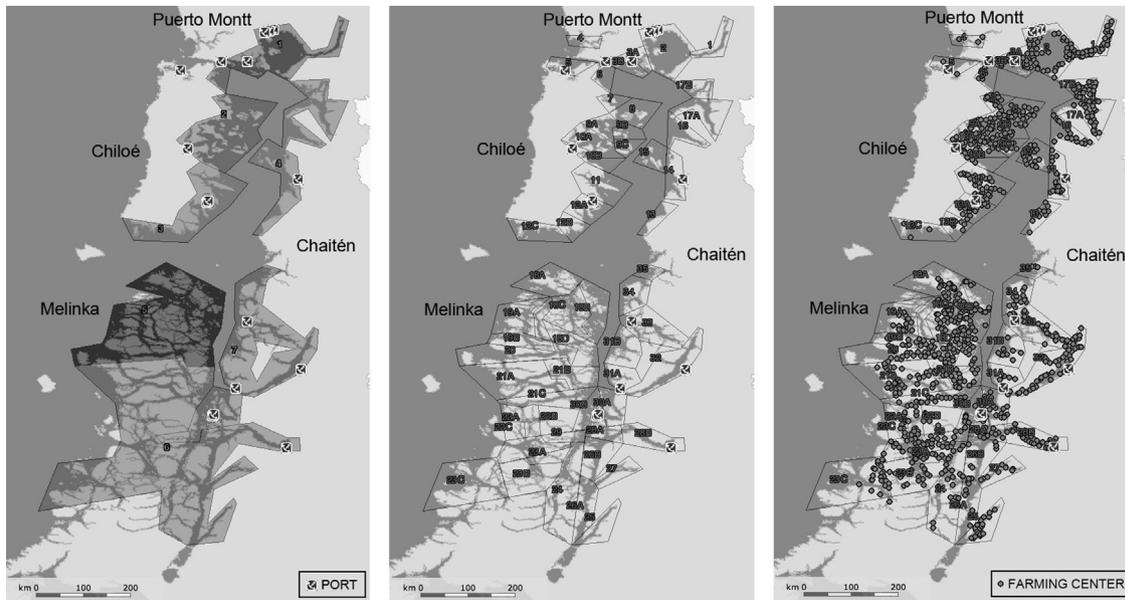
In 2009, a new set of laws and norms to regulate aquaculture production was proposed, it dictates new sanitary, productive and communications laws, norms, protocols, and standards. These new regulations, all salmon-related, are continuously being complemented and reinforced with new articles and norms, for example, establishing a maximum number of fish per pen, depending on factors such as an average harvest fish weight, trying to comply with a minimum mortality and survival rates of 85%. Other values for these parameters are being established for Rainbow trout and Coho. Some managers propose that the problem with this new regulation is that the maximum values are fixed regardless of currents, water quality, water renewal, depth, or other key factors, all of which have a bearing on the maximum level that the pen should be able to stand. Prior to these regulations, each center decided how much fish should fit in its pens, on the basis of the factors affecting that particular center.

During the restart of production in 2009, producers were very cautious about the health of the smolt, one of the weakest moments being when the smolt is moved from a sweet water environment to a salty open-sea pen, where mortality rises if the smolt is too immature or small. It was widely decided to delay this transfer until the smolt's weight reached about 140 g, which led to high survival rate of the smolts. At that moment, it was publicly divulged that a company having seven centers in operation and which had just finished its first harvest after ISA, had achieved the lowest mortality of all times in this industry, the seeding having been performed with the number of smolt fixed by law. However, by the end of 2010, the smolt weight at the time of passing to salt water had been lowered down to 110–120 g. Additionally, from the successful and historical productivity rates obtained, many companies started seeding more smolt again, a decision that is not technical, but rather one that managers state as emanating from the board of directors.

The Integrated Management System, a management tool which was launched in August 2003 by SalmonChile A.G., for the purpose of assuring compliance with national and international regulations and good practices in terms of fish health, food safety, quality, environmental management, as well as worker health and safety. Its role has been increasingly relevant and encourages the continuous improvement in companies, by applying benchmarking and certification by independent companies. (Salmon [49])

One of the main changes encouraged by this new order has been the definition of exploitation neighborhoods. These are defined zones, each one constituted by a small group of adjacent sea concessions, neighborhoods that were determined by the government as the new way to control sanitary conditions by controlling the productive operations inside each zone. Fig. 2 depicts the defined Salmon Farming Macrozones, where each one hosts a neighborhood, and each of the neighborhoods host a group of sea concessions and farming centers. The new regulations state that a neighborhood must operate their centers in synchronization, which means doing their productive biological cycle simultaneously.

