

Sustainable Marketing for Aquaculture in Veracruz, Mexico: Vulnerabilities Assessment.

by

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Abstract

Employing interviews and participant observations during 2013, the present study examines three fish farms in the state of Veracruz, Mexico. The study's aims were to ascertain how the farms' stakeholders describe the socioeconomic and environmental vulnerabilities related to their operations and how, and to what extent, notions of sustainable marketing could contribute to mitigating such vulnerabilities. Vulnerabilities varied depending on farm size. The smallest farm exhibited the greatest vulnerability to financial and environmental risks due to a Federal decree prohibiting the usage of the river's water that it employs to operate. The medium size farm is exposed to social risks resulting from protests that prevented consumers from reaching the farm. The large farm demonstrated fewer vulnerabilities attributed to a governmental "macro-investment" in 2009. The results should assist aquaculture owners/managers, governments and other stakeholders in making informed decisions to ensure the sustainability of aqua farming in Veracruz Mexico and beyond.

Keywords: Mexico; Veracruz; Aquaculture; Sustainability; Sustainable Marketing; Vulnerabilities.

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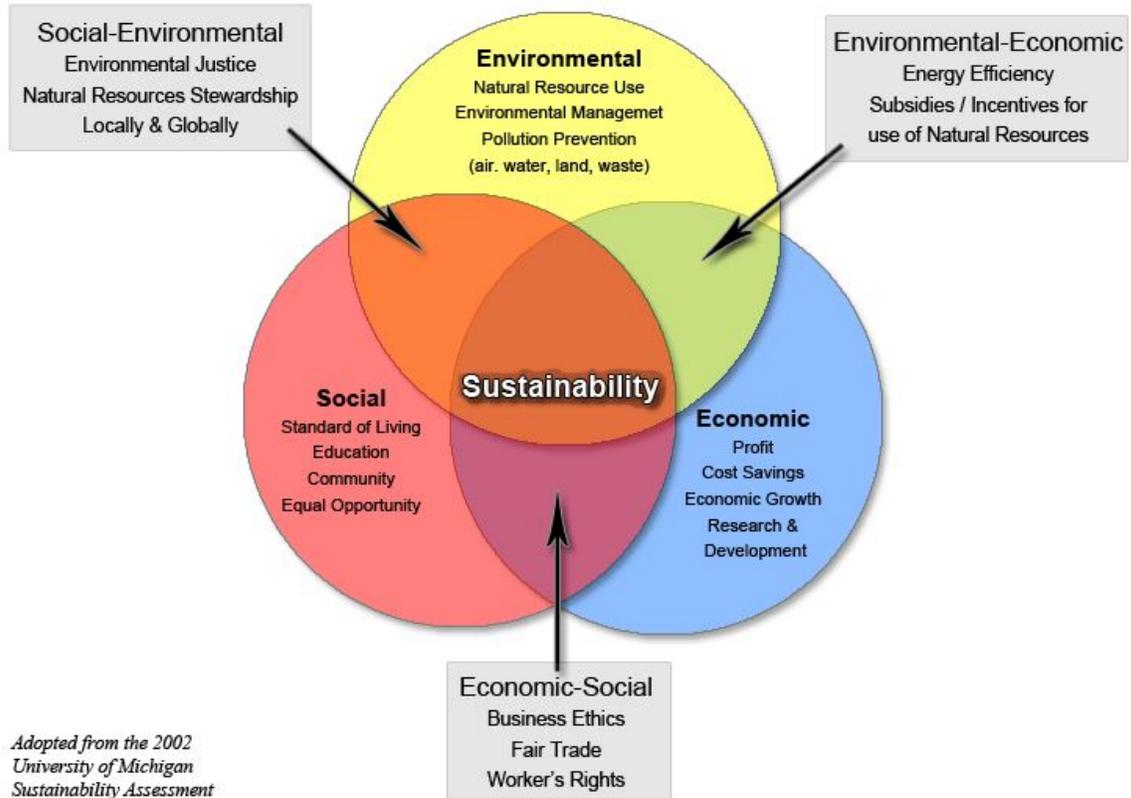
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List of Acronyms

| | |
|--------------------------|--|
| AEPA | Anuario Estadístico sobre Pesca y Acuicultura (Annual Statistical Directory of Fisheries and Aquaculture). |
| AVAC | Asociación Veracruzana de Acuacultores (Veracruzanean Association of Aquaculture Farmers). |
| CESPTV | Comité Estatal Sistema Producto Tilapia Veracruz (Veracruzanean Committee of Tilapia Product System). |
| CONAGUA | Comisión Nacional del Agua de México (Commission of Mexican National Water). |
| CONAPESCA | Comisión Nacional de Pesca y Acuicultura: National Commission of Fisheries and Aquaculture. |
| CSAPV | Comité de Sanidad Acuícola y Pesquero Veracruzano (Veracruzanean Comitee of Healthiness of Aquaculture and Fishing) |
| ECLAC | Economic Commission for Latin America and the Caribbean |
| FAO | Food and Agriculture Organization of the United Nations |
| FIRA- FOPESCA | Fideicomisos Instituidos en Relación con la Agricultura - Fondo de Garantía y Fomento para las Actividades Pesqueras. (Funds Instituted to Relation to Agriculture -Fund for Promoting Fishing Activities) |

| | |
|----------------|---|
| FR | Financiera Rural (Rural Government's Agency). |
| INAES | Instituto Nacional de Economía Social (National Institute of Social Economy). |
| INECOL | Instituto Nacional de Ecología (National Institute of Ecology). |
| INEGI | Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography) |
| IUCN | International Union for Conservation of Nature |
| LGPAS | Ley General de Pesca y Acuicultura Sustentable (General Law of Sustainable Fishing and Aquaculture) |
| MPA | Marine Protected Area |
| PAN | Partido Acción Nacional (National Action Party). |
| PRI | Partido Revolucionario Institucional (Institutional Revolutionary Party) |
| PROFEPA | Procuraduría Federal de Protección al Medio Ambiente. (Federal Attorney General for Environmental Protection). |
| PSPA | Programa Sectorial de Pesca y Acuicultura (Sectoral Program of Fishing and Aquaculture) |
| SAGARPA | Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food) |
| WCED | The World Commission on Environment and Development |

The Three Spheres of Sustainability



Chapter 1.

Introduction

My research is an attempt to obtain a better understanding of the aquaculture sector, specifically fish farms, in the southeastern state of Veracruz in Mexico. In addition, I seek to determine how notions of sustainable marketing can alleviate social, economic and environmental vulnerabilities in regards to the information retrieved from my research on these farms. Ultimately, my work is an evaluation of the socioeconomic and environmental vulnerabilities surrounding three specific fish farms selected in Veracruz, Mexico.

The first chapter of my work examines the background of the study surrounding aquaculture and sustainability. The first section briefly illustrates the term aquaculture and its origin as an economic activity practised worldwide. The second section provides specific data of aquaculture on a Mexican scale comparing Mexico to the rest of world on supply and demand for aquaculture products. The third section presents the situation of aquaculture in Veracruz compared to other states. The fourth section introduces the concept of sustainability and how it can be applied to companies through sustainable marketing. The fifth section provides the problem statement and the professional significance of the study. The final section is an overview of the methodology used in my research. The concepts contained in this chapter will be addressed in more detail in the literature review section.

Background of the Study

Aquaculture

A study commissioned by the Canadian Department of Fisheries and Oceans in 2005, that interviewed restaurateurs, residents of communities near aquaculture facilities, and the general population, concluded that most participants had never heard of the term “aquaculture” despite aquaculture being practiced for millennia. In the study, some participants thought aquaculture meant fish farming, while few participants knew that it also included plants and shellfish. (Barrington, et al, 2008). Given the low level of understanding of the meaning of aquaculture, it is vital to provide a clear definition. Among the studied definitions, the definition that best describes the aquaculture situation is used in Valerio Crespi’s work (2008). Crespi coined a more business-oriented definition of aquaculture that I considered to be relevant to my work. Crespi states “the farming of aquatic organisms in inland and coastal areas, involving intervention in the rearing process to enhance production and the individual or corporate ownership of the stock being cultivated”. Although it is widely believed that aquaculture only implies the rearing of animals for consumption, a broad and more complete definition of aquaculture includes the rearing of tropical fish; the production of minnows and goldfish; the culture of sport fish varieties for stocking into farm ponds, streams, and reservoirs; the production of animals for augmenting marine stocks; and aquatic plant culture. (Stickney, 1979)

An examination of the many theories and studies related to the topic of aquaculture suggest there are many terms used synonymously with aquaculture. The most employed synonyms are: “marine agriculture”, “underwater agriculture”, “aquatic agriculture”, “pisciculture”, “fish culture”, and “fish farming”. Other synonyms include specific or individual species such as shrimp culture, shrimp farming, salmon culture or salmon farming. In some cases, the synonyms imply a different characteristic. For example, the term “mariculture” was coined to distinguish between “marine aquaculture” and “freshwater aquaculture”. (Stickney, 1979)

It is acknowledged that underwater agriculture is almost as ancient as agriculture itself. The close relation of human beings with water is reflected in the activity of underwater agriculture. The first known written record describing aquaculture and its benefits is a very short book in Chinese written by Fan Li in 460 Before Common Era (B.C.E). Pictographs from the tombs of the Pharaohs of Egypt show what appears to have been some form of tilapia fish culture. Similarly, oysters were cultured by the Romans nearly 2,000 years ago. (Stickney, 1994). In fact, some evidence shows that aquatic agriculture has been practiced in Asia for at least 3,000 years; however, archeological evidence from British Columbia in Canada reveals that Aboriginal peoples were enhancing marine production of species thousands of years before that by creating berms on beaches to enhance foreshore productivity of shellfish species to provide their communities with a sustainable food source. (Urban, 2006). Likewise, evidence suggests that aquaculture systems were invented by the indigenous inhabitants of Australia, who may have raised eels as early as 6,000 B.C.E by developing about 100 kilometers of volcanic floodplains into a complex of channels and dams using woven traps to capture eels and preserve them to eat year round. Additionally, the Japanese cultivated seaweed by providing bamboo poles, nets and oyster shells to serve as anchoring surfaces for spores. (Turcios & Papenbrock, 2014).

Even though aquaculture has been practiced for centuries, it was not until the 1970's that aquaculture was deemed a discipline of science. In fact, it was not until 1978 that the US Department of Agriculture's farm bill acknowledged for the first time the applicability of aquaculture to the goals of that agency. (Stickney, 1979)

Currently, The WWF (2015) (World Wildlife Fund) calculates that the global fishing fleet is 2-3 times larger than what the oceans can sustainably support, however it was until the 1990's that aquaculture started to be considered a solution for the over-exploitation in the fishery science, in which, the term "collapse" became a frequent key-word in the expanding literature of aquaculture, because over 87% of global capture fisheries are currently fully - or over-exploited-. Hence, aquaculture is looked upon with increasing urgency to fill the growing global demand for seafood. (Volpe, et al, 2014).

Aquaculture also plays an important role in global efforts to eliminate hunger and malnutrition by supplying fish and other aquatic products rich in protein, essential fatty acids, vitamins and minerals. It is well-known that fish constitute an important and healthy part of the human diet, mainly due to the presence of polyunsaturated fatty acids which play an essential role in human health but also due to the presence of vitamins, minerals and proteins with a high biological value. Thus fish represent a high-quality nutritional source. The health benefits associated with the consumption of fish products are particularly important for the prevention of heart-related diseases and for many vulnerable groups, such as pregnant and lactating women, infants and pre-school children. (Subasinghe, et al, 2009). Debates over the quality, flavour and nutritional contents of farmed and wild fish are still common. Studies have demonstrated (Cahu, Salen, et al. 2004; Claret, Guerrero, et al, 2014) the lipid composition of farmed fish is less affected by seasonal variations than that of wild fish, moreover, sensory analyses by trained consumer panels have not reported any significant differences between wild and farmed fish. Regarding consumers' perception, consumers associated wild fish with a more natural, healthier and better tasting fish, showing that many people seem to be prejudiced against the farmed fish product. However, these opinions resulted from strong emotions and not from scientific evidence. (Verbeke, Sioen, et al, 2007). In conclusion, farmed fish can provide consumers a nutritional composition and flavour that is at least as beneficial and good as that provided by wild fish. (Schlag, & Ystgaard, 2013)

Aquaculture can also make significant contributions to development by improving incomes, providing employment opportunities and increasing the returns on resource use. With respect to food availability, aquaculture contributes to the quantity of food through the supply of aquatic products from domestic farming and through the supply of food purchases using foreign exchanges.

Thus, aquaculture was considered an alternative to the low levels of fisheries and increasing demand for seafood. (Hutchings, 2000; Mullon, 2005; Hancock, 1997). Consequentially, a global debate took on momentum regarding how to manage fisheries sustainably. The precautionary approach to fisheries management, ecosystem management, Marine Protected Areas (MPA's) and governance, rarely mentioned

before, took center stage. The prescriptions of sustainability did not address the key failings in most fisheries systems. Overfishing was supposed to be a symptom of poor governance systems rather than a problem to be treated. Prominent fishery collapses motivated scientific scrutiny of various hypotheses (e.g., climate change and overfishing). The effects of the examination of the eventual failure of the management systems involved created disharmony among the various sectors such as fishermen, scientists, managers and politicians (Shumway & Parsons, 2006).

International Organizations such as the World Bank, FAO and OECD have agreed that aquaculture has the potential to provide the extra 40 million tons of fish needed to meet the projected worldwide consumption of fish by 2030. In 2001 De Silva proposed that aquaculture's further growth and development would have to occur under a different socio-economic atmosphere because the basic paradigm, aimed to increase production at almost any cost, was detrimental to the environment and human capital. Hence, he concluded that a sustainable increase in production with minimal environmental perturbations was needed so aquaculture could increasingly contribute to poverty alleviation, social equity (through employment generation) and food security, which is considered to exist when all people, at all times, have physical and economic access to sufficient, safe and nutritious food, allowing them to meet their dietary needs and food preferences for an active and healthy life. In mid-1990, the motivation for aquaculture research was to provide mankind with alternative forms of nutritious and plentiful food. The concept of growing aquatic organisms to provide food for humanity was favourably viewed by most researchers. In addition, underwater agriculture was proposed as a mean of supplementing natural marine and freshwater productivity and thus to diminish food shortages (Stickney, 1994). Under the proper circumstances, densities per unit water volume under aquaculture strategies greatly exceed those found in the natural environment. (Stickney, 1979). Though there are in fact few, if any, cases where fish stocks have become extinct because of over-exploitation, some appear to have been pushed to such low levels that they are not worth exploiting. (Hannesson, 1996). In the search for sustainable fisheries, overfishing has repeatedly been identified as the primary problem. (Shumway & Parsons, 2006).

Da Silva (2001) also argued that before the new millennium, the primary goal of aquaculture was to increase production and profitability, either through the application of technology, the use of more resources or an increase in the area under culture. According to him, environmental and social issues were only of limited concern and there has been limited emphasis on the development of suitable strategies to deal with them. De Silva predicted the solution to be neither that simple nor that straight forward because of the presence of other influential factors such as social, political and even global marketing issues.

Aquaculture has also been attributed to negative environmental results where it is practiced due to the competition for valuable resources such as water, land, seed, broodstock and feed ingredients which are often in short supply. In addition to environmental risks, the excess of fish waste and interbreeding exists. The same resources are commonly used in agriculture, an activity with which aquaculture is often integrated. It happens that this competition creates conflict between user groups, which ultimately increases public concern about the consequences of aquaculture development. (Stickney, 1994).

The majority of animals selected for aquaculture around the world come from three phyla: Mollusca, Arthropoda and Chordata. Examples of the most common cultivated species are:

1. Mollusca: Quahong clam, American oyster, bay scallop, blue mussel.
 2. Arthropoda: blue crab, American lobster, white shrimp, red swamp crayfish.
 3. Chordata: channel catfish, salmon, rainbow trout, green sea turtle.
- (Stickney,1978)

Aquatic agriculture has presence all over the world; however, in Latin America and the Caribbean region, it has experienced the most rapid development growth rate. According to the Food and Agriculture Organization of the United Nations (2005), between 1970 and 2006, the world's growth rate of aquaculture increased by 8.8%. In the same period the aquaculture's growth rate in Latin American and the Caribbean increased by 22%. In addition, the huge quantity of available land suggests that the region has the potential to sustain and increase the aquaculture production. Despite Asia

accounting for 90% of the world's produced seafood through aquaculture farms, the FAO argues that the Asian region's available land to expand the industry of aquaculture is practically exhausted, thus it is expected to have a lower growth rate than the Latin America and the Caribbean region.