This simple rule has its problems, as one manager stated: "Imagine that there is a firm which has all its centers in one neighborhood and works only Salar: the new zone regulations will



**Fig. 2.** (a) South of Chile, Chilean Salmon Farming Macrozones, consists of cluster of neighborhoods. (b) South of Chile, Chilean Salmon Farming Neighborhood, zones for sea concessions. (c) Chilean Salmon Farming neighborhoods and the actual farming centers. Source: Information System for Sustainable Aquaculture. (SIAS), GeoAustralis online interactive system.

force them to work the centers synchronously, all have to be seeded, farmed and harvested simultaneously. Therefore, they will have long periods without processing and selling, about 6 months every 2 years when they would have been able to sell and supply salmon.”

This statement shows that the situation can become critical, as farmers need to supply their clients continuously along the year. So a small firm, that has only a few centers in the same zone, will have to migrate to other zones in order to have a constant production, which means renting new sea concessions and tackling many other costs; a situation that does not seem viable. Many farmers suggest that in such a scenario, these small firms will likely disappear.

Additionally, some larger companies have such a great number of sea farming rights that it appears unlikely that they could be able to work all of them. So there are many concessions that, as they are reserved for a given firm that could be deeply in debt and close to bankruptcy, are not being exploited, even though there are newcomers with fresh money who are eager to do so. Some managers state that it is urgent to solve this situation, such as setting a period within which to begin operation at a given concession or else relinquish it.

Furthermore, some managers did not like the way zones were determined. One of the managers declared: “The regulations that determine neighborhoods are a complete disaster, an example of incompetence. Exclusive zones for groups of farmers were determined without considering many key factors, such as currents, or geographical conditions. Looking at the map with zone knowledge, one would think that this distribution was closely related to business and negotiating, rather than to an experience-based decision aimed at seeking biological threat isolation between farming clusters.”

By mid-2011, many of these measures, standards and new protocols were implemented and applied. The common opinion of the interviewed managers was, despite that at the moment of the crisis they were not directly benefited with the role and decisions of SalmonChile – even some of them were very disgusted – they now state that SalmonChile did the right thing for the industry. They regard the institution as the main responsible for the new order and now recognize that the survival of the industry was the real purpose of their work, knowing that many sacrifices and hard decisions needed to be taken.

#### 4.4. Uncertainty for the future success of the industry

Despite having in 2010 good productive and sanitary results based on a cautious, controlled, and small number of fish in water, there were reports during late 2010 and early 2011 that producers were already seeding a large number of fish. The estimated number of fish seeded in Chile’s industry in 2010 was around 20 million, about 400% higher than in 2009, whereas the number estimated by suppliers for 2011 was about 120 million. However, the opinion of experimented managers with a biology background is that there are no strong biological, sanitary, or operational reasons to support the belief that the new set of farming regulations should guarantee a successful harvest with no mortality.

As it has been stated publicly, by 2012 many producers considered the Infectious Salmon Anemia virus (ISA) threat as solved, even though they are aware of the reappearance of infection in some centers during late 2010 and early 2011. For the last months of the first semester of 2011, there were no reports of ISA infected centers, but as of July 1st 2011, the Chilean Authority, National Fisheries Service (Sernapesca), maintained a list of 15 centers considered to be in a *suspicious* state of being infected by ISA. Afterwards, ISA reappeared in almost every center and now the industry tries to cope with this threat as a constant challenge and not a transitory one.

One operation manager with biological background stated that the results of an oceanographic model indicated an increased resulting vulnerability based on the spreading of pests. The effect of an increase in the number of fish would be similar to that of shortening the distance between centers. Hence, with the current volume of fish in the water all the centers are considered interconnected, and any center could become the starting point of a new pandemic. It is proposed that the Authority should determine the neighborhood zones on the basis of the total number of fish in each zone, and this could force the closing down or relocation of some plants, which is very unlikely to happen in Chile.