Aquaculture in Mexico

With a territory of 1,964,375 km², its 12,500 km² of coastal lagoons and marshes, 6,500 km² of interior water-bodies such as lakes, rivers and dams and a total of 1,277,904 hectares of coastline, Mexico has high potential to sustain fishing and aquaculture. The aquaculture in Mexico appeared in the 1930's as a social activity created to contribute to the economy of extremely poor regions. Despite the sector experiencing recent changes, the main infrastructure of aquaculture is located in rural zones with 80% of the aquaculture industries being extensive and in consequence low-yield, because extensive aquaculture produces a lower yield per unit of land, and its use commercially requires large quantities of land in order to be profitable. (INEGI, 2010).

Currently, Mexico is experiencing difficult times due to a political transitional period, where PRI Partido Revolucionario Institucional (Revolutionary Institutional Party) won the presidential elections on June 2012, after 12 years of Partido Acción Nacional's PAN (National Action Party) mandate. It is hard to establish the new government's position toward aquaculture; however, due to its right-center background it is expected that the development of the sector will be still promoted. The social implications of the aquaculture sector should not to be ignored due to the high number of families that rely on aquaculture as their main source of income.

International standards classify Mexico as a middle-income country, however, the existing poverty and inequality are aspects deeply and historically rooted in the country's economic life. By 2003, approximately half of Mexican population (nearly 50 million) lived in poverty and one fifth (approximately 20 million) in extreme poverty (World Bank, 2004). The southern states of Chiapas, Guerrero, Oaxaca and Veracruz are Mexico's poorest regions. Mean incomes in the southern states of Mexico are roughly half of the Mexican average, such that about two thirds of the population in the south are poor compared with half of the national population. (Asiain-Hoyos, 2009).

Mexican aquaculture follows three principal directions:

The promoted aquaculture. Developed in small bodies of water, the promoted aquaculture destines its production principally toward a farmer's self-consumption. The most common species cultured in this practice are tilapia and carp.

Aquaculture fisheries. These fisheries are created for the systematic rearing of carp, tilapia, catfish, black bass, and prawn, among others, in medium and large dams.

The Controlled Aquaculture. The main goal of controlled aquaculture is commercialization that requires a high amount of investment. The main species produced under this category are trout, catfish, shrimp and oyster. (AVAC, 2009)

According to the Statistical Annual Directory of Fisheries and Aquaculture (CONAPESCA 2013), the Mexican national fishery production was 1,687,498 tons (live weight), of which 254,056 tons were produced under the aquaculture methods, meaning that aquaculture had a participation of 15.05% of the total production of fisheries in the country. In contrast, worldwide fish produced from farming activities accounts for over one-quarter of all fish directly consumed by humans (Naylor, Goldberg, et al, 2000). The most cultured species are shrimps, sea beams, oysters, carps and trout with 100,321; 72,779; 43,567; 19,956; 7,026 tons, respectively.

In regards to international trade during 2010, 249 thousand tons with a value of 842 million dollars were exported from Mexico and 215 thousand tons with a value of 647 million dollars were imported, resulting in a favorable balance of 196 million dollars. The most exported species is shrimp with 31% of the total; its main destination being the United States which demands the product beheaded and frozen. Other countries where Mexico exports to are Hong Kong, Spain, Japan, Holland and Italy. Mexico mainly imports shrimp from China, Guatemala and Honduras but it imports more fisheries from Vietnam, the United States, Norway and Chile as well. (CONAPESCA, 2012).

Regarding the global context, in comparison to Mexico, Asian countries dominate the aquaculture production as shown in the table below

Table 1.1 Thousands of tons (live weight) of seafood produced in 2011.

| World ranking | Country | 2007 | 2008 | 2009 | 2010 | 2011 |
|---------------|---------------|--------|--------|--------|--------|--------|
| 1 | China | 41,173 | 42,670 | 45,279 | 47,830 | 50,173 |
| 2 | Indonesia | 3,121 | 3,855 | 4,713 | 6,278 | 7,937 |
| 3 | India | 3,355 | 3,479 | 3,792 | 3,790 | 4,578 |
| 11 | Chile | 853 | 871 | 881 | 713 | 970 |
| 14 | Brazil | 290 | 290 | 416 | 480 | 630 |
| 17 | United States | 526 | 500 | 480 | 497 | 397 |
| 21 | Mexico | 268 | 283 | 285 | 271 | 263 |
| 26 | Canada | 169 | 144 | 154 | 161 | 162 |

Note: Figures adapted from (CONAPESCA, 2012)

During the year 2011, China was the largest producer of fisheries worldwide, and the largest importer, followed by Japan and the United States, respectively. Conversely, in terms of national consumption during the same year, Mexico was ranked as the 30th largest importing country of fisheries (measured by thousands of tons). Regarding the value of the imports (measured by millions of dollars), data demonstrated that Japan spends the most money on fisheries worldwide, followed by the United States and China respectively. Once again, Mexico is ranked 30th in this category. To conclude, the balance of payments of fisheries shows that in 2011, China, Vietnam and Norway had the largest surplus, respectively and Japan, the United States and France had the largest deficits. Mexico had a surplus of roughly 370 million dollars, which maintained it in the 17th position. (CONAPESCA, 2012).

The set of legislation that regulates Aquaculture in Mexico is extremely complex mainly because of the large number of administrative entities involved. The use of certifications and labels such as “organic”, “fair trade” and so on, is vital to build trust with certain products, even though there is a constant debate whether they increase profits or not. Unfortunately, the small-scale farms seldom know the advantage of having these certifications and sometimes they do not acknowledge which one is best for their products, assuming that they trust the label schemes. The fact that most of the aquaculture industries are located in rural zones and managed by peasants makes it more difficult to have the proper managerial tools and practices to run a business.

Aquaculture in Veracruz

The state of Veracruz in Mexico has around 720 kilometers of coastline with several climate changes due to the large variation of altitude. The microclimates include cold snow-topped mountaintops, warm wet tropical weather, subtropical and template weather. According to CONAGUA (Mexican National Water Commission), 33%

of Mexico's freshwater finds pathways through Veracruz, pouring into the Gulf of Mexico. Veracruz, in the national context, is one of the most privileged states in terms of natural resources, including water. However, in spite of its potential to achieve economic and social progress, Veracruz is among the five lowest ranked states in terms of the main indicators of development and well-being (PNUD, 2015). Unfortunately, thousands of families survive with less than the minimum income required to satisfy their fundamental necessities. (Asiain-Hoyos, 2009).

Table 1.2 the top five Mexican states producers of fisheries through aquaculture in the year 2012

| State | Tons of Live Weight |
|----------|---------------------|
| Sinaloa | 50,882 |
| Sonora | 36,162 |
| Veracruz | 33,012 |
| Tabasco | 19,684 |
| Nayarit | 17,711 |

Note Figures adapted from (CONAPESCA, 2012)

The five state productions combined represent 61.98% of the total Mexican rearing fisheries through aquaculture methods.

Veracruz, like almost any other state of Mexico, is experiencing problems related to violence. Since it is one path to the border of the United States, drug cartels take advantage of the state's location and of the closeness to American ports like the Port of South Louisiana and the Port of Houston. Veracruz has more than 7.6 million inhabitants, the third most populous state in Mexico, with a Human Development Index (HDI) of 0.713, which is considered as low and equivalent as the one in Albania. Interestingly, according to the current growth rates in Veracruz, it will reach Distrito Federal's HDI (which is 0.830) in the year 2066 (PNUD, 2015). 56% of the population is under 30 years old. Life expectancy is 71 years for men and 76 years for women. 3.5% of the population migrates to other states and an average of 11 persons of every 1,000 migrates to United States per year. (INEGI, 2012)

In the next section, the term sustainability is presented. In regards to sustainability in the sector, the recently reformed General Law of Sustainable Fishing and Aquaculture (Ley General de Pesca y Acuicultura Sustentable) contains the principles for organizing, promoting and ordering the social, environmental, productive, technical and biological aspects at a national level. The Comité de Sanidad Acuícola y Pesquero Veracruzano (Veracruzanean Comitee of healthiness of aquaculture and fishing) is in charge of training and the diffusion of good practices regarding aquaculture production, having a main goal of sustainability. Another institution working on the subject is the Comité Estatal Sistema Producto Tilapia Veracruz (Veracruz State Committee of Tilapia Product System), which seeks to improve the organization, productivity and allow entry into the national and international markets to increase the products added value of the tilapia farmers. Regarding the sustainability factor, it has been proposed that the implementation of the aquaponic systems, which links the aquaculture with hydroponics, begin in suburban and urban zones for the production of tilapia and ornamental fish. The aquaponic system is also recommended for areas where the availability of water is scant.

Sustainability, Vulnerabilities and Sustainable Marketing

Most countries are facing challenges of achieving development to an adequate degree of environmental sustainability. Many efforts have not been successful due to the contradictions that arise within the developmental modality existing between economic growth and the environment. Sustainability emerged as concept to redefine the notion of development by merging it with the natural environment.

Since its creation, the sustainability approach has tried to contribute to the reduction of every kind of vulnerability (social, economic and environmental) in any given system. (Turner, Kasperson, et al, 2003). The term vulnerability as defined by Luers, Lobell, et al (2003) means *“the degree to which human and environmental systems are likely to experience harm due to a perturbation or stress”* and, in recent years, it has

become a central focus of the global change and sustainability science. A new emphasis on vulnerability marks a shift away from traditional scientific assessments, which limit analysis to the stressors (e.g. climate change, hurricanes) and the corresponding impacts, towards an examination of the system being stressed and its ability to respond (Luers, et al., 2003)

Companies, as a social organization with economic and sometimes social purposes, are subject to apply sustainability within their goals. A quite recent marketing trend called sustainable marketing proposes the idea of working with sustainability within all the levels of a company. The working definition of sustainable marketing used throughout this work will be the one coined by Emery (2012), which is the following: *“Sustainable marketing is a holistic approach whose aim is to ensure that marketing strategies and tactics are specifically designed to secure a socially equitable, environmentally friendly and economically fair and viable business for the benefit of current and future generations of customers, employers and society as a whole.”*

The term sustainable marketing applies when an organization takes the perspective that it operates within a finite resource system, and thus has a responsibility to its current and future stakeholders to make strategic decisions for the long-term benefit of the entire system. Sustainable marketing differs from conventional marketing in its holistic approach to decision-making, monitoring and evaluating organizational actions and consequences. That is, when an organization commits to sustainable marketing, overarching sustainability goals become the guiding force behind all operational decisions at all levels of the organization. This topic will be expanded in the next chapter.

Future of Aquaculture

Aquaculture is transiting to a stage of important improvements. More innovative techniques, but sometimes re-adopting ancient systems, are being implemented. Aquaculture is being shaped by a myriad of factors. The development of aquaculture is closely related to the development of Aquaponics. Although there is evidence that

aquaponics was practiced centuries ago, it has gained popularity as a response of those factors changing the industry. The first examples of aquaponics systems were found in South China and Thailand where rice was cultivated and farmed in paddy fields in combination with fish. These poly-cultural farming systems existed in many Eastern countries where fish, such as the swamp eel and pond snails were raised in the paddies. The Aztecs, in Tenochtitlan, in present Mexico City, cultivated agricultural islands in Mexico as early as 1150–1350 B.C.E where plants were raised on stationary and sometimes movable floating gardens, islands in lake shallows, and waste materials dredged from canals and surrounding cities were used to manually irrigate the plants. This method of that early agriculture system, called Chinampa, usually measured from 30 × 2.5 m to 91 × 9.1 m.

Chinampas were created by staking out the shallow lakebed and then fencing in the rectangle with wattle. The fenced-off area was then layered with mud, lake sediment, and decaying vegetation, eventually bringing it above the level of the lake. Often trees such as willow (*Salix bonplandiana*) and cypress (*Taxodium mucronatum*) were planted at the corners to secure the chinampa. Canals navigated by canoe surrounded the islands and were used to raise fish. Waste from the fish fell to the bottom of the canals and were collected to fertilize plants. These gardens had very high crop yields with between four and seven harvests a year.

However, the development of modern aquaponics is often attributed to the works of the New Alchemy Institute at the North Carolina State University where researchers developed the use of deep water culture hydroponic grow beds in a large-scale aquaponics system in the 70's. For example, Canada first saw a rise in aquaponic setups throughout the 90's, predominantly as large commercial installations raising high-value crops such as trout and lettuce. (Turcios & Papenbrock, 2014). A more recent case of aquaponics in Canada is the research conducted by the University of New Brunswick in Saint John and the Department of Fisheries of Oceans Biological Station in Saint Andrews which has been running a pilot project in the Bay of Fundy, Nova Scotia, where kelp, mussels, and salmon are being grown together, connected by nutrient and energy transfer through water, in a so-called Integrated Multi-Trophic Aquaculture (IMTA) system, in which the by-products or waste from one species are recycled to

become inputs as fertilizers or food for another. The term multi-trophic refers to the incorporation of species from different trophic or nutritional levels in the same system and this is one potential distinction from poly-culture systems. According to the research, biological and economic results were positive, but social acceptability was also a critical component of aquaculture sustainability. In general, the mussels grew 50% faster in weight and kelps increased their biomass production by 46% when grown in proximity to salmon aquaculture sites. The study also concluded that kelps and mussels are good candidates for bio-mitigating the dissolved inorganic and organic matter in the water.

The Problem Statement

The purpose of this study is to investigate how the stakeholders of commercial aquaculture in Veracruz describe their socioeconomic and environmental vulnerabilities related to their operation; what the sources of such vulnerabilities are and how, and to what extent, sustainable marketing could contribute to mitigating such environmental and social vulnerabilities in the commercial aquaculture in Veracruz, Mexico.

The following research questions define the scope of the research:

1. How do stakeholders of commercial Aquaculture in Veracruz describe the socioeconomic and environmental vulnerabilities related to their farming operations?
2. How, and to what extent, could sustainable marketing contribute to mitigating environmental and social vulnerabilities in Aquaculture in Veracruz, Mexico?

The Professional Significance of the Study.

When planning my research, several aspects were considered to classify my work as a work with professional significance. First, aquaculture has been considered as an economic activity to relieve poverty and hunger by the Food and Agriculture Organization of the United Nations and by many other organizations and governments. Second, few works have studied aquaculture farms in Veracruz from a non-technical approach. As noted by Turcios & Papenbrock (2014), research on the public's perception of aquaculture practices is lacking at a general level. Most of the information circulating about the topic of aquaculture is subjective and unsubstantiated, typically in the form of media reports. In addition, the studies found by the researcher are exclusively focused on either the raising process, ecological impact, poverty reduction, technology transfer or subsidies. Thirdly, despite that the concept and idea of Sustainability has been known and applied for at least one decade in Mexico, there is still a lack of knowledge of aquaculture's social, environmental and economic benefits. Therefore, my research aims to fill this gap by addressing the potential benefits sustainable marketing could contribute to aquaculture farms and doing so in the context of Mexico where very little research of this type has previously been conducted. My research offers a unique opportunity to expose Mexican aquaculture given the importance of aquaculture improving the well-being of local communities. In light of the proliferation of small-scale as well as larger scale companies in the aquaculture sector, the premise is that sustainable businesses contribute to build sustainable communities.

Overview of the Methodology

My study examines three inland fish farms in the southern state of Veracruz Mexico to ascertain how the stakeholders of the farms describe the socioeconomic and environmental vulnerabilities related to their operation and how and to what extent, notions of sustainable marketing could contribute to mitigate such vulnerabilities. The research for this qualitative study was carried out in the Mexican State of Veracruz on three separate aquaculture farms. Research was also conducted at

many different locations that included: homes of the study participants, public spaces, local markets and fish farms. The farms studied were selected because they are representative of small, medium and large farms to give a broader perspective about the vulnerabilities that different sized farms might have. The first farm is considered as small because it employs less than ten people in their daily operation. The second farm is considered as medium because they employ between 25-30 workers and finally, the third farm studied is considered as big because they employ nearly 100 workers daily to operate.

The small fish farm I visited is named “El Arcoiris de Tlalnahuayocan”, located in the community of Rancho Viejo in the municipality of Tlalnahuayocan. The small-scale trout farm is located nearly 20 minutes away from the city of Xalapa, the capital of the State of Veracruz. Despite the fact that Rancho Viejo is a small community, of roughly 800 inhabitants, it had at the time of the research, nearly nine fish farms with adjacent restaurants, serving mainly the community and neighboring cities.