Besides the opposite views held by managers and biologists, in 2010 there were doubts that all companies would be able to re-engage in high production rates. Most companies did not have the kind of money that would be required, and it was unlikely that banks would be willing to lend them more money. It would have

been cheaper for them to kill their egg or smolt before moving it to the sea pens. Additionally, in late 2010, some centers were found infected with ISA so, at that moment it was doubtful that there could be any interest in investing again. Nonetheless, firms obtained funds from banks and IPOs and they are currently dealing with ISA infected but controlled salmon pens.

## 5. Research findings

### 5.1. Firm structure

The Chilean salmon industry cluster consists of large farming companies and a greater number of Small and Medium Enterprises (SMEs) that support the entire industry cluster needs. Regarding the number of large companies, Chile is following the current global trends in mergers and acquisitions (see Table 1) but in the crisis period of 2006 to 2009 the number of companies increased, this may be explained by all of the crisis turmoil and instability. In 2012, the merging trend started again. However, interviewed managers think there is too much to grow and expand yet so as to be near an industry final size, or mature level of development, as it is observed in Norway and other farming regions.

Most of the largest salmon farming companies started directly as an aquaculture production center, but there are middle-sized firms that added salmon farming as an expansion to their business. As the manager of a salmon farming company (A3) stated, “we have always been a fishery firm, and when we decided to start with aquaculture, we defined salmon, trout and Coho as products, trying not to impact or distort the market by price or volume. Our original clients of white fish forced us to supply them with red flesh fish, warning us that if we didn't abide, they would no longer buy any fish from us. That is the reason of the creation of our aquaculture branch ....”

Firms producing in Chile (local and foreign based) can be categorized according to their origin, size and financial status; from each of these categories 2 or 3 companies were surveyed (see Table 2).

**Table 1**  
Number of companies responsible for the 80% of production.  
Source: Kontali.

	Norway	Chile	Scotland	Canada
1997	70	35	12	–
2000	55	18	8	–
2003	45	15	7	8
2006	31	10	5	3
2009	25	18	5	3
2012	24	16	4	3

**Table 2**  
Sample firm and groups' characteristics.

Group	Company size	Debt	Comments	Responsible management	Surveyed companies
A	Small	Suffered high losses, financially supported by group	Normally associated with a fishing company/group that has assets to be shared	Low commitment to environmental measures	A1, A2, A3
B	Medium	Highly in debt	They require fresh money from banks or others in order to obtain biomass. Banks already own part of the company and some of their assets	Low commitment to environmental measures	B1, B2, B3
C	Medium	Suffered high losses, financially supported by group	With access to resources from Chilean groups that could finance them. They possess attractive assets	Medium Commitment to environmental measures	C1, C2, C3
D	Large	High debt over their equity	Exclusively dedicated to fish farming. They require fresh money from banks or others in order to obtain biomass. Banks are already holding some of their assets	Medium Commitment to environmental measures	D1, D2
E	Large	Suffered high losses, financially supported by group	Companies owned by international groups, mostly Norwegian and Canadian	Low commitment to environmental measures	E1, E2, E3

Table 2 shows that most interviewees expressed low commitment to ERM. The industry was focused on achieving the highest product output growth possible. Therefore, they grew at an extremely high rate from year to year, which was reflected in the fact that some of the companies invested more money than their accumulated historical revenues.

One of the reasons of this low commitment can be found in the expertise of the labor force of the industry. Interviewed manager of B2 firm shared that “In Chile general managers are and have been Engineers that seek to maximize production and develop commercial links, and they have accomplished this very well. On the other hand in Norway they are and have been people that came from the Biology world.” and complemented “Chilean Industry has been efficient in processing fish, inventing new products, creating new markets, but very weak and performed poorly on the biological side.”

Salmon farming is an emergent industry that has been developing in Chile during the last 30 years, governed mostly by entrepreneurs [1,23]. The common lack of biological support on the operational and sanitary decisions from the entrepreneurs and the authorities are seen as a threat to the whole local industry [22]. As C1 firm manager said “we had little experience, when we had to face the ISA crisis and decide as a company what strategy to follow, first we have to acknowledge that we were no experts, we lacked experience and knowledge. We did not know about genetics, nutrition, oceanography, pests and diseases, that is what we are, as an industry and firm.”