The second fish farm I visited is named “El Fuerte 1847” located in the community of Plan del Rio, municipality of Emiliano Zapata. The location of this farm is prestigious, due to the fact that it is just beside an old road that links the Capital of the State with the coastal city of Veracruz. “El Fuerte 1847”, which considers itself as a medium size company, also has an adjacent restaurant in which it sells nearly all of its production.

The third fish farm I visited, whose name will not be mentioned throughout this research at the request of the owner and because anonymity was promised, was located in the municipality of Alvarado. Although Alvarado is a coastal municipality, the farm (which will be hereafter referred to as “PezCo”) is not located on the coast. “PezCo” employs more than one-hundred people daily and is considered as one of the biggest and most successful fish farms in the State of Veracruz. Contrasting with the other two farms visited, “PezCo” does not offer an adjacent restaurant to sell its production. In fact, nearly one hundred percent of their production is distributed to local markets and restaurants in the cities of Alvarado and Veracruz.

The study examines the social, economic, and spatial dimensions of the utilization of sustainable marketing in the commercial aquaculture in the State of Veracruz employing qualitative ethnographic methods. The ethnographic methods used in my study include, semi-structured interviews, participant observation and document analysis. Fieldwork was conducted between the months of September and December 2013. In regards to the interviews, the research participants of this work included stakeholders of the commercial aquaculture in the State of Veracruz. The research participants were: key informants, owners and/or managers of the fish farms, farm workers, farm neighbours, farm consumers and farm suppliers. The key informants were selected on the basis of their level of involvement with and knowledge of aquaculture employing snowball as the sampling method of recruitment. In chapter three, more details will be provided for the methodology component of the present thesis.

Participant observations were conducted on the fish farm located in the community of Rancho Viejo, during five consecutive business days with the goal to understand how a fish farm works and what its practices are. Participants were provided with a consent form, in which they gave their written or oral consent, stating the purpose of the study with the option to stop their participation at any time. In addition, the participants had the option to request the company's approval form to conduct the observation at any time. I observed the farm's daily operation, how the workers behave; their attitudes towards other workers, the owner and consumers. Hand-written notes were taken during the observation.

In order to have a better understanding of the aquaculture business and the vulnerabilities surrounding it, I engaged in public document analysis. Consent forms were not needed to access the documents in the public domain. The documents were gathered from Mexican governmental institutions such as SAGARPA, CONAPESCA, PROFEPA, INEGI, INECOL, and from a Civil Association of Fish Farmers in the State called AVAC. The following chapter will inform the theories and research that has been published around and related directly to the research questions developed in chapter one.

Chapter 2. Literature Review

The next section attempts to define Sustainability in more detail. It also determines when the concept was used for the first time and when it gained international importance. The following section defines notions of Marketing and integrates aquaculture's contribution to food production as a whole. The third section, called Sustainable Marketing, explains the points of convergence between Sustainability and Marketing, resulting in a marketing approach that can be applied to most industries. The subsequent section describes the contributions on the concepts of Vulnerabilities, mainly social ones, containing examples of vulnerabilities related to seafood production. Following that, the chapter transitions to the notions of Sustainable Communities (or Societies) to illustrate how these are interrelated with aquaculture and how the most relevant and recent studies define the sustainable communities. Finally, the end of this chapter addresses a relatively new trend of aquaculture thought to be even more environmental, economic and socially-friendly, called aquaponics.

Industry Analysis

In a general perspective, Aquaculture is a complex industry shaped by numerous factors such as the market and marketing requirements, changing demand habits, production techniques, higher competition in international trade, environmental and social issues and national and international interests. (Wurmann, et al, 2004).

During the Conference on Aquaculture in the Third Millennium held in Thailand in 2000, it was concluded that despite the majority of aquaculture was rural and subsistence, aquaculture played a major role as a provider of direct and indirect employment to the rural poor and, in consequence, to poverty alleviation. In many

developing countries, aquaculture provides opportunities for diversification on agriculture farms, which can be classified as rural, subsistence or industrial. In the first, the species cultured are generally those that feed low in the food chain, using a low-level of primary inputs and where the culture activity may not necessarily be the main source of income of the household, but one of a diverse range of economic activities on a small-scale agriculture farm. The last tends to culture species of higher value and generally involves more intensive practices that use a high level of primary resources, such as water, feed, energy and etcetera. (De Silva, 2001).

In 1970, only 3.9% of every fish in the world market came from aquaculture. However, in 2004 this figure reached 43%. (Seijo & Martinez, 2005). The contribution of aquaculture to the global food supply has increased steadily during the last 15 years by comparison to the capture fisheries. Between 1984 and 1997, aquaculture's share in the total aqua-food supply has grown from 12% to 28%; nearly every third kilogram being consumed is cultured. (De Silva, 2001). As aquaculture began to boom in the 1990's, several concerns emerged such as the clearing of mangroves to make way for shrimp farms in Asia and Latin America, increased use of fishmeal and fish oil made from wild marine fish, - that as mentioned before, puts even more pressure on the wild fisheries- and the generation of water pollution and shrimp and fish diseases. By 2015, total production from aquaculture is expected to be 74 million tons. In addition, new research predicts that aquaculture production will need to more than double between now and 2050 to meet the demands of a growing population. However, doubling aquaculture production without further increasing the industry's efficiency could lead to a doubling of environmental impacts. Unless the aquaculture industry is able to boost productivity, the limited availability of land, water and feed may constrain its growth.

More than 40% of the world's population live not more than 100 km away from the coastlines, putting high pressure on the coastal ecosystems. Aquaculture developed in the last decades, keeps fish in ponds for easier harvesting and high technological fish farms extensively use feed, hormones and often antibiotics. That is the reason issues regarding the ecological impact of industrial aquaculture have been raised and the sustainability of such practices questioned. With respect to the pollution generated by aquaculture, some fish excrete nitrogenous waste products by diffusion

and ion exchange through the gills, urine and feces. Decomposition and reuse of these nitrogenous compounds is especially important in aquaculture using recirculation systems due to the toxicity of ammonia and nitrite and the chance of hypertrophication of the environment by nitrate. (Turcios & Papenbrock, 2014).

Aquaculture, as any other industrial sector, has had issues regarding technology transfer from "developed countries" and within countries among lesser and more advanced operations. Typically, there is indigenous technology and local initiatives that lack capacity to manage the so-called "transferred technologies" which is the process of transferring scientific findings from developed countries to users in developing countries to create more benefits. Technology cooperation and diffusion is rarely successful and sustainable without some form of capacity building. Capacity building efforts are made more effective when they are extended, adapted, and localized. Capacity building includes the extension of education and training to other groups such as community or school groups, and the inclusion of women and children; the methods and delivery of education and training must be adapted to local conditions and to the knowledge and skill levels of the trainees. To this regard, the United Nations Convention on the Law of the Sea deals specifically with marine technology and capacity building in the management, exploration, and exploitation of marine resources, which is the only international agreement on transfer of technology on marine matters. (Agboola, 2014), which leaves aquaculture without a formal document on transfer of technology. Nevertheless, FAO has published technical guidelines on aquaculture development to promote good practice in the industry as part of its programme of implementing the Code of Conduct for Responsible Fisheries. (Fisheries and Aquaculture Department, 2015).

In a Latin American and Caribbean context, there are several important trends in relation to aquaculture farms. There usually are, in the region, a good number of small to medium size aquaculture farmers and some sophisticated export oriented big-size enterprises. Smaller farmers supply local demand or sell their crops to exporters. (Wurmann, et al, 2004). Occasionally, they have the capacity to access international markets directly. It is also normal to see big farmers assisting small producers; supplying them with post-larvae, balanced diets and even advancing working capital with the aim of securing their crops to amplify their exports businesses. Levels of vertical and

horizontal integration in this industry also vary extensively in the region, and depend on a wide variety of circumstances. It is generally typical, though, that small farmers neither produce their own post-larvae, nor do they sell their harvest directly to the public or for export purposes. In the case of shrimp farming, they usually concentrate on pond farming their producing from Post-larvae stage to market sizes. Big farmers are increasingly vertically integrated; handle their own brood-stock; produce post larvae and grow them to market sizes and thereafter sell end products directly to brokers or distributors abroad or in their own countries. (Wurmann, et al, 2004).

Although Mexico was not positioned in the top ten of the world's producer through aquaculture methods, it was ranked number six in the world's larger producer of cultivated shrimp in 2011. Conversely, Mexico is ranked 17th in regards to the frozen shrimp exportation; with Vietnam, India and Thailand being the top three respectively (measured in thousands of tons). Regarding the value of the exportation of frozen shrimp at a world level (measured in millions dollar), Mexico jumps to the 11th position; Vietnam maintaining its first position with Thailand coming in second and India third.

Table 2.1 Mexico's Fisheries Production in Tons.

| Year | Total Production | Capture | Aquaculture |
|------|------------------|-----------|-------------|
| 2008 | 1,745,424 | 1,461,799 | 283,625 |
| 2009 | 1,768,068 | 1,483,049 | 285,019 |
| 2010 | 1,619,982 | 1,349,265 | 270,717 |
| 2011 | 1,660,475 | 1,397,620 | 262,855 |
| 2012 | 1,687,498 | 1,433,472 | 254,026 |

Note Figures adapted from Annual Directory of Fisheries and Aquaculture (CONAPESCA, 2012).

As shown in the table above, in the year 2009, aquaculture's production reached its maximum level in the last five years. Surprisingly, it was in 2009 when the total production of fisheries through capture methods also reached its maximum level.

Mexico

Aquaculture in Mexico is still considered as a developing industry. The Reglamento de Pesca Marítima y Fluvial (Regulations for Maritime and River Fishing) in 1923 classified aquaculture as a fishing activity. Eventually, two Aquaculture Centers were built, one in Aguascalientes and one in Estado de Mexico to produce juvenile fish. Between the 1930's and 1950's aquaculture efforts were directed to disseminate trout and bass cultivation. In the 1960's, 16 Aquaculture Centers were open to reproduce mainly carp. Also in the 1960's, the Instituto Nacional de Investigaciones Biológicas (National Institute of Biological Research) now Instituto Nacional de Pesca y Acuicultura (National Institute of Fishing and Aquaculture) was created (FIDEFA), opening and administering most of the Aquaculture Centers (AC). According to the CONAPESCA website (2014), the operation of the AC's had a limited impact in the development of aquaculture as a whole. There are currently eight Federal Aquaculture Centers and four supporting ones in operation, (none of them in Veracruz), working mainly in the reproduction of tilapia, carp, trout, catfish and bass.

The institutional efforts for the development of aquatic agriculture are oriented towards the promotion of the rural aquaculture and the fish re-population of reservoirs, especially in the largest dams. Nevertheless, the results of these activities are not fully evaluated. From 1950 to 1970, state aquaculture policies were oriented towards the development of extensive aquaculture. From the mid-1960 and into the 1970's, efforts were concentrated on building hatcheries to provide seed, fingerlings and post-larvae for social and commercial production. Although the 1980's are distinguished by a profound economic crisis caused by devaluation and an almost uncontrolled inflation, policies were directed into the industrialization of aquaculture and turned the industry into a high-yield one. In the 1990's, after the economic crisis, a renewed fisheries and aquaculture industry appeared whose development was closely related to the opening of Mexico State to the international markets. In addition, during this decade, a new ecological

awareness began to shift the state policies towards promoting the development of the aquaculture industry. (Crespi & Lovatelli, 2011). According to Álvarez & Ramírez's work in 1999, as a result of the implementation of the promoted aquaculture people living in marginalized zones increased the household incomes and their consumption of food with high protein contents.

In regards to the distribution and diversity of fisheries in Mexico, there are a total of 412 registered companies with CONAPESCA from which, 225 are dedicated to freeze the products, 46 companies work in the canning process, 17 plants transform fish into oil and flour mainly, and the other 124 companies are listed under the category of craft-work. Of the total amount of companies dedicated to packaging, and any other type of transformation of seafood in general, 61.5% are located in Sonora, Sinaloa, Nayarit, Baja California and Baja California Sur; 16.7% in Oaxaca, Michoacán, Chiapas, Jalisco and Colima; 12.6% in Veracruz and Tamaulipas and only 9.2% in Yucatán, Campeche and Tabasco. (CONAPESCA, 2012).

The Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación SAGARPA (Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food) manages 25 underwater farms, dedicated to the production of young fish, eggs and larvae, generating more than 27 million of organisms. Shrimp, carp and tilapia combined comprise 89% of the space dedicated to this activity. CONAPESCA, whose main goal is to increase development and competitiveness of the sector, coordinates the three levels of government and executes different promotion programs and projects, regarding fishing and aquaculture practices,.

In the year 2012, SAGARPA administered 14 centers for the production of juvenile fish and post-larvae around the country. The three most produced species were tilapia, carp and trout. The western state of Sinaloa and the land-locked state of Chihuahua are the only states with two centers; however, the state that produced more juvenile fish and post-larvae was Michoacán with 2,968 thousands organisms. (CONAPESCA, 2012).

According to CONAPESCA (2012), there are 9,230 aquaculture farms in Mexico, using 115,910 hectares of land. The state of Veracruz has the highest number

of aquaculture companies in the country; however, Sinaloa is the state with the highest area of land used for aquaculture purposes with 47,397 hectares. In 2012, there was a total of 266,380 people working in the aquaculture sector, with Sinaloa, Veracruz and Sonora, respectively, being the top three states with the highest percentage of people employed in that sector accounting for 31.9% of the total in Mexico.

Data demonstrated that in 2010, there were 293,803 people working in aquaculture farms. 2010 was the year with the highest levels of employment between the years of 2002 to 2012. Figures also illustrated that during the period from 2002 to 2007, there was an increasing trend of people working in the aquaculture sector. In the years 2008 and 2009, we can see a reduction of the same number. During 2009, there were nearly the same amount of people working in aquaculture as in 2003. During 2010, there was an abrupt increase of roughly 20,500 people working in aquaculture; however, in 2011 there was a decrease of nearly 20,430 people. Continuing into 2012, the reduction trend persisted, falling closely to the same amount as the year 2002. The data suggests that during 2010, there was a great interest in working in aquaculture, however, the interest rapidly vanished by the next year. Reasons for the decrease of people working in aquaculture will be explored in the results chapter.

Mexico is a federal republic, the President, who is the head of the Executive, is elected by popular vote for a term of six years. The Cabinet is appointed by the President. The department responsible for normalizing and regulating aquaculture within the country has had some significant changes since its creation and has, most of the time, been linked to the fisheries sector. Experts like Asian-Hoyos (2009) argued that the unstable condition of the Department has constrained the development and implementation of long-term policies and programs. At a Federal level, the institution in charge of Aquaculture is CONAPESCA, which depends upon SAGARPA. Since 1998 FAO has collaborated with the Mexican government, represented by SAGARPA, to evaluate annual programs of "Alliance for the Countryside". In addition to national evaluations, the FAO prepares analytical documents that serve as feedback for Mexico on topics such as agricultural and rural development. SAGARPA (2005) predicted that aquaculture in Mexico could exclusively follow one of these three possible paths:

a) Increase productivity, intensification and integration, diversifying species and systems in general.

b) Damage the environment and increase marginalization of small producers who are not given the necessary tools to participate in the industry development.

c) Comprehensively develop the industry supporting small producers and provide aquatic ecosystem services, which are currently under pressure due to the over-exploitation of resources.

Seijo & Martínez (2005) argues that the Mexican government needs to guarantee and protect equity to financial and water resources as well as propose and implement an innovative entrepreneurial model that allows small-farmers and their communities to participate in the development of infrastructure, knowledge and resources regarding the aquaculture industry. The Federal direction by CONAPESCA to sustainably developing aquaculture has four pillars whose aims are to:

1. Diversify cultivated species: using biotechnologies in Research Centers and Universities to improve their quality.

2. Integrate supply chains: attempting to eliminate intermediaries who prevent small-scale farmers from economic profits.

3. Intensify production systems: attempting to avoid the pitfalls of intensification such as environmental degradation and problems in human health.

4. Increase added value: using certifications and labels such as “Fair Trade, Sustainable and Organic”.

Aquaculture production in Mexico predominantly consists of tilapia, shrimp, oyster and carp. Tilapia farming solely represents 30% out of the total national aquaculture production, including inland and offshore. However, if only freshwater aquaculture is considered, tilapia accounts for nearly 70% of all farmed aquatic resources. In 1964, tilapia farming was introduced as an element of the biggest and

most ambitious regional development programs. The objective was to improve the livelihoods of the rural inhabitants of the tropics, particularly those affected by the construction of a large dam over the Papaloapan River, in the neighboring states of Veracruz and Oaxaca. Despite the remarkable overall efforts to make tilapia production systems extensive over the past forty years, most development programs that intended to intensify the activity have had unclear evaluations and in consequence, unclear results.