### 5.2. Products and markets

The format of the product depends mostly on the cuts performed to the fish, if it is fresh or frozen, or subject to further processing like smoking. In all the cluster firms, the definition of the product format and volumes to be produced is mainly in the hands of a salmon farming firm manager. It is preferred to produce more volume of simple products, so as to process the easiest and fast profile of produce, declaring that “the simpler, the better for selling”, like fresh and gutted products; as most of the managers stated, “we can sell all and everything we are able to produce.” As an example, for fresh fish the procedure described was, “the complete process of fresh fish is very simple: after killing and washing it, in 5 minutes it is chilled on ice. At 5 PM it is departing by truck to Brazil, arriving a couple of days after. Or it may depart to the US, where in a couple of days it arrives to Miami, and in 2 more days becomes available for the retail market, where it remains fresh and for sale for 18 days.”

The Chilean ISA sanitary crisis started on 2007, bringing high mortality in the salmon farms that led to a financial, political and industrial turmoil [35]. During the following years the Chilean firms

have not been able to continue supplying its markets, especially the U.S. Therefore, Norwegian and Canadian producers expanded their sales to the resulting available markets [51]; furthermore, receiving the benefits from a huge increase in their sales volume at a greater price [19]. From 2008 till mid-2011, markets were variable in price and volumes given the output increase of Norway and North America, and catastrophic events like the Chilean ISA crisis and earthquakes and tsunamis in both Chile and Japan, diminishing Coho production.

Chilean production started its recovery at the end of 2010 and exports resumed in 2011. Since then former target markets were partially recovered; consequently global prices dropped and since 2012 the global market has a continued growth drive and a positive price trajectory. In the late 2013, Chile re-established its position as the prime supplier to the US market (FAO [20]). Latin American market started to raise significantly its demand for salmon, especially Brazil. The Brazilian market currently represents three quarters of the Latin American demand of Chilean salmon [41].

### 5.3. Moral disengagement

The observed behavior allows to believe that the salmon industry management made short-term decisions, blinded by the overall production success and so created a vicious business and production cycle that led to the process of complete *moral disengagement*. And, even though they already knew or at least had been seriously warned that this industry will reach a production limit level that may bring severe consequences, the *Tragedy of Commons* prevailed and moral disengagement was widely adopted and embraced. Statements given by managers were eloquent, as stated by one **A3** firm manager “the Chilean system collapsed because of the greediness, avarice, lack of scheduling and the narrow-mind of the people in charge”, complemented by another **E2** firm manager “the Chilean entrepreneur is problematic, they do not perform well in their work, have a low knowledge and understanding of the business, low knowledge in the labor related matters, etc.”

Hence, moral disengagement has been found to play a key role in a wide range of unethical actions and decisions, and as proposed by Shepherd et al. [52], the disengagement of pro-environmental management demonstrated by entrepreneurs' values was greater when the perceived industry munificence was low as it was in this crisis. Correspondingly, once the actors fully understand all their options, as well as all the consequences of their actions, they will use more resources as fast as they can [54]. Regarding this position, the industry was also constituted by executives that were eager to amplify this reaction, as a **C1** manager stated: “this industry has a profile of owners and managers that are haughty, proud and greedy enough to not collaborate, just to be free riders and aggressive. This business is not a warm climate and a nice neighborhood.” Some individuals abuse their liberty to act not considering the detriment of community and society; implicit is the deeper fear that they are approaching a dangerous threshold [29]. Accordingly, a **C1** firm manager proposed, “for me, the crisis was a Chronicle of a Death Foretold, everybody knew that we were sitting on a time bomb, and no one wanted to lead the change because it meant an increase in costs.” When confronted with the predictable claim that a single actor's impact was minimal, more biology-biased producers adduced that the effect-harm threshold comes from the cumulative interaction of many pollutants [29].

### 5.4. Basis for moral disengagement

The moral disengagement behavior in the salmon industry finds its theoretical basis in the *Tragedy of the Commons* problem, which occurs when the natural domain of a resource is coincident with or intersects the rights domains of two or more resource users. Since a resources' domain is the extent of the area in which it moves to

fulfill its natural function, the resource may clearly still be considered common because the resource itself moves through the rights domains of both users [25], regarding this subject a C1 firm executive stated: “the big mistake of this industry is that the owners think that the sea is an inextinguishable source of resources and an infinite and unbreakable system; when they realize that the ocean, resources, pests, industrial presence and natural cycles are connected a great step into sustainability will be born.”