Technical issues and lack of new knowledge have not been the primary constraints of aquaculture, but instead social, cultural, political and economic factors, were probably the key constraints (Asian-Hoyos 2009). In recent forums, experts in tilapia farming have mentioned that in order to reach long-term sustainability and be competitive, tilapia farming needs to develop genetically improved stocks to obtain predictable and efficient production from a cost-benefit perspective and objectively assess the implications fish cultivation has in the social and cultural aspects.

Since 2003, shrimp and tilapia production have had the highest increasing rates due to private investment and subsidies from Programa de Acuacultura y Pesca de Alianza para el Campo (Programme for Aquaculture and Fishing from Alliance for the Countryside). This was the first Federal Program to support aquaculture in more than a decade. The program from 2003 to 2005 allocated 346.6 million Pesos (approximately 26.6 million CAD) to 283 aquaculture initiatives (its last report was published in 2007). Nevertheless, during 2005 only 12.5% of the applications to obtain resources from the Program were granted with funds.

A study published in 2004, concluded that Mexico had over 300,000 hectares that could be fit mainly for shrimp farming, but high costs of land and high costs for building ponds, low temperatures during winter, specifically in northern part of the country, and disease outbreaks that had affected shrimp production in previous years, had come to discourage further investment in this field.

Veracruz

Aquaculture accounts for 22% of the total production of fisheries available in Veracruz during the year 2012. In contrast, for Sonora, aquaculture represents 52.89% and for Sinaloa 48.73%. Surprisingly, according to CONAPESCA (2012), Veracruz does not have a center for the production of juvenile fish and / or post-larvae, however it is the state with the higher number of aquaculture farms, having 24.7% of all the aquaculture companies in the country. In other words, fish farmers in Veracruz need to either purchase juvenile fish from a CONAPESCA's centre in another State, produce it themselves or acquire it from a private-owned centre. In contrast, from the summation of all the fish farm's land in the country, Veracruz has 1% of the total, whereas Sinaloa has 8.37% of the total of fish farms employing 40.9% of the country's land for aquaculture purposes. These figures suggest that despite Veracruz having many fish farms, most of them must be working on small pieces of land. The fact that roughly 99% of the underwater agriculture in Veracruz is practised in small-scale farms accentuates the role of industry in the region and highlights its importance as an economic activity with the potential of reducing poverty and increasing the source of nutritious food.

Table 2.2 Production under aquaculture methods measured in tons of live weight.

| Year/ State | Sinaloa | Sonora | Veracruz |
|----------------|---------|--------|----------|
| 2001 | 23,590 | 25,084 | 43,349 |
| 2002 | 27,723 | 20,204 | 43,993 |
| 2003 | 28,189 | 32,574 | 41,113 |
| 2004 | 29,903 | 45,687 | 36,874 |
| 2005 | 31,061 | 57,164 | 35,709 |
| 2006 | 40,616 | 67,852 | 33,156 |
| 2007 | 41,780 | 70,187 | 38,211 |
| 2008 | 45,917 | 82,800 | 34,338 |
| 2009 | 45,416 | 87,168 | 33,124 |
| 2010 | 50,198 | 52,340 | 41,103 |
| 2011 | 57,929 | 42,497 | 37,831 |

Note Figures adapted from Annual Directory of Fisheries and Aquaculture 2013.

The table above shows Mexico's three largest producers of seafood under aquaculture methods. Noted is how Veracruz's highest production was in 2002 when it in fact is ranked first nationally. The production in the state under study in 2011 is roughly the same as in 2007, showing increases and decreases for the last decade.

Regarding the number of people employed in the aquaculture sector, Veracruz seems to follow the national trend. 2010 was the year with the highest amount of people working in the aquaculture sector, with 34,224 persons dedicated to the activity. Following the country's negative trend in 2011, the state had 5,058 less people working in the industry of aquaculture, a figure that represents 22.5% of Mexico's people that stopped working in aquaculture. Surprisingly, by 2012, the state had a positive trend on this issue, having an increase of nearly 80 people. In regards to financing, Veracruz obtained roughly 1% of the total of resources granted to all the states. In 2012, Veracruz obtained from FIRA-FORAPESCA a total of 15,337 (thousand pesos) for the Fisheries

Sector as a whole, which includes aquaculture. In comparison, the same year, Sonora obtained a total of 1,761,476 (thousand pesos).

According to the CONAPESCA (2012), there was, in Mexico, 1,558 aquaculture projects that received governmental resources, either on infrastructure, machinery and equipment, genetic materials, or in monetary currency. Unfortunately, the latest version of the Annual Statistical Directory of the year 2012 does not contain information about how many aquaculture projects are supported by the Federal Government in Veracruz. (CONAPESCA, 2011)

Sustainability

Sustainability has been defined as ‘the consumption of goods and services that meets basic needs and quality of life without jeopardizing the needs of future generations’ (Gordon, et al, 2011). Sustainability is about limiting the rate of resources used, while making the best use of the resources available. Sustainability is now a mainstream issue, evidenced by the growing interest shown in sustainable issues. Any operational definition of sustainability can be categorized by two factors, the scale and scope. The scale of sustainability refers to the number of criteria that are addressed, which can range from narrow to broad. Narrow definitions of sustainability assess only one or a small number of factors, while broad definitions include consideration of a more comprehensive suite of variables including, but not limited to, the economic, social and environmental aspects. The second factor that complicates the discussion of sustainability is the scope with which the suite of factors is measured. For instance, when international bodies try to assess the sustainability of any product, considering these bodies might have different standards and/or principles, one can conclude the product is sustainable and the another one can conclude the opposite. (Tlusty, et al, 2012).

As indicated previously, one can trace the popularity of sustainability to a report (also known as Brundland's Report, named after the former Prime Minister of Norway Gro Harlem Brundland who created a Commission to address environmental and development issues.) made by The World Commission on Environment and Development (WCED) presented in 1987 called "Our Common Future: From One Earth to One World" .It addressed the problem of conflicts between environment and development goals by formulating a definition of sustainable development which was the following: *Sustainable development is paths of human progress which meets the needs of the present without compromising the ability of future generations to meet their own needs.* (World Commission on Environment and Development, 1987). The report outlined the premise that world sustainability can be achieved, in part, via sustainable business development which is based upon three key elements: social equity, economic sustainability and environmental sustainability. The three elements form the basis of the framework known as the *Triple Bottom Line*, which was coined by John Elkington co-founder and chair of a sustainable business consultancy. The *Triple Bottom Line* has also been referred to by the phrase *people, planet and profit*, and also called the three E's -*equity, economic and environment.* (Emery, 2012).

The concept of Sustainable Development, however, was first used by the Swiss-based International Union for Conservation of Nature (IUCN) in their report published in 1980 on World Conservation Strategy: *Living Resource Conservation for Sustainable Development.* The interdependence argument advanced by the IUCN was much the same as that expressed by the WCED but the report itself failed to receive the extraordinary attention that surrounded the WCED. (Estes, 1993). In the Brundland's report, development was conceptually presented as a journey toward a more sustainable state. To emphasize this journey, the WCED placed importance on identifying critical environmental trends, and suggested that the determination of best and more sustainable outcomes would come through a comprehensive understanding of the extant conditions and potential outcome states. (Tlusty, et al, 2012).

The WCED's approach to sustainable development emphasized the need for new conceptions of global development which recognized0: (Djuric, 2005)

- The fact that social and environmental problems are interconnected.
- Environmental stresses are not restricted to particular locales or geographic boundaries.
- Environmental catastrophes experienced in one world region, in the end, affect the well-being of people everywhere.
- Only through sustainable approaches to development could the planet's fragile ecosystems be protected and the aims of human development be furthered.

The term "Sustainable Development" seems to have replaced such venerated concepts as "growth," "modernization," "progress" and even "accelerated development" as the unifying concept for worldwide development activities. According to Richard J. Estes (1993): "Neither free-market, dependency, nor Marxist paradigms of development respond adequately to the development needs of the world's poorest and slowest developing countries". Generally speaking, there has been recognition of three aspects of sustainable development: (Edwards, 2000).

- Economic: an economically sustainable system must be able to produce goods and services on a continuing basis, to maintain manageable levels of government and external debt, and to avoid extreme sector imbalances which damage agricultural or industrial production.
- Environmental: an environmentally sustainable system must maintain a stable resource base, avoiding over-exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes. It includes maintenance of biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources.

- Social: a socially sustainable system must achieve distributional equity; adequate provision of social services including health and education, gender equity, and political accountability and participation.

Regarding the social aspect of sustainability, in 2001 Jon Hawkes proposed what he called “the forth pillar of sustainability”. According to Hawkes, besides including the social, economic and environmental dimensions, culture needs to be studied in order to have a comprehensive understanding of sustainable societies, which in fact, depend upon a sustainable culture. For Hawkes, a society's values and the ways they are expressed are a society's culture. He argues that culture has been largely ignored in the public planning process and in how governments evaluate the past and outlines that culture is a process that everybody uses to discuss the future; evaluate the past and act in the present. Ultimately, cultural diversity, as the fourth pillar of sustainability indicates, locally-adapted food-production practices based on indigenous knowledge are effective in reducing hunger and poverty in developing countries.

In addition, culturally diverse, locally-based farming practices, based on biological diversity, in terms of plant and animal species and ecosystems, enhance the resilience of small-scale farming in developing countries, which captures the ability of the environment and local communities to withstand and cope with change and stress, such as harsh conditions, drought and disease. As an example, organic agriculture represented by small-scale poly-crop and bio-diverse farms, has been mentioned to be a culturally diverse farming practice that improves food security and accessibility both in the North and South. (Solér, 2012).

In sum, the cultural diversity category implies that food production affects a variety of human societies/cultures represented in the world. Negative impacts on cultural diversity occur when agriculture practices create detrimental effects on small scale farmers and indigenous people which is caused by the change of land's purpose. The loss of available fish stocks and change of agricultural practice contributes to the detriment of small-scale farmers and indigenous people. The replacement of locally adapted small-scale farming practices that provide farmers and local markets with diverse food, with large-scale industrial monoculture using industrial seeds, leads to a

loss of knowledge in rural communities. In South America, the disruption of rural communities has led to migration as landless farmers and unemployed agricultural workers move to the slums of big cities. (Solér, 2012). From now on and for practical terms, the fourth component proposed by Hawkes will be included in the social aspect of sustainability throughout my study.

Sustainability Measurement

Sustainability must be demonstrated not assumed. Although several proposals for measuring sustainable development have been debated, there is not a unified criterion. The following chart contains a set of indicators used for the European Union to monitor its Sustainable Development Strategy. (The Sustainable Development Indicators, 2012).

Table 2.3 Indicators used by European Union to Measure Sustainability

| Theme | Headline Indicator |
|--|--|
| Sustainable Consumption and Production | Resource productivity |
| Social Inclusion | Persons at-risk-of-poverty or social exclusion |
| Socio-economic development | Growth rate and GDP per capita |
| Demographic Changes | Employment rate of older workers |
| Public Health | Healthy life years, life expectancy at birth |
| Climate Change and Energy | Greenhouse Gas Emissions, Share in renewable energy. |
| Sustainable Transport | Energy consumption relative to GDP |
| Natural Resources | Common Brid Index |
| Global Partnership | Official development assurance as share of gross national income |
| Good Governance | No specific indicator |

Note Information adapted from Communication Department of the European Commission (2015) retrieved from <http://ec.europa.eu/eurostat/web/sdi/indicators>.

Sustainable seafood is among the most sought after of all seafood adjectives. Ironically, it has also been poorly defined and hence measured in the past. The Global Aquaculture Performance Index (GAPI), introduced by the Seafood Ecology Research Group at University of Victoria in 2013, is the first tool to assess environmental performance of global marine aquaculture production, permitting direct comparison of disparate species, production methods and jurisdictions. The GAPI employs the analytical foundation of the Environmental Performance Index (EPI), which is a globally recognized statistical framework that scores the environmental performance of all recognized countries against 10 core environmental issue areas. The EPI country rankings are presented biennially at the World Economic Forum in Davos, Switzerland. The GAPI indicates which products perform best across an array of environmental criteria allowing users to drill down to assess performance within each species, producing country, or individual issue areas. Quantifying environmental performance of aquaculture production has historically proven difficult, reflecting scarcity of data, inconsistent reporting, incomplete science and a wide range of potential environmental impacts across a global distribution of production. (Volpe, et al, 2014).

Stakeholders

In order to fulfill the objectives of this study, it is imperative to describe and define the diverse groups that may be interested in aquaculture, also known as stakeholders. The definition of stakeholder employed in this research is the one proposed by Gordon et al (2011), which defines a stakeholder as all the persons or groups with legitimate interests on any enterprise. In his Stakeholder Model, they propose that governments, investors, political groups, customers, communities, employees, trade associations and suppliers have equal interest on any business. An industry's ability to integrate new sustainability policies and regulations is dependent on its ability to identify key stakeholders. In fact, the issue of stakeholder ambiguity, or the inability to identify key

stakeholders, has the potential to be particularly prevailing in sustainable development policies due to the complex and multi-state nature of these policies. These stakeholder relationships, in the case of sustainable development, involve a variety of groups of interest who are not directly involved in the production process, making their positions and direction ambiguous. These indirect stakeholders, defined as secondary stakeholders, are those not engaged in transactions with the organizations and corporations directly involved but can affect, or are affected by, the production process. (Morfopoulos, 2007). Thus, specific degree and intent of the sustainability claim depends upon the goal of a certain group of interest. I assume for example, that the farmer's goal may be to keep farming, to support families and communities and to preserve a way of life. In this regard, generally speaking, fish farms managers may need to balance the needs of the farmers against the health of the species that are managed, and the ecosystem in which they reside, while taking into consideration the regional and national interests they represent. The supply chain may need to guarantee the continued supply of species and stocks at a suitable price now and into the future so that they can obtain retail distribution for their business to succeed. Environmental NGO's may want to ensure that species and ecosystems are healthy. Finally, consumers are likely to be different than the other groups in comparison; in part driven by ethno-culturally divergent intentionality's. All of the different views affect the approach of each group to sustainability. The stakeholders exist with the dichotomy of the betterment of current lives constrained by the limitations of nature and future lives, and how they manage these trade-offs differs. (Tlusty, et al, 2012).

Application

The Mexican government's commitment to provide support to the sector is expressed in the form of a clear articulation of policies, plans, strategies and the availability of adequate funding and capacity building for their implementation. One of the primary challenges is to avoid a trend seen across the agricultural sector where such commitment ceases because of shifting government development priorities. (Subasinghe, et al, 2009). Sustainability must be approached as a journey; a function of process variables. The word "Sustainable" implies an end point; a function of state variables. (Tlusty, et al, 2012).

For aquaculture to apply sustainability, it must meet four criteria, which include economic, social (and cultural) as well as environmental factors. The first criteria is profitability. If no profits were generated, the farm would either close or rely on subsidies, which ultimately deplete government budgets. Hence, aquaculture must be self-sufficient financially. The second criterion is a stable level of returns. Moreover, mortality rates and process of inputs and outputs must be not highly volatile. Volatility contributes to risk and hence reduces attractiveness for potential creditors. The third is general cultural, gender and social acceptability because attitudes towards the sector have to be at least neutral to be sustainable. Studies have demonstrated that there is a detrimental effect on any industry if social perceptions are hostile. (Barrington, et al, 2008). Finally, and fourthly, aquaculture operations must be environmentally neutral over a long-time horizon. (Hishamunda & Ridler, 2002). In addition, any given company making a "sustainable" declaration is often at different points in the scale/scope arena. As a result, buyers, retailers and consumers have difficulty differentiating between these products. Furthermore, they often assume that a sustainable product has no further need for improvement, when in fact this is rarely the case. (Tlusty, et al, 2012).

Lastly, there are eight sustainability components, or nodes, of the typical seafood product life cycle: inputs, production, processing, distribution, packaging, retail, end user behavior (including acquisition of product, storage, and cooking) and waste disposal that marketing can explore and evaluate in order to improve the industry's development. (Tlusty, et al, 2012).

Marketing

Satisfying customer needs by creating value while making a profit for a business forms the central premise of the past conventional marketing definitions. Terms such as *need*, *want*, *benefit* and *stakeholder* are as valid today as they were before, however these have become all the more significant as we move towards fulfilling the demands of the sustainability agenda. (Emery, 2012). In the marketing literature of the late 1960's and early 1970's, there was a critical self-reflection and debate on the role of marketing in the processes of social and environmental change (Reutlinger, 2012). In some accounts, self-reflection also involved an ethical and societal problematic issue of

marketing as an institution as well as a call for business organizations to accept themselves as corporate-citizens in a society in a more responsible way. It was until the late 1980's, when environmental and social problems were again in the focus of public attention; the discussion on the role of marketing in society re-emerged and new concepts, such as green marketing, environmental marketing and enviro-preneurial marketing, were introduced (García-Rosell & Moisander, 2008).

It is pertinent to first define the implications of generic *marketing*: It is the management strategy and process through which goods and services move from conception to the customer. Generic marketing includes two strategic decisions, positioning and segmentation, and the coordination of four elements called the 4 P's of marketing:

- Product: Identification, selection and development

- Price determination

- Place: Selection of a distribution channel to reach the customer

- Promotion: Development and implementation of a communication strategy

Despite a movement towards sustainability, marketing is still driven by the principle of satisfying consumer needs. Marketing is central to global society, and when directed responsibly, it can encourage us to recycle, reuse, buy Fair trade, eat healthily, drink sensibly, save energy and support good causes. Marketing also contributes in promoting economic development around the world, raising living standards in many countries (Fisk, 2001). In the race for economic development, governments, society and business have created environments in which marketing has flourished to serve consumer and societies needs. However, the negative consequences of marketing are an effect of wider societal and structural conditions and not necessarily a direct cause of unsustainable practices, for instance, just as consumption is a collection of social practices that influence, and are influenced by, lifestyle choices, social norms, societal structures and institutions (Gordon, et al, 2011).

Arguably, marketing does exactly what it is supposed to do; sell more goods, encourage consumption and make profits. It is not naturally managed to deliver sustainability, thus its potential to do so is often ignored. (Gordon et al, 2011). An array of groups around the world are increasingly influencing consumers to avoid buying and supporting products whose production methods, origins, package, etc., can be related to questionable attitudes regarding the environment, biodiversity, social justice, etc., affecting market prospects. At the same time These, and several other reasons, have encouraged farmers worldwide to get organized in different manners (i.e. producer organizations) and to support international private bodies like the Global Aquaculture Alliance, (GAA), which was created in 1997 with the aim of fighting back unfair public campaigns affecting shrimp farming industry and expressing its views and needs in front of local and international authorities. (Wurmann, et al, 2004).

Certainly, marketing has another role to play: marketing sustainability. Informing people that they can no longer drive everywhere, consume what they want or take frequent flights is undoubtedly unpopular. Yet, an important message to deliver to firms and consumers is that seeking more resource-efficient ways of meeting our needs and aspirations does not have to mean a reduction in well-being (Van Dam & Apeldoorn, 1996).

In regards to the marketing of seafood, if sustainability is to be adopted, it should include environmental, social and economic assessments of the production method, plus evaluations relating to how seafood is processed, distributed, packaged, sold, consumed and its post-consumption disposal. The linkages between nodes from producer to consumer need to be transparent to gain the maximum sustainability benefits. (Tlusty, et al, 2012). In addition, producer associations can collaborate to increase the demand through generic marketing. Such is the case of rival salmon producers from Canada, Chile and the USA, who had their associations complete three-year marketing campaigns to promote farmed salmon in the USA, their major market. Evidence identified that approximately 30 million consumers were reached in a number of larger cities. The evidence indicates that the campaign was successful with younger

consumers of an income of more than \$50,000 USD a year, though. (Barrington, et al, 2008). In conclusion, Sustainability can become a central component of all marketing thought and practice, one that carries a convincing business case from a consumer perspective. (Gordon, et al, 2011)

Sustainable Marketing

Sheth and Parvatiyar (1995) were one of the first to propose the idea of a sustainable marketing concept, which leads to sustainable development in combination with government action. The goal of sustainable marketing is to promote sustainable consumer behavior and offer suitable products, with the aim of economic and environmental sustainability. However, this first definition excluded the social dimension of sustainability. Equally, Van Dam and Apeldoorn (1996) linked sustainable marketing to the environment and even combined it with ecological and green marketing under the heading of environmental marketing, with the aim of furthering sustainable economic development.

Conversely, García-Rosell and Moisander (2008) used the terms “environmental marketing” and “green marketing” in a way that considered environmental and social issues to be interlaced. Taking a macro-marketing perspective, they recognized the link between marketing and sustainable development and as a result, García-Rosell and Moisander discovered the urgent need to move from the current consumption marketing to a more sustainable marketing. According to them, sustainability can only be achieved by combining active government intervention with proactive marketing targeting at more reasonable consumption and production patterns. Nonetheless, there still is a lack of awareness, understanding, trust, and in some cases, apathy about sustainability issues among consumers (Chatzidakis, et al., 2007). Most initiatives promoting sustainability have been implemented upstream, aimed at altering structural conditions that included incentives, legislation, environmental design, technological development and norms. Primarily, these initiatives have focused on developing new technology and getting industry and businesses to become more sustainable. (Gordon, et al, 2011).

According to Emery (2012) the sustainable marketing concept has broken previous narrow interpretations based solely on environmental concerns, as it recognizes that the success of business is intertwined with environmental, social/ethical and economic performances. Therefore, this paradigm is a more holistic, integrative approach that puts equal emphasis on environmental, social equity and economic concerns in the development of marketing strategies. (Pandey, et al, 2012).

Sustainable marketing is often confused with Corporate Social Responsibility (CSR). In theory, CSR predates the sustainable marketing movement. CSR addresses a company's relationships with of its stakeholders and is commonly defined as a "commitment to community well-being through discretionary business practices and contributions of corporate resources". It has been used to address internal issues such as employee relations, health and safety at the workplace, as well as external issues such as the relationship with the local community and consumer rights. Notwithstanding, CSR was not originally intended to be used as a means to establish sustainable business and sustainable development. The motivations of the CSR were to improve business performance by giving something back and have been primarily associated with doing good deeds. However, its aims have been considered as self-contained and center on single issues that may or may not be within the spirit of sustainability and in consequence, may not provide long-term holistic solutions. According to Emery (2012) CSR is changing and it currently uses and adheres more often to sustainability principles and vocabulary which can be easily confused with a sustainable approach, when CSR campaigns appear to contain sustainable features. In general CRS tended to focus on specific social issues. CSR has often had stronger links to corporate image and brand building rather than to planned sustainable practice for all stakeholders.

Sustainable marketing can be studied as the union of three existing marketing disciplines: green marketing, social marketing and critical marketing. Green marketing facilitates the development and marketing of more sustainable products and services while introducing sustainability efforts into the core of the marketing process and business practice. Social marketing involves using the power of marketing to encourage sustainable behavior among individuals, businesses and decision makers while also evaluating the impact of current commercial marketing on sustainability which links into

the critical marketing paradigm which involves analysis of marketing theory, principles and techniques using a critical theory approach. The analysis can help to guide regulation and control, development of marketing theory and practice, and to challenge the dominant institutions associated with marketing within a capitalist system, encouraging a marketing system in which sustainability is the ultimate goal. (Gordon, et al., 2011).

Three ways in which sustainable marketing can be achieved are illustrated in the following chart:

Table 2.4 Type of Marketing

| Marketing Type | Actions |
|--------------------|---|
| Green Marketing | Developing and marketing sustainable products and services while introducing sustainability efforts at the core of the marketing and business process. |
| Social Marketing | Using power of upstream and downstream marketing interventions to encourage sustainable behavior. |
| Critical Marketing | Analyzing marketing using critical theory approach to guide regulation and control and stimulate innovation in markets. Challenging the dominant institutions of the capitalist and marketing systems to construct a more sustainable marketing discipline. |

Note data adapted from (Gordon, et al, 2011).

Through green marketing, sustainable products and services can be introduced into the marketplace. Such efforts could ensure that product design and development, manufacturing, distribution and promotion are made sustainably, thus limiting consumption and waste. Social marketing can be used across a number of sustainable activities to encourage public transport use, cut carbon emissions, support local food producers or reduce consumer debt. In addition, critical marketing can be used to challenge the dominant marketing theory and practice, shifting the focus from encouraging and increasing consumption to other goals such as quality of life and satisfaction (Gordon, et al, 2011).

In other words, sustainable marketing is an approach of marketing that ideally coordinates internal organizational processes and organizes resources that create value for stakeholders through which the external natural and social environments are enriched by the activities of the firm. The approach is used most effectively by organizations that have clearly stated values and goals for their desired effect on their own economic viability, as well as on the natural and social environments they operate within. From now on in this research, Sustainable Marketing will be approached as a marketing stream that incorporates the economic, environmental and social aspects within any business strategy. Ultimately, the term sustainable marketing applies when an organization takes the perspective that it operates within a finite resource system, and thus has a responsibility to its current and future stakeholders to make strategic decisions for the long-term benefit of the entire system. Sustainable marketing differs from conventional marketing in its holistic approach to decision-making, monitoring and evaluating organizational actions, and consequences that includes economic, social, cultural and environmental considerations. That is, when an organization commits to sustainable marketing, the totality of sustainability goals become the guiding force behind all operational decisions at all levels of the organization.

In contrast to the classic tactical marketing mix elements of price, place, product and promotion, a sustainable marketing strategy might adopt four other tactical dimensions involving first, *customer solutions* that go beyond product or service-based benefits to provide triple bottom line benefits that address consumers' societal or

environmental concerns; second, a *commitment to customer costs* that incorporate the social and environmental costs of products throughout the product life cycle; third, *customer communications*, which entails ideas of firm transparency; and finally, *convenience*, which means that firms go beyond conceptions of customer exchanges, focused only on sales or even customer lifetime value to approaches that incorporate access, sharing, and alternative models of product use and disposition. (Emery. 2011).

Sustainable marketing recognizes that most human activity is dependent on the existence of the natural capital provided by the planet, and acknowledges that long-term, sustainable economic viability will result from both environmental stability and societal equity. It is important to understand sustainable marketing's all-encompassing nature from strategy to tactics and implementation, viewing the business as a whole from one single objective: to become as sustainable as possible, socially, environmentally and economically.

Furthermore, an organization that uses sustainable marketing manipulates natural resource use by aiming to increase the productivity of a given unit of resource by a measurable, meaningful amount, while at the same time seeks to identify and incorporate alternative recycled or renewable resources into its operation. Sustainable marketing organizations invest in restoring, maintaining and expanding ecosystems to sustain society's needs. Through these actions, they also avoid regulation and customer cynicism and discontent (Willard, 2009).

Not surprisingly, the resistance some companies express to environmental efforts is due to the fact that they do not know, with certainty, that the trade-offs between economic development and environmentalism are necessary. To make their environmental efforts pay off financially, companies have, in general, followed one or more of the three following main approaches:

1. Investing in initially more-expensive methods of sustainable operation that eventually led to dramatically lower costs and higher yields upon reaching economies of scale.

2. Starting with small changes to their processes, generating substantial cost savings, which they then use to fund advanced technologies that made production even more efficient.

3. Spreading their sustainability efforts to the operations of their customers and suppliers.

The pursuit of sustainability can be a powerful path to reinvention for most businesses facing limits on their resources and their customers buying power. We are moving to a world of scarce resources, in which companies will increasingly need to consider their total return not just on assets and equity but also on resources. (Ibid.)

Two of the Sustainable Development Goals (SDGs), which are built upon the Millennium Development Goals and converge with the post 2015 development agenda, are related to food production and consumption. Goal 2: end hunger, achieve food security and improved nutrition and promote sustainable agriculture and goal 12: ensure sustainable consumption and production patterns. (United Nations, 2015).

In the field of consumer policy, communicative instruments such as product labeling schemes, consumer education campaigns, advisory schemes and consumer information are used to promote sustainable food consumption. The market for eco-labeled food is concentrated in Western Europe, Denmark, Switzerland and Austria, being the world's largest markets proportionally for organic food with 5% total market shares, or more, respectively. In theory, eco-labeling is considered a primary tool for promoting sustainable consumption, as eco-labels both remind consumers of sustainable product alternatives and simultaneously provide trustworthy sustainable product alternatives, minimizing consumer time spent searching for sustainable products. However, reviews of product-related environmental information concluded that eco-labels have limited impact on consumers outside the green segment. (Solér, 2012). In the case of food, that means that labeling schemes such as organic and fair-trade labels have limited impact on consumer demand for sustainably produced food. It is worth mentioning that a certification scheme with industry domination of the standard

setting body and in its membership and finance can be expected to have more industry-friendly standards. In contrast, standards can be expected to be stricter where a certification scheme is dominated by an independent environmental and socially responsible organization.

In order for consumers to consider buying sustainably-produced food, they must recognize, understand, and value the characteristics of such food. Emery's work (2012) indicates that characteristics for consumers who engage in sustainable consumption practice have problem awareness, environmental values and adherence to social and personal norms supportive of sustainable consumption. Consumers are altering their purchase habits as they cope with a new terminology made up from words and phrases they had not used before such as *natural, organic, fair trade, free range, ethical, eco, biodegradable, recyclable, environmentally friendly, green, carbon neutral, carbon footprint, socially responsible*, and so on.

For a long time, marketers were focused on only one type of sustainable consumer that is named the green consumer. However, the sustainable paradigm poses a new challenge for marketers, which is to target everyone. The potential sustainable consumer has no specific profile and belongs to no particular socioeconomic group. In addition, the motivations behind consumption affect our ability to become more sustainable and may be used to work for or against the installation of sustainable consumption habits. In these regards, consumption can be generally classified under categories such as rational, habitual, socio-psychological, hedonistic, self-identity, and communication-based. (Emery, 2012).

In rational consumption, it is assumed that sustainably motivated consumers make purchases as a result of going through a logical decision-making process based on reason, having evaluated the product against both conventional and sustainable criteria. Interestingly, it has been argued that rational behavior would not necessarily result in sustainable consumption because rational decision makers would be more inclined to favor their own short-term personal interest over other considerations such as long-term societal sustainability. Habitual consumption argues that routines and habits account for many purchase decisions because people buy the brands they are familiar

with and the general disinterest that results from habitual consumption is responsible for consumers not adopting more sustainable routines. Sociological consumption assumes that shopping is seen to fulfill specific social and cultural needs, in consequence, considers consumption as embedded in the socio-cultural composition of society with a particular role to play in the lives of individual consumers and in their groups. Hedonistic consumption argues the shopping itself and merely goods and services possession gives pleasure to the consumer. Self-identity consumption suggests that consumption is a significant part of our behavior for establishing and reaffirming our identity. Finally, and linked to self-identity, communication-based consumption argues consumption can be used as a means of communication with others, because goods and services are a significant representation of personal and cultural meaning. (Emery, 2011).

From a behavioral change perspective, the main difference between consumers who buy eco-labeled products or engage in sustainable consumer practice and those who do not is how they value the environment. Consumers must, without any doubt, perceive the relationship between what they consume and effects on the environment in order to activate relevant environmental values. Consumer practices supported by social norms are more likely to be accepted than those unsupported by such social pressure. (Solér, 2012).

Examples of communicative instruments supporting the demand for sustainable foods are the labeling of organic and fairly-traded food, climate labeling and consumer education/information campaigns initiated by government and/or business on product-related sustainability motivational psychology. It has been suggested that education about sustainability issues related to consumer lifestyle is a way to empower consumers. Literature provides evidence that exclusively informing consumers about alternative consumption alternatives is not enough to achieve behavioral change. (Solér, 2012).

One way to design information with the objective of promoting sustainable food consumption is to emphasize the specific features and benefits associated with sustainably produced food in an understandable and transparent way. Recent literature in the field of sustainable marketing provides guidance on how to increase consumer knowledge and help change consumption-related norms. As noted previously, the key

characteristic of sustainable marketing and branding is its dual communication focus on both product/service-related benefits and product/service-related solutions to sustainably-related problems. Sustainable marketing emphasizes the educational and empowering requirements of marketing communication. The empowering aspect of Sustainable Marketing communication implies that marketing efforts may also require efforts to inform consumers about issues on the sustainability agenda and how they relate to lifestyles and choices. Such educational marketing communication efforts enhance the possibility of engaging consumers in ways experienced as meaningful, which will create demand for brands that provide sustainability-related solutions. In sum, the successful marketing of sustainably produced food provides consumers with information about sustainability issues related to food production from different stakeholder positions including producers of food and the natural environment.