On the other hand, the common technical explanation for this over-exploitation is that, due to lower scientific and technical know-how, Chilean producers face fish mortality all along their smolt breeding and farming productive processes. And the way used to solve this loss is by supplying and loading the system at its beginning with more salmon eggs and not by research and applying measures towards diminishing the deaths. As sustained by an **A3** firm manager: “there are no R&D departments in most of the Chilean salmon companies; some international companies have their innovation, research and development departments.” Consequently, this situation was noticed in the operational and production figures: “when we started on 2000, we did some research on the productive chain, the value chain and the commercial network. We found that there were some indicators that showed us that something was wrong, that in Chile we lacked something; the first example was that for producing one smolt Norway requires 1.4 eggs and in Chile we used 4.5, as clear as that.” It was widely acknowledged and accepted that this strategy brought the expected output despite the existing loss; production suffered more losses and lowered quality, but the output was increased. As stated by a **C1** firm manager: “there were no incentives to talk and coordinate, it was more effective to seed more eggs and harvest more because the farms are exposed to a neighbor that may affect my production despite being prepared with measures based on vaccines, and clean and proper practices.”

The main implication of this behavior is that there has not been an industry's ethics to manage its natural resources. This may be in part because ethical systems alone are not strong enough to deter *free riders* [30]. As stated by a **C2** firm manager: “this industry needs to control the companies in hands of greedy profit-oriented investors that are thinking on staying in this industry just for a profitable season and then migrate to another industry, they are the ones that first trespass the limits and bring risk and uncertainty to the whole industry.”

### 5.5. Moral re-engagement

After the production crisis and countless losses, there was a period of halt, a stopped production stage for almost all of the producers. This was a time for retrospection. Analysis and planning were performed by this industry and, finally, environment-concerned policies were proposed, developed and implemented. As proposed in this section, this change to a pro-environment bias was based in economic moral re-engagement and restorative justice. As proposed by a **C1** firm manager, this acknowledgement process did happen: “the key factor to survive the crisis was to humbly acknowledge our failures and all of the areas where we lack knowledge and experience, with that start point we have survived the crisis and at the same time improved a lot, almost every productive step has increased its knowledge and efficiency, and lowered mortality.”

The environment-oriented care actions related to moral-reengagement were mainly forced by sanitary conditions, financial problems, and a low production. Sanitary conditions depleted production naturally because it was impossible to continue salmon cultivation, as the environment was no longer supporting salmon life in their pens. Afterwards, financial problems occurred due the death and loss of the biomass; most of the value of this industry is invested and resides in biomass and not in machinery or facilities

and, hence, capital was lost and the performed strategy of years of over-investing resulted in a devastating financial crisis caused by a dominoes' effect that impacted all of the cluster firms. The crisis was severe, losses were much larger and beyond what one would expect in other industries. As stated by **B2** firm manager: "everything we advanced and progressed in 20 years was lost in this crisis, the money lost in these 2 years crisis was larger than the equity generated in the previous 20 years." Therefore, low or even zero rates of productions were performed henceforward. Consequently, the oceans had time to naturally cleanse and pests' threats were finally diminished. This was corroborated by a **D2** firm manager: "there are firms looking for an exit, but banks already realized that without fish production, every asset loses its value: pens, plants, equipment and the only asset with value is the land"; he also stated that "ISA disappeared not because of biosecurity measures but due the farming halt and the absence of cultivated fish in seawater."

After the crisis, it was widely acknowledged by industry managerial executives that moral disengagement was something awfully wrong, turning the whole industry ecosystem of fjords, channels and open sea spaces into a non-productive salmon farming platform, causing the fall of the industry. Therefore, moral reengagement with pro-environmental values naturally appeared and flourished in the industry. This view was also required to be widely accepted and adopted because the government would not have approved the aid program of half a billion US dollars and investors, neither would it have reappeared to help recover the industry. This goes in line with Rawls's theory of justice, which indicates that the public administration by extension of the obligation of noblesse oblige and the principle of participation must participate and directly seek for measures to establish equity between actors; in this case, should be to solve the conflict caused by industry *free riders* [18].

The mechanisms of moral disengagement propose to unveil the variables and to understand how disengaging one's moral controls may influence one's propensity to act unethically. The findings related to the impact of moral disengagement shows that unethical behavior has important implications for understanding why an actor might engage in an egregious act, and where an organization seeking to reduce such acts may target an intervention [4].