The low levels of knowledge and trust among Western consumers regarding sustainably produced food were reported as *alarming*. However, knowledge regarding food production and its relation to sustainable issues is considered a main driver of sustainable food consumption practice. (Solér, 2012). If consumers cannot directly perceive the difference between sustainably and conventionally produced foods, they must, in order to start buying sustainably produced food, value information on these issues. Ultimately, marketers as cultural producers to a large extent can prescribe how food is valued by consumers. Change in the consumption of food in a sustainable direction can be achieved, for example, by describing food production from a variety of perspectives in a way that enables consumers to value sustainability of food production.

Environmentally conscious buyers of aquaculture products face a complex mental process in determining how differing species, production regions and production systems all affect the "sustainability" of the product. In response, a sustainable seafood industry has arisen, aiding buyers, both wholesale and retail, in making informed conservation choices. (Volpe, et al, 2014).

The concept of sustainably produced food is complex and obscure, so it is difficult to perceive how consumers understand how sustainably produced food can be elaborated and promoted. (Solér, 2012). However, the study employs the following

definition: Sustainable Food Production System (SFPS) is one that provides healthy food to meet current food needs while maintaining healthy ecosystems that can also provide food for generations to come with minimal negative impact on the environment. It also encourages local production and distribution infrastructures and makes nutritious food available, accessible and affordable to all.

In the promotion of sustainably produced food, the wording intentionally emphasizes the possibility of making a difference by consuming it, as suggested in the sustainable marketing literature (Emery, 2011). The usage of words like *biodiversity restoring*, *resource efficient*, *locally adapted* and *welfare and rights restoring* indicates that the solution-oriented connotation of the word “restoring” (in terms of “biodiversity restoring” and “welfare and health restoring”) evokes the sense that one is contributing to increased biodiversity, welfare and health as a consumer of sustainably produced food. These words have been chosen to evoke the sense that one is contributing to the more efficient handling of resources in feeding the world and to the local adaption of farming as a consumer of sustainably produced food because “biodiversity-restoring” food production helps reverse the loss of diversity of plant and animal species, of varieties within species and in ecosystems. “Resource-efficient” food production promotes an efficient ratio between inputs of energy and water and output of calories/protein. “Locally adapted” food production is based on the plant species and varieties as well as farming practices that have evolved in local climates and under local conditions. As such, locally adapted food production ensures biodiversity in all its aspects. “Welfare and rights-restoring” food production promotes human and animal rights. Human rights in terms of access to food and water are secured, in a developing country context, small-scale chemical-free subsistence-based farms serving local/regional markets. Such food production promotes biodiversity and cultural diversity, reduces GHG emissions, increases health and animal welfare and ultimately reduces poverty levels. (Tlusty, et al, 2012).

Educating consumers about sustainability issues and solutions in relation to food production will increase their propensity to adopt eco-labels as a search-and-choice indicator in a supermarket setting. Consequently, the empowerment of food consumers in terms of negotiating and constructing the meaning of sustainable food production is a

process of communication that is dependent on how the concepts are used in a market setting. (Solér, 2012). A sustainable marketing approach requires consideration of ideas and influences from other areas such as political science, psychology, sociology, anthropology, economics and ecology for the purpose of engaging the aspects of human willingness.

Vulnerabilities

Vulnerability research has its roots in the social sciences. It has a particularly long history in the risk-hazards and geography literature, where vulnerability has been defined as the potential for loss and is often understood to have two sides: an external side of shocks and perturbations to which a system is exposed and an internal side which represents the ability or lack of ability to adequately respond to and recover from external stresses. Over the last decade, social scientists have focused on the socio-economic, political structures and processes that make people vulnerable and have identified critical components of vulnerability such as the exposure to stressors, the capacity to anticipate, cope with, resist and recover from natural hazards, and the consequences of stresses. Vulnerability is also implicit in much of the economics literature that focuses on poverty issues. Within this context, vulnerability to poverty has been conceptualized as the likelihood of falling below a consumption level, such as a poverty line and as the variability of income or consumption. In recent years, interdisciplinary research teams have begun to explore the vulnerability of linked human–environmental systems (Luers, et al, 2003).

Socially created vulnerabilities are largely ignored, mainly due to the difficulty in quantifying them, which also explains why social losses are normally absent in after-disaster cost-loss estimation reports. Instead, social vulnerability is most often described using the individual characteristics of people such as age, race, health, income, type of dwelling unit, employment and so on. Social vulnerability is partially the product of social inequalities—those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond. However, it also includes

place inequalities—those characteristics of communities and the built environment, such as the level of urbanization, growth rates, and economic vitality, that contribute to the social vulnerability of places.

There is a general consensus within the social science community about some of the major factors that influence social vulnerability. These include: lack of access to resources (including information, knowledge, and technology); limited access to political power and representation; social capital, including social networks and connections; beliefs and customs; building stock and age; frail and physically limited individuals; and type and density of infrastructure and lifelines. (Cutter & Boruff, 2003).

According to political economy theory, in capitalist societies, people find the basic resources for their everyday living in three primary social systems: the labor market, family organization, and welfare institutions. Transformations taking place in market mechanisms, in primary relationships, and in state regulation are therefore able to alter the distribution of social opportunities and constraints in the society. It is thus within these systems that the most important social risks contributing to social inequality and social exclusion have to be found. (Hishamunda & Ridler, 2002).

Vulnerability is a relative concept. Its cultural, political-economic, and physical geography is essential to its evaluation. Vulnerability evaluations thus appear most successful when they are conducted for defined human-environment systems, particular places, and with particular stakeholders in mind. (Cutter & Boruff, 2003). In recent years, interdisciplinary research teams have begun to explore the vulnerability of linked human–environmental systems. The concept of vulnerability is related to fragility of a society and its ability to absorb risks and external and internal shocks.

With weak or improper regulations for the allocation and use of natural resources, there is always a tendency for conflicts to emerge between resource users. Invariably, less influential and disadvantaged stakeholders are denied access to these resources. Unregulated or improperly regulated aquaculture development also results in a high discounting rate on the use of natural resources and, therefore, encourages practices that exploit these resources beyond their carrying capacity. One of the greatest constraints could be the impact of climate change on aquaculture. At this stage, climate

change presents non-quantifiable threats of changing temperatures, weather, water quality and supply. (Subasinghe, et al, 2009).

Sustainable Communities

Communities can be defined as shared space or interest. In the case of distance, it includes spatially bounded relationships such as a town or region. In considering communities that emerge from common interest, I refer to groups bounded together through common perspectives that may or may not be formalized through an association or online community. (Blay-Palmer, 2011).

Communities are entering a world that some authors have labeled as the Third Industrial Revolution as societies move from fossil fuels, which is the Second Industrial Revolution, to renewable energy generation and technologies in sustainable smart communities. Concepts such as recycling, eco-conscious, leadership in energy and green technology, among others, touches on aspects of sustainability, which includes all aspects of living in order to preserve communities for future generations.

Solving problems can come from the ground-up or local level that makes enormous changes. Many organizations around the globe are working to find solutions to a collection of increasingly environmental, economic and social justice problems. These groups come from different parts of civil society, including business. They include research institutes, community development agencies, local organizations, corporations, networks, faith-based groups, trusts and foundations. They work together to restructure communities and economies to mitigate poverty and avoid social and economic crisis.

Considering that most communities are not blank spaces, effective sustainability strategies must take into account existing buildings, transportation systems, energy infrastructure and industries. The ultimately goal of a planning process is to create synergies across buildings, land use types, utilities, and other shared services to achieve sustainable solutions that save money, while increasing energy efficiency, reducing carbon emissions, lowering demand on natural resources and improving quality of life for

members of the community. (Woodrow, 2009). Thus, a sustainable community is one that unites people in a place or through space and is, “based on ecological balance, community self-reliance, and participatory democracy”. These communities are negotiated within and are largely determined by the circumstances of the state and its priorities. However, “sustainable communities” remain a debated term, and it is difficult to produce a concise definition. Difficulties in definitions translate into difficulties in identifying what a sustainable community looks like in practice. As a result, “sustainable communities” are not easily classified in practice. (Blay-Palmer, 2011).

In order to be a sustainable community, it is necessary to transform core values and ultimately the economic engine that powers any given community. That is why my study analyzes the sustainability of aquaculture with the purpose of reaching a more sustainable community surrounding the case study farms. In this regard, Hawkes (2001) identified a set of core and universal values that all contemporary sustainable societies might embrace

Table 2.5 values of sustainable communities.

| | |
|---------------|--------------------------------------|
| | |
| Participation | Safety |
| Engagement | Security |
| Democracy | Health |
| Tolerance | Well-being |
| Compassion | Vitality |
| Inclusion | Creativity |
| Freedom | Imagination |
| Justice | Innovation |
| Equality | Love and respect for the environment |
| Peace | |

Note adapted from (Hawkes, 2001)

He also suggested that each individual's culture determines what values we adopt, discard, change or apply in our existence. According to Hawkes (2001), a sustainable society (or community) depends upon a sustainable culture. He explains that if a society's culture is disintegrated, so will everything else.

There are examples in which aquaculture practices can serve as environmental protectors, while at the same time contributing to socio-economic development. These aquaculture systems contribute to environmental rehabilitation and even mitigate the impacts of effluents from other agricultural and industrial operations. Such integrated farming systems, are the rice-fish farming and fish farming in irrigated systems and the rehabilitation of endangered populations through stocking and the use of mollusc culture to improve carbon sequestering and seaweed culture in coastal areas to reduce aquatic nutrient loadings. (Subasinghe, et al, 2009).

On one hand, aquaculture may generate other beneficial externalities. When located in isolated rural areas, it can provide pressure to improve infrastructure, promote the development of small communities and discourage the youth from migrating to cities. In addition, aquaculture can stimulate research and technological development; some of it funded by the industry itself. On the other hand, aquaculture can lead to inequitable income distribution and varied social conflicts if the socio-economic-cultural needs of local people are not considered in its development. (Hishamunda & Ridler, 2002).

Summary

From an activity that was principally small scale, non-commercial and family based, aquaculture now includes large-scale commercial and industrial production of high-valued species that are traded at national, regional and international levels. Although current production is largely based on small-scale operations, there is a wide consensus that aquaculture has the potential to meet the growing global demand for nutritious fish food and to contribute to sustainable growth of national economies while supporting the sustainable livelihoods of many communities. Markets, trade and consumption preferences strongly influence the growth of the sector with clear demands for the production of safe and quality products. Consequently, increasing emphasis is

placed on enhanced enforcement of regulation and better governance of the sector. It is increasingly noted that sustainable development and responsible production of aquaculture, in the long-run, cannot be achieved without the full participation of producers and the other stakeholders in the decision-making and regulation process. This has led to efforts to empower farmers and their associations and move towards increasing self-regulation. These factors are all contributing to an improvement in the management of the sector, typically through the promotion of sustainable practices of producers. (Subasinghe, et al, 2009). In sum, aquaculture can create environmental and social damage, but it is also a source of protein, employment and usually foreign exchange. Because of the potential negative externalities, aquaculture must not only be profitable but also be socially responsible and environmentally neutral; so that promotion of sustainable aquaculture can be a desirable policy objective. (Hishamunda & Ridler, 2002).

Chapter 3. Methodology

General Perspective

The methodology employed in this study during the field research between September and December 2013 in the Southern Mexican state of Veracruz (see figure 3.1) is explained in the current chapter. My study examines the social, economic, and spatial dimensions of the utilization of sustainable marketing in three fish farms in three different municipalities within Veracruz, including the examination of the socioeconomic and environmental vulnerabilities surrounding the farms. I employ qualitative ethnographic methods because according to Anderson (2009), ethnography applied to businesses is central to gain a full understanding of the customers and the business itself. Ethnographic researchers visit consumers in their homes or offices to observe and listen in a non-directed way. One of the goals is to see people's behavior on their terms and not in the businesses terms. The observational method enlightens about the context in which customers, for example, might use a new product and the meaning that product might hold in their lives. Research is also conducted at many different locations including: public spaces, local markets, fish farms and homes of study participants.



Figure 3.1 Localization of Veracruz within Mexico.

Note figure taken from (INEGI, 2010).

The purpose of my study is to investigate how the stakeholders of aquaculture in Veracruz describe their socioeconomic and environmental vulnerabilities related to aquaculture farming and how, and to what extent, notions on sustainable marketing could contribute to mitigate such environmental and socioeconomic vulnerabilities in the aquaculture in Veracruz, Mexico.

The following research questions define the scope of the research:

1. How do stakeholders of Aquaculture in Veracruz describe the socioeconomic and environmental vulnerabilities related to the operation of small-scale aquaculture farming?
2. How, and to what extent, could sustainable marketing contribute to mitigate environmental and socioeconomic vulnerabilities in Aquaculture in Veracruz, Mexico?

In the design of the methodology, I conclude that ethnographic methods would suffice as the objectives of the present master's thesis. I base my research on the

ethnographic methods as summarized by De Munck and Sobo (1998), which are: (i) Let the informants speak for themselves. (ii) Provide accurate descriptions of the contextualized stream of social life and (iii) Build theory inductively from the data, the methods chosen to be employed in this study include: interviews (see appendix a), participant observation and document analysis. The research participants of my work includes stakeholders of aquaculture in the State of Veracruz, which are: key informants, owners and managers of the fish farms, farm workers, farm neighbours, farm consumers and farm suppliers.

Research Context and Participants

The study took place in the southeastern state of Veracruz in Mexico, between September and December 2013, which was selected due to the fact I am originally from there and know the area better than any other part of Mexico. I focused my attention on fish farms in three different municipalities in Veracruz. My stay in Mexico was characterized by heavy rains due to the presence of two meteorological phenomena. Hurricane Manuel and Hurricane Ingrid affected Mexico at the same time, making 2013 one of the rainiest years in decades. Hurricane Ingrid affected the Gulf of Mexico area and caused intense rain in eight Mexican states, including Veracruz and Hurricane Manuel in the Pacific coast caused more than 20 casualties and some cities, such as Acapulco, remained evacuated due to landslides.

The first fish farm I visited, called Arcoiris de Tlalnehuayocan, is located in the municipality of Tlalnehuayocan, which has a population of 16,311 inhabitants, from which 682 people are at least 18 years old with university studies. In this municipality, there is a community called Rancho Viejo, I considered Rancho Viejo to have unique characteristics to conduct research because of its distinct location, which is in the middle of an ecoregion called cloud forest, (a.k.a fog forest). It is generally a tropical or subtropical, evergreen, montane, moist forest characterized by a persistent, frequent or seasonal low-level cloud cover, usually at the canopy level. Cloud forests often exhibit an abundance of mosses covering the ground and vegetation, in which case they are also referred to as mossy forests. Mossy forests usually develop on the saddles of mountains, where moisture introduced by settling clouds is more effectively retained.

(Ponce & Reynoso, 2012). The average annual rainfall in the region is 1,510 mm in comparison to the one in Vancouver, which is 1200 mm in the airport and 1590 mm in downtown. (Cervantes & Barradas, 2001; Shepperd & Shaw, 2011).

Rancho Viejo has 786 inhabitants. It has an illiteracy rate of 16%, compared to the national illiteracy rate of 6.9% (INEGI, 2010). Among people from Xalapa, which is the capital of the State of Veracruz, it is well known that in Rancho Viejo (see figure 3.2) there are fish farms with adjacent restaurants in which you can eat the fish that moments ago were swimming in a pond. People from outside the community visit Rancho Viejo to enjoy fish. My visits to Rancho Viejo were delayed due to the intense rain and the roads poor conditions. The overall appearance of Rancho Viejo resembled a ghost town. It consists of six main streets and approximately seven small streets that border the community. I saw seven signs of restaurants (and fish farms); only two were open, even though the signs mentioned that they were open seven days a week. I phoned the five closed farms several days later and never received an answer.