### 5.6. A new order on restorative justice

In terms of restorative justice, industry leaders developed a plan to establish a new order in the salmon farming industry. It was known that if the same rules of the game previous to the *ISA crisis* were still the setting, then managers would moral-disengage again and be back on an over-exploitation strategy. As stated by a **B2** firm manager: "there is a cultural background that explains why this crisis happened, it is how we have structured this industry. If this structure remains, this kind of crisis will happen again."

Therefore, a new order determined by a set of regulations was required to force the industry to change, because it was expected that some executives were ready to restart business with the same destructive production practices. As an **A3** firm manager confirmed at that time: "my experience talking with other producers is that many of them consider the *ISA* threat as solved, despite that they knew about the reappearance of infection in some centers." Hence, the challenge of the recovering of the industry was hard and complex; it had to be a plan that successfully monitored and controlled how these firms operate and produce. As a **C1** manager stated: "in Chile they are not good to coordinate and trust; the entrepreneurs profile is such they cannot agree and follow a common business and production behavior", so they have to be forced to behave accordingly. While the Association current regulations were not able to avoid the crisis. As told by a **B2** firm manager: "the associations exists to supervise,

monitor, limit, and control the industry free riders, and I see this did not happen in the salmon industry."

This new plan mainly determined a new order in most of the production activities, from the designation of geographical productive zones, production synchronization, feeding, and other productive matters that involved techniques, new labor and sanitary regulations, quality standards, and improvements on law enforcing. It was seen as a good start for a rebirth of the industry. This plan was finally approved, backed and adopted by different actors of the industry.

Nonetheless, the plan was strongly criticized by some firms because it lacked scientific robustness and real power for law enforcing, but it was approved, backed and adopted. The criticism was harsh about the proposal to enforce the law, adding at that time: "all of the problems are amplified by Sernapesca, Chilean National Fishing Agency, a weak and incompetent authority; we cry for a 'Maritime' SAG (Agriculture and Cattle service, another public authority), a solid and demanding agency to control this industry. Sernapesca has no boss, it is incompetent, weak and not empowered, it depends on the Ministry of Economy that does not understand the salmon business."

## 6. Discussion

### 6.1. Discussion

Regarding proposition 1, the Chilean salmon-farming cluster behaved as a *Tragedy of Commons* environment due to many reasons exposed in the previous section (shared resources, diffusion of pollutants, etc.). And after the cluster production had collapsed, resulting on a financial debacle, the only feasible way out for most of the firms in this industry was to ask for help to the government and investors. These are not going to help again if the same *Commons* situation reappears. Naturally, given this new industry setting and managerial context, the change came as *Moral Reengagement* to executives and directors.

The most interested actors in restoring the industry were the owners and managers with a biological background and expertise. This may be because they know farming processes can be done properly and also because they did not have any interest in leaving the industry. On the contrary, some investors from other areas just withdrew when the crisis arrived. Based on these reasons, proposition 1 is accepted.

The search for Restorative Justice encountered its way on a new order for the Chilean salmon industry. This was required by government and investors to support the industry but formulated by members of the industry, not a government centralized authority. This new set of regulations and norms reformulated the Chilean salmon farming productive platform and allowed the income of fresh fluxes from government aid (USD 450 Million) and private investors. The implementation and complying of this new broad set of standards allowed the rebirth of this industry and the first signs of reactivation came with successful harvests showing excellent sanitary and survival indicators. However, producers started to over-exploit and soon pests, *ISA* and deaths reappeared. Entrepreneurs may be left alone in some areas, but they must be controlled in order to avoid a new crisis. Therefore, this established new order must be backed by an enforcement of the industry and the government. Hence, proposition 2 is accepted.

Regarding propositions 3 and 4, after the crisis the leaders of the few but large firms with biological background spoke and took the lead to install an ERM on each firm, covering the whole industry. They were listened by all industry actors and carefully followed, starting a low level and careful productive operation. The result was an excellent production and very low death rates,

historical record productivity figures. And with that news, producers restarted their operations, and a few months after, egg supply firms started reporting a huge increase in orders. Anyway, it was a matter of a few months for ISA virus to appear again.

It was the main Chilean salmon farming firms that really pushed to establish a new sanitary order in the industry and foreign firms' advanced environmental capabilities were observed and considered but were not the channel to this new standard of the Chilean ERM practices and regulations. Therefore, it is concluded that Chilean salmon companies are not focusing in ERM, but they should do so if they want to get more internationally competitive in emerging markets. Chilean Government and firms are prone to adopt ERM to enhance and improve their international competitiveness and survive, but only under the threat that might destroy their production. Hence, propositions 3 and 4 are partially accepted.

## 6.2. Research implications

A positive relationship has been observed between self-regulation and moral awareness, and the impact these factors might have on moral reasoning among entrepreneurs [6]. Therefore, it is strongly suggested that tools for engaging salmon farming entrepreneurs in moral awareness must be developed and enforced. It seems particularly relevant that the ecosystem built for the salmon industry follows new emerging approaches in sustainability. A psychological approach has been proposed for developing key strategies in case of averting the *Tragedy of Commons* and protecting the environment. It focuses on interventions in different levels such as information for understanding, identity for belonging, institutions for trusting and incentives for self-enhancing. Some of these elements are found on the current new order established for this industry [59].

Rawlsian justice perspective is plausible, illuminating, and potentially useful when applied to the entrepreneurial context in the Chilean salmon industry and, as proposed by Newbert and Stouder [43], entrepreneurs enjoy a unique opportunity to shape their organizations in ways that encourage not only their success but also their ethical flourishing. As stated by E2 firm manager, "what must be changed is the entrepreneur. He must change his priorities and considerations when managing a biological system. It is the general manager and the board that must establish the regulations and protocols to be followed." However, it is not proposed that the entrepreneur is required to be changed, but he must be prevented from forcing the company to go as far as overexploiting. It seems clear that there must be an authority that enforces a regulated framework that enhances the entrepreneur ethical behavior.

In summary, it is proposed that countries trying to escape from the *Tragedy of the Commons* must face three forces which will determine success or failure in resource management: the regulators' enforcement power, the extent of harvesting capacity, and the ability of the resource to generate competitive returns without being extinguished [13]. Therefore, the new order in the Chilean salmon industry must take care to properly achieve governing these three forces. As stated by a C1 firm manager, "SalmonChile A.G. performed a role that the authority did not do, called it a crisis, dictated the measures to seek for a restart and forced the actors to follow them. At the end of the crisis, it prevailed in this role but now we need a regulatory entity that enforces the law and also has a scientific background to support the measures."

Beside the importance of the government as a central actor, Chilean salmon industry should focus on achieving high sanitary standards for open sea where they operate. This strategy will improve their international competitiveness and the resulting benefits of a decrease in production losses along with lower costs and higher market value. However, in this industry *free riders* impose their low level sanitation as the industry standard.

Therefore, this effort must be enforced by new regulations followed by an active role of governmental agencies enforcing the law. An implication of this strategy is that firms should not compete through low pricing; managers should rather apply standards of high quality and pursue differentiation. Because Norwegian salmon industry is a strong competitor in the American market, both should follow different product positioning strategies [55].

Findings of this study suggest that Chilean salmon farming firms are not keen to invest in environmental preservation in spite of the recommended common practice [36,15] and that corporate investment and preserving local environmental quality need not to be opposing policy objectives. As concluded by Garrod and Whitmarsh [24], it is suggested that the government must support the environmental interests of the whole industry, and a system of appropriate incentive structures is required to change the industry in the direction of ERM.

This section proposes that, in the long range, Chile must develop an Innovation and New Product Development platform, accompanied by an exporter platform with the ability to properly distribute its products to various target markets as other foreign competitive suppliers already do. This will aid to focus in a more controlled and small production with higher value added and higher utilities.

## 7. Conclusion

The Chilean salmon farming sanitary crisis revealed that the previous high industry growth rate was based on an aggressive and careless production operation, conceived and performed by industry firm managers due their moral disengagement on proper practices and sustainability.

The following deep financial crisis and an extended stop in production let moral reengagement appeared naturally, it was instrumental for firms to be perceived as renewed in order to receive help from the government and convince the market on their IPO's. At that moment, due the government lack of technical strength and capacity to reestablish order, the industry firms association was forced to propose themselves a new regulatory standard. A new order was established as a way of restorative justice.

But this new order seems not to be satisfactory. Until appropriate new industry standards and its regulatory administration are actually enforced, this industry will still be on the verge of a crisis.

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