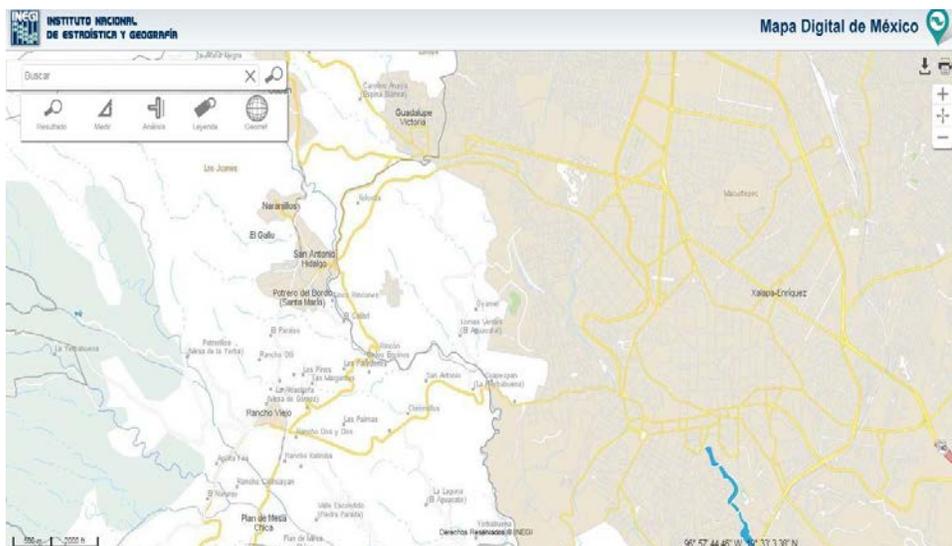


Figure 3.2 Localization of Rancho Viejo.
Note figure adapted from (INEGI, 2015)

Fish farmers of Rancho Viejo utilize natural water from the Pixquiac River. Pixquiac's River Basin (see figure 3.3) covers around 10,727 hectares and is 30.27 kilometers long, running through the municipalities of Perote, Acajete, Tlalnahuayocan, Coatepec and Las Vigas. Pixquiac River originates at "Cofre de Perote", an extinct volcano, at 3,760 meters above sea level. Pixquiac River's water is directed to four different dams that serve the cities of Xalapa and Coatepec. The economy around the aforementioned basin is based on potato crops and aquaculture.



Figure 3.3 Pixquiac River's Basin.

Note adapted from (INEGI, 2015).

The second municipality I visited was Emiliano Zapata, with a population of 61,718 inhabitants. In the municipality, there is a small town called Plan del Rio (see figure 3.4) which is well known as a regular stop to buy food and drinks because it is around half way between the city of Veracruz and Xalapa. Approximately one decade ago, there was an inaugurated a toll highway that encircled Plan del Rio, reducing the amount of cars (and customers) that drove through the town. Despite the construction of the highway, it seems that Plan del Rio's economy is recovering. The small town is also well known for its unique style of preparing Mexican food. In short, there are still

restaurants and vendors offering mainly papaya, mangoes, tamarind, honey, sugarcane and other seasonal fruits still operating there.

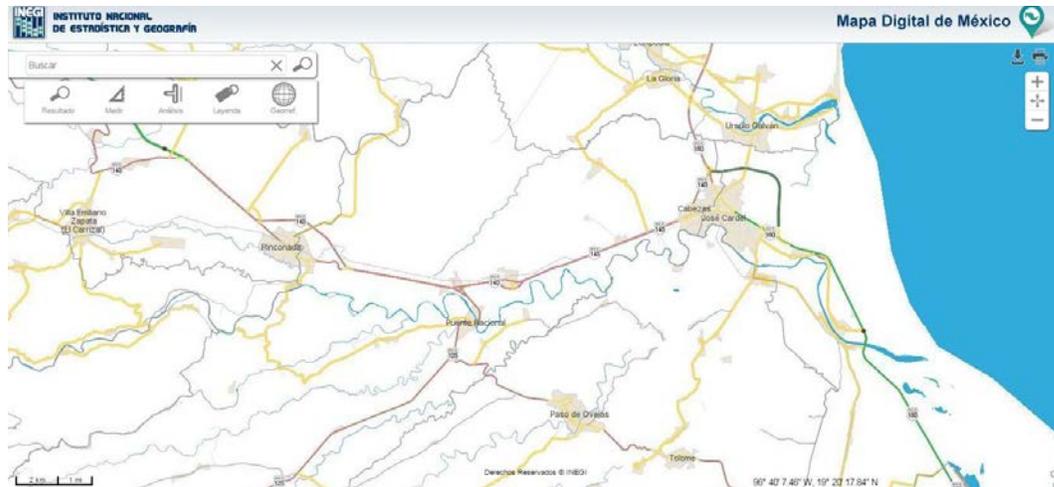


Figure 3.4 Localization of Plan del Rio.

Note adapted from (INEGI, 2015)

When I inquired about the existence of any fish farm in the municipality of Emiliano Zapata, I was surprised by the amount of people that mentioned the same farm and restaurant “El Fuerte 1847”. The first time I visited the farm was on a weekday. It was very calm but I still saw approximately eight customers. I visited the farm three different days to interview its stakeholders. The localization of this farm is prestigious because it is just by the old road. This farm has six ponds in total. Unlike farmers in Rancho Viejo, El Fuerte 1847 does not utilize natural running water; by contrast, it obtains the freshwater from normal pipes.

The third farm that I visited was “PezCo”, a big farm that employs more than 100 people daily, located in the municipality of Alvarado (see figure 3.5). Alvarado has a population of 51,955 inhabitants, of which 4,650 have university studies and are at least 18 years old. Although Alvarado is a coastal municipality, the farm is not located on the coast. It was not difficult to find initial information about “PezCo” farm, due to the fact that it is one of the biggest in the state. Unlike the other two farms visited, PezCo does not

have an adjacent restaurant to sell its product. In fact, nearly one hundred percent of their production is distributed to local markets and restaurants in the cities of Alvarado and Veracruz.



Figure 3.5 Localization of Alvarado.

Note adapted from (INEGI, 2015)

After several attempts of arranging a meeting with the owner and/or manager of "PezCo", I finally obtained the permission to interview one of the owners. I could say the owner was attentive to me while I explained my research but he expected to obtain some benefit from it. He did not give me permission to record the interview and preferred his name not to be mentioned in any sort of document of my research. We talked around 40 minutes about the general situation of the farm and he mentioned the company's new product, the successful production of juvenile fish. (Mentioned later by the company's manager). The owner mentioned the company's need of commercializing the new product.

All the study participants were promised full confidentiality under the law and informed that stringent measures would be employed to protect their confidentiality. They were assured of the following.

Participation in the study was strictly voluntary and they were free to withdraw at any time.

- Participants had the option to protect their identity with pseudonyms or code name, which included the fish farms' name.
- Participants had the option to skip questions they prefer not to answer.
- Although the interviews were recorded, the participants had the option to have portions or the entire recorded interview erased.
- Participants were informed that all notes and recordings taken during the interview would be kept in a locked or password-protected environment.
- Participants were offered the opportunity to receive a copy of the completed study.
- No photographs that might compromise the participant's confidentiality would be included in research publications.

Instruments Used and Data Collection

The ethnographic methods used in this study included: interviews, participant observation and document analysis that are explained below.

Interviews:

I employed two types of interviews, explained as follows:

Face-to-face, semi-structured interviews with three key informants, who were selected on the basis of their level of knowledge of aquaculture in the region. It is worth mentioning that neither of the key informants were directly associated with any of the

three fish farms under study. They were contacted by phone call, using publicly available contact information in order to collect initial data. These interviews lasted approximately sixty minutes each. The first key informant was Francisco Rivera, whose uncle used to have a fish farm in the municipality of Tierra Blanca, Veracruz. The second was Carlos Szymanski who is a lawyer and contributes as a legal adviser with a NGO called Sendas A.C., which promotes regional development and thirdly was a biologist, Ignacio Martinez, who has previously studied aquaculture farms in order to increase their productivity.

Face-to-face, semi-structured interviews with the owner and manager of each fish farm, 4-5 farm workers, who were interviewed outside the farm, 6 farm neighbours, 5 consumers and 1-2 suppliers of each fish farm. All of the aforementioned participants were recruited to the study through referrals made by the key informants. I requested the key informant to pass on my contact information and the study information to the potential participant. These interviews lasted ninety minutes each. Refer to appendix A to see the interview guides.

Participant observation

The participant observation was conducted within “El Arcoiris de Tlalnehuayocan” trout farm in five consecutive days during business hours. The objective was to understand how the fish farm operated, what its practices were and what its socioeconomic and environmental vulnerabilities were. Participants were provided with a consent form stating the purpose of the study and the option to stop their participation at any time, in which they gave their written and/or oral consent. The participants had the option to request the company’s approval form to conduct the observation at any time. I observed the farm’s daily operation, how the workers behave; their attitudes towards other workers, the owner and consumers. Hand-written notes were taken during the observation.

Document Analysis:

In order to have a better understanding of the aquaculture business and the vulnerabilities surrounding it, I engaged in public document analysis. I did not require a consent form to access the documents. I analyzed documents gathered from Mexican

governmental institutions such as “Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación” SAGARPA (Secretary of Agriculture, Cattle, Rural Development, Fisheries and Food), “Comisión Nacional de Acuacultura y Pesca” CANAPESCA (National Commission of Aquaculture and Fishing), “Procuraduría Federal de Protección al Medio Ambiente” PROFEPA (Federal Attorney’s Office of Environmental Protection) and “Instituto Nacional de Estadística y Geografía” INEGI (National Institute of Statistics and Geography”. Educational Institutions such as “Instituto de Ecología” INECOL (Institute of Ecology) and Universidad Veracruzana, contributed with valuable information. I also gathered information from a Civil Association called “Acuacultores Veracruzanos” AVAC (Veracruzanean Fish Farmers), in which some of the fish-farmers are active members providing information and preparing documents to benefit the industry.

Data Analysis and Storage

I collected all data needed to produce the present thesis and then it was digitized and inductively analyzed using Tesch’s eight steps to provide a useful analysis (Creswell, 2009).

1. Got a sense of the whole.
2. Picked one document, went through it and asked myself “what is it about?”
3. Made a list of topics and formed them into columns.
4. Took this list and went back to the data; abbreviated the topics as codes.
5. Found the most descriptive wording for the topics and turned them into categories.
6. Decided on the abbreviation for each category and alphabetized these codes.

7. Assembled the data material belonging to each category in one place and performed a preliminary analysis.

8. When necessary, recoded the existing data.

In addition, I performed a second reasoning with the *node* feature of Nvivo analysis software, in which the categories and codes were reassessed to assure a correct analysis of information and to examine the relationships in the data.

All interviews were initially captured on a hand-held recorder and then transcribed into my personal laptop. All of the interviews, hand-written notes and documents analyzed, were produced in Spanish. At my arrival to Vancouver, in January 2014, I personally transcribed and translated all the data needed to produce this study. The recordings, photographs and other digital information was stored on a flash memory data device in a secure location and the transcriptions were retained on the hard drive of my password protected laptop computer. After completing the analysis in 2015, all relevant data was transferred to an external hard-disk and will be stored in a locked cabinet at Simon Fraser University until 2018, at which time all of it, with the exception of the thesis document, will be destroyed.

Summary of Methodology

To summarize, the previous explanation of the qualitative field research for the study involved face-to-face semi-structured interviews, as well as observation and informal conversations with research participants over the period dated September to December 2013, who were stakeholders of aquaculture in Veracruz. The goal of the study was to ascertain the socioeconomic and environmental vulnerabilities vis-a-vis aquaculture in Veracruz and how, and to what extent, notions of sustainable marketing could alleviate these vulnerabilities. The methods employed in the study provided unique characteristics in qualitative studies such as (i) behaviors that are studied in their natural settings, (ii) its descriptive nature, (iii) the emphasis on understanding processes rather

than outcomes and (iv) the goal to accurately describe the meaning systems and the use of symbols of the people being studied. In sum, ethnographic approaches provide in-depth and up-close understandings of how the ‘everyday-ness’ of work is organized and how, in turn, work itself organizes people and the societies they inhabit. (Ybema, Yanow et al, 2009). Finally, although only a small sample size was used for this study, some general trends and attitudes can be identified, and areas for future research will be mentioned in the subsequent chapter, which presents the results obtained with the methods mentioned above.

Chapter 4. Results and Conclusions

Chapter four describes the findings I encountered during my field research in the Eastern Mexican state of Veracruz between September and December 2013. The first case study described is the farm “Arcoiris de Tlalnehuayocan”. I observed their day-to-day activities during five business days. This farm is located 15 minutes away, by car, from the city of Xalapa. The second farm described is “Fuerte de 1847”, which is nearly half way between the city of Xalapa and Veracruz. Finally, the farm “PezCo” was the third and last company studied. After a general introduction of each farm, I present the interviews and observations. Implications will be identified further in the chapter. To conclude, the chapter contains the conclusions and considerations for future research in terms of Sustainable Marketing for fish culture.

Farm Arcoiris de Tlalnehuayocan

I started my field research in the community of Rancho viejo, which belongs to the municipality of San Andres Tlalnehuayocan that is located 15 minutes away by car from the city of Xalapa, which is the capital of the state of Veracruz. I had previously heard of an annual festival held in that municipality that involved fish farmers. Rancho Viejo is well known for its many fish farms with adjacent restaurants in which you can eat fresh trout cooked in a variety of recipes. It is mainly a weekend destination to enjoy with family due to the tranquility of the area and its proximity to the capital of Veracruz. Figures found in a local newspaper showed that there used to be at least 30 fish farms in the community by 2009. (Gayosso, 2009). Conversely, at the time of my visit to the town I counted a total of 10 farms/restaurants. Despite their signs mentioning they were open between six and seven days a week, I found only three farms open during a weekday. I observed that most of the farms have reduced their business hours and they were now opened exclusively Fridays, Saturdays and Sundays, specifically during the low season that goes from September to February. During the high season, March to August, they

add one or two more days to their working hours because of the warmer weather. Due to the catholic tradition of not eating meat during holy week, (usually in March or April) farms increase their demand and their working days. I tried to contact some of the closed farms by telephone and obtained no answer. I chose to work with the farm “Arcoiris de Tlalnehuayocan” where I did participant observations during five business days.

Rancho Viejo consists of three main streets and other six small streets that border the community. The Pixquiac River crosses the community on the eastern side, from which the totality of fish farmers utilize the water to fill up the ponds to cultivate rainbow trout. Pixquiac's River Basin covers around 10,727 hectares and is 30.27 kilometers long, running through the municipalities of Perote, Acajete, Tlalnehuayocan, Coatepec and Las Vigas. Pixquiac River originates at “Cofre de Perote”, an extinct volcano, at 3,760 meters above sea level and later pours into a larger basin called La Antigua. Pixquiac River's water is directed to four different dams that serve the cities of Xalapa and Coatepec. CONAGUA comes to analyze pollution and the quality of the water twice a year. They measure chemicals in the river's water prior to entering the ponds and then once again in the water that comes from the ponds and returns to the river in order to determine what chemicals are added in the raising process. To this regard, one cook stated that raising trout does not pollute the river at all because respective authorities come every 6 months to measure the chemical levels in the water. She stated that they clean the ponds exclusively with salt. The English translation of what she said is as follows:

“I think, raising trout does not pollute at all. They clean the ponds with salt, which is natural. Authorities have come to check the environmental impact of the farm and they always find it good. We are a very small farm/restaurant so we don't affect nature.”

The economy around the aforementioned basin is based on potato crops and aquaculture. A Federal legislative decree promulgated in 1935, 1948 and rectified one more time in 1955 contained in the Official Journal of the Federation, established a prohibition of using waters of La Antigua and Pixquiac rivers for economic and private

purposes, with the goal of assuring potable water supply for the city of Xalapa. (Pare, 2012), which places the farmers operations in a situation of illegality.

I interviewed the owner, who is also the manager, workers (including two cooks, one waitress and support staff), neighbours, customers and suppliers about socioeconomic and environmental vulnerabilities in regards to the farm operation and about their knowledge of sustainability and sustainable marketing. “Arcoiris de Tlalnehuayocan” has two ponds to raise rainbow trout.

The farm started its operations in 1992 when four family members wanted to obtain an extra source of income. Initially they received financial support from the Federal government managed by the state of Veracruz. However, the governmental support ceased approximately eight years ago. The farm has an adjacent restaurant in which trout is prepared in a variety of 15 recipes that includes local ingredients, such as pineapple, lemon, chiles, tomatoes and etcetera. The customers of the farm, as mentioned by the owner, are families from Xalapa that come specifically on weekends and occasionally truck drivers that have to go through the community. The farm purchases most of the vegetables, fruits and species in the “Wholesale Food Market” in Xalapa due to their reduced prices. The fish food they use is from Estado de Mexico, (approximately 350 kilometres away) and the fries and juvenile fish are purchased in Orizaba, which is 180 kilometres away.

Arcoiris de Tlalnehuayocan had neither a formal written organizational structure nor any sort of document listing of each worker’s responsibility. Every worker is subordinate to the owner who also performs the managerial role. The owner's wife is the principal cook and there is another woman working as a secondary cook. There usually is one server who is a subordinate of the cooks. During the high season, they hire another server who usually is a member of the family or a teenager of the community looking for an extra source of income.

Environmental Vulnerabilities

At first, the owner had a hard time trying to define “environmental vulnerability”, however, he understood what it was when I used the term “environmental risks” (in

Spanish “riesgo medio ambiental”). The owner then was preoccupied with the decrease of water of Pixquiac's river. He mentioned the farm depends upon that water and the government is not doing anything to protect the river.

As he summarized in his following comment,

There are some dams up the mountain, in Cofre de Perote and Puebla, that are changing the river's path, and so we get fewer and fewer water each year. The communities up the mountain are growing and they pollute the water and cut down the trees. It is not a big issue, but I am afraid of not having water with good quality someday. With the hurricane, we have had intense rains and the river's level seems fine, but at the same time, people do not go out of their homes, so we lose anyway.

He also admitted to having filled out formal complaints at SAGARPA and PROFEPA because he knows that up the hill they are depleting the forest and polluting the water with the construction of houses. He argues, the waste is being poured into the river with no consideration of the people that need the water down the hill.

To this regards his answer about how he is trying to solve the farm issues was:

I ask the government for more credits, it gave us money at the beginning and then forgot about us. The customers we have are not enough to survive or re-invest to keep growing. I, personally, have visited SAGARPA (Secretary of Agriculture, Livestock, Rural Development, Fishery and Food) and PROFEPA (Federal Attorney for Environmental Protection) to tell them about the dams, the pollution and deforestation up the mountain but the process is really slow. They tell me that they have the complaint and that they will research about it. When they actually go and check what is going on, the people who cut the trees down are no longer there. They

keep saying that nothing happens, but they just go there to check too late.

All the other interviewed farm workers coincided in not being able to provide a definition of “environmental vulnerability”, however understood the idea with the concept “environmental risks”. They mentioned “scarcity of water” (in Spanish, “falta de agua” or “escasez de agua”) as their environmental problem being number one, followed by “deforestation” (“deforestacion”) and third “climate change” in a form of extreme weather. All the neighbours interviewed coincided that the "size of the river" (“tamaño del río”) is the number one environmental related to fish farms in Rancho Viejo; “climate change” (extreme rains and extreme hot temperatures) ranked second and “deforestation” came third. Customer’s answers were divided between old customers, recurring customers and new customers. Old customers mentioned "scarcity of river's water" as the farm environmental vulnerability number one and new customers mentioned “climate change” demonstrated in intense rain. Interestingly, one farm supplier of vegetables in Xalapa admitted to knowing the person that buys the products at the fish farm but indicated not knowing anything about the environmental vulnerabilities regarding the farm. The fish food supplier also mentioned not being familiar with the situation of the farms in Rancho Viejo that consume their products. It is worth mentioning that neighbours, consumers and suppliers were able to understand the concept of “environmental vulnerability” using the concept “environmental risks” (“riesgos medio ambientales”, in Spanish.

Economic Vulnerabilities

Once again, the owner of Arcoiris de Tlalnehuayocan did not provide a definition of “economic vulnerability” (vulnerabilidad económica), however, he understood the concept when I employed the synonym “economic problem” (problema económico). He then mentioned that the economic bad condition the farm is currently experiencing was directly linked to environmental issues. According to him, the company does not have enough customers to make the farm profitable. Once again, he made the government responsible for the situation. He argued, they stopped giving financial support to the farm a long time ago. The owner never received any administrative training to operate the business. He has learned "on the run" and "learned from mistakes". He confessed not

being very optimistic regarding the future of the farm, as he mentioned, "If the situation continues as today, I don't think we are going to be in the business in five years. Other restaurants have already closed, as you can see, we could be next".

In general, workers are aware of the farm's situation, citing "lack of customers" (falta de clientes) as their number one economic preoccupation, followed by "risk of closing the farm" (riesgo de que la granja cierre) and third being "losing my job" (perder mi trabajo). The second cook admitted to be concerned about the low profits they are obtaining. According to her, she has had in mind going back to her old job in the coffee crops even though she does not like it as much as this one.

As she put it:

I used to work in the coffee plantations in Coatepec (a small city about 15 km away Rancho Viejo) but you know that it is a very exhausting job. I had to wake up at six in the morning every day and work for 8-10 hours a day. Working in this farm means I have my everyday meal and it is not so tiring.

Despite the owner mentioning they also sell trout to go per kilogram, the second cook mentioned they have not sold trout per kilogram to go in at least three months because the fish are not big enough. Consumers mentioned they have seen a reduction of the people coming to the restaurant, arguing the rainy weather is an obstacle despite it is nearby to their homes. A few recurring customers have noticed other farms have closed, especially in the last three years. Neighbours rarely consume the farm's products. They mentioned that they purchase trout during special festivities such as birthdays, Holy week and mother's day. When asked for the reasons they answered "prices are a little bit high and because I have lived in here for so many years I am already used to fish so I want to taste different food, like meat, chicken, and so on". Concerning the suppliers, the vegetable store was interviewed at the Wholesale Food Market in Xalapa. They mentioned to not being aware of Rancho Viejo's economic issues, however they have noticed fewer people is coming from that community to acquire their vegetables and fruits. "I used to remember more people coming from

Rancho Viejo, five or six. They used to get tomatoes, onions, limes and fruits, now we have only three customers from there. They come every second week, approximately”.

Social Vulnerabilities

The owner had never heard of such term of “social vulnerability” (vulnerabilidad social). After using the concept “social problem” (problema social) he mentioned the “lack of a stable source of income” (falta de una fuente de ingreso estable) as his one and only preoccupation in terms of social issues in spite of this issue being more related to an economic risk, in my opinion.

Interestingly, workers interviewed mentioned “more income” (más ingresos), “insecurity at work”, (sentirse inseguro en el trabajo) and “road condition when it intensely rains” (las condiciones de la carretera cuando llueve mucho) as their top three social risks. The second cook also mentioned to be afraid of being robbed at work or when she walks to take the bus that goes to Coatepec, where she lives.

As she mentioned: ...sometimes I feel insecure because we don't have security... I mean, if someone would like to steal our money or things he would do it like in three seconds. The community has been a very safe place, but you never know. I have heard so many stories about thieves, rapists and everything. In addition, we are concerned about the river flooding the restaurant. I go to Coapexpan (nearby bus station in Xalapa) and then to Coatepec at the end of the day, there is not floods in that area. But the another waitress goes to Xalapa through San Bruno Avenue, and when it is the rain season the small river floods the avenue and the cars/busses can't go through.

She also brought to attention a flooding that had affected the farm five years ago. They had to close for about one and a half weeks to fix the furniture and clean the mud the river left behind. Neighbours of the farm mentioned “road conditions” and “insecurity” as their top social preoccupations. One neighbor mentioned that despite Rancho Viejo is and has always been a safe place to live in; in the past, there were a couple of assaults

in the two roads that connect the community with Xalapa. He said “we were alarmed because even here that is quite small there is violence, we are afraid of our sons and daughters being out at night”. Customers coincided with “road condition” and “insecurity” being their top social preoccupations. Conversely, suppliers at the Whole Sale Market mentioned not to know any sort of social issue in Rancho Viejo.

Term Sustainability

The owner was not able to provide a definition of sustainability, however after being told what it was he mentioned his farm does have sustainable practices because they do not pollute the river due to the fact that they never throw waste in it. They clean the ponds exclusively with salt. The owner also admitted not to recycle plastic or glass; however, they gather the food scraps and put it back into the soil as fertilizer. The owner did not ascertain what sustainable marketing was about. After being told what it was, he mentioned: “in that case we are not sustainable because we barely get profits”. In addition, he responded he would apply sustainable marketing to his company; however, he first wants an assurance that he can work on the farm without being preoccupied with the river’s level.

In addition, following Emery’s (2011) considerations about sustainable products tend to be more expensive because the ingredients may cost more than their conventional counterparts may. For example, organic food grown with natural fertilizers may be more expensive than those foods not utilizing natural fertilizers. I asked the owner if he would be willing to increase the product’s final price in 10-15% to cover the initial expenses of adopting sustainability in order to obtain notions for further designs of sustainable strategies. He admitted that if prices would have to increase 10-15% for being able to implement sustainability within his business, people would not consume the fish. He precisely said: “I doubt it. In that case every dish would be \$77 pesos...no, I do not think so”.

Workers interviewed could not define the concept and mentioned not to have heard that word before. After being told what it was some of them related the term to

“environment” (medio ambiente) and “protection of the river” (proteger el rio). Consumer’s answers were divided in terms of their education level. People with post-secondary education, despite not being able to define it, inferred sustainability was related to “protecting the environment” (proteger el medio ambiente). On the other hand, consumers with lower years of education could neither define the term nor relate it to any other concept. Immediate neighbours could not define nor relate the term with any other concept, despite some of them mentioning they “think to have heard the word before, perhaps on TV” (creo que lo he escuchado antes, tal vez en la television). Additionally, suppliers at the Whole Sale Market did not provide any definition or relate the term to any other.

When asked if they would like to apply sustainable practices in the future, the owner answered the following:

Well, yes, but what we want now is a guarantee of being able to work. We want the government to help us out not to grow, but to keep working. Regarding the forest, you can see, we have been in here for 20 years and it is still all green. We only cut the trees down to build the restaurant and ponds but we do not destroy nature. Rancho Viejo has not developed a lot.

General Conclusions

Evidently, farms in Rancho Viejo live in a paradoxical environment because when it rains, the river's water is abundant; however, there are not many customers and when the weather is warmer, there are more customers but not enough water in the river to sustain raising more fish. One cook mentioned that the farm does not have the Federal permission to use Pixquiac River’s water to operate, so they are working in an illegal condition. She attributes this fact to their not receiving attention from the government in terms of the financial aid they no longer receive. In this regard, Celia Gayosso wrote an article in the local newspaper “Diario de Xalapa” in 2009, in which she mentions that CONAGUA intended to sanction farmers from Rancho Viejo for using the “Federal waters of Pixquiac river” despite of the legal prohibition with 800 thousand Pesos (nearly

\$64,000 current Canadian Dollars), when the farmer's properties are valued in 70 thousand Pesos (nearly \$5,600 current Canadian Dollars). Gabriela Parissi, technical adviser of urban development in the municipality of Tlalnehuayocan, argued that the 80-year-old water prohibition would allow the farmers to work in a non-prohibited activity such as woodcutting, which would worsen the environmental situation.

In 2009, the former Governor of Veracruz, Fidel Herrera Beltrán, mentioned to the local Newspaper Diario de Xalapa the following “I am surprised, and it's gratifying, of seeing so many new ponds that we do not even have registered”, referring to the fast rate of fish farms openings in the state.

In an article for the local newspaper “Diario de Xalapa” in 2012, José Morales interviewed a fish farm owner regarding the economic crisis they were experiencing. In that interview, the owner called for a promotional campaign to Secretaría de Turismo (Ministry of Tourism) and the municipal government. The owner argues that they have not received any financial support from SAGARPA. Sales have decreased nearly 100% in the last year, customer numbers have also decreased and the water temperature is warmer so it is harder to keep the fish alive. Two years later, in 2014, José Morales wrote another article about the situation on Rancho Viejo's trout farms, in which he concluded that farmers still call for promotional campaigns to the Ministry of Tourism, specifically to the promoters of the 22nd Central American and Caribbean games that were going to be held in the state of Veracruz that year and, as a result, would bring tourists to the region.

Regarding the term sustainability, the majority of people related the term exclusively to environment. Defining “environment” (medio ambiente) as the weather (clima), water (agua), quantity of trees (número de árboles), and air quality (calidad del aire).

To conclude the owner mentioned to foresee the farm's development as follows:

Really bad. Sometimes I think we are not going to be around in five years into the future. We do not have enough customers and the river is drying out. I have talked to my family and we are seriously considering looking for jobs somewhere else. Perhaps going to the city (Xalapa) or trying to cultivate something else.

Generally speaking, what I found in Rancho Viejo's fish farms were:

1. There is a trend of fish farms closure or at least a reduction of business hours of operation.
2. Fish farmers and workers know almost nothing about sustainability and about sustainable marketing.
3. The farm received support from the government to start the business; however, they attribute their failure to not receiving the subsidies and or credits anymore.
4. The farm is pessimistic about their future, calculating that in five years it will not be operating.
5. The farm does not produce enough quantity of fish to reach external markets (such as nearby cities).
6. The farm complains about water scarcity and blames the different levels of government about it.
7. Although its production is not high and in consequence, the pollution is not high either, they do not recycle, or treat water to remove biological or chemical waste products from the water.
8. Although there are some initiatives to protect Pixquiac's River Basin, there are ongoing vulnerabilities, environmentally and socially speaking.
9. They do not have any type of formal business model and/or structure.
10. Suppliers are disengaged of the community's context.
11. There is a sense of insecurity around the farm in neighbours and workers, in other words, risk of being robbed.

Farm El Fuerte 1847

The second farm visited was “El Fuerte 1847” located in the town of Plan del Río, municipality of Emiliano Zapata. Demographics:

Emiliano Zapata is one of the 212 municipalities of the State of Veracruz, with an extension of 398 kilometers. It is contiguous to the Capital of the State, Xalapa. The municipality has nearly 132 communities with a total population of roughly 50,000. Its mean daily temperature is 25 C; several small rivers cross through Emiliano Zapata on their way to the Gulf of Mexico; all of them are considered part of the Actopan River's Basin. Surprisingly, there is not any secondary institution in this Municipality. After high school, students have to move to other communities to pursue secondary studies.

El Fuerte 1847 raises a relatively new species of tilapia called “pargo cerezo” that is a hybrid of the species niloticus and mossambicus, first produced by researchers of Universidad Nacional Autónoma de México (UNAM) to improve its flavor, resistance, color and decrease the time of fattening. “El Fuerte 1847” started operations in 1996, under the control of four brothers. The farm took its name based on the Fort built in Plan del Rio under command of the Venezuelan Fernando Miyares y Mancebo to protect the "Royal Road" (the path between Veracruz and Mexico City) during the Bourbon's government in the 18th century. El Fuerte 1847 farm employs between 25 and 30 people during weekends and half that number in winter and weekdays, when they have fewer customers. Its main market is families from Veracruz, Cardel, Xalapa (located 180, 38 and 36 km away from Plan del Rio, respectively) and other smaller towns near the area, as well as truck drivers that pass by to rest and have lunch. Most of El Fuerte 1847's production is sold in the restaurant; however, they designate some fish to small fish markets in Rinconada and Plan del Río. They also have uncooked fish “to go” sold by the kilogram. The farm is open Monday to Sunday from 9 AM to 8 PM, 365 days a year. Consistent with "Arcoiris de Tlalnehuayocan" the founders of this farm also started operations without any previous knowledge of raising fish or running a business using accounting, general principles of administration and so on.

El Fuerte 1847 farm started production of alevins (young fish that still have attached the yolk sac) of pargo cerezo early in 2013 thanks to UNAM's initiative and training. Despite being a new activity, the owner reports the production a success because they are no longer spending money to get the alevins. Interestingly, the owner never mentioned to have the plan of commercializing the alevins to other farms.

Despite the farm having some presence on social media such as Facebook, Instagram and FourSquare, there is some misinformation about its location. On some of the aforementioned websites, it is mentioned that this farm is located in the community of Rinconada. El Fuerte 1847 exclusively controls the Facebook profile, which was in fact created by the youngest waiters and it has not been recently updated. People who visit the restaurant post pictures of their experience and thoughts. To this regard, the owner mentioned how they promote the farm: "some of the kids (young waiters) have created a website of the restaurant to attract more people but there are more people coming because they hear we are doing things right and the dishes taste good".

Environmental Vulnerabilities

One of the owners of the farm, who is also the manager, indicated not having any complaints regarding the environment around the farm and mentioned that he has never heard anyone complain about it either. In comparison to Rancho Viejo's farms, this farm does not consider water supply as an environmental issue. Interestingly, the workers with higher education levels knew what an "environmental vulnerability" was; mentioning that it was "something that harms the environment" (algo que afecta al medio ambiente). When they were asked about their opinions regarding the farm's environment they all agreed on not having any complaints about it. According to one waiter, it is still very "green in here" (todo esta verde aqui), referring to the vegetation. Another mentioned: "I don't think we are doing bad to the surrounding environment. You see everything is green in here. Nobody has ever complained about it."

Equally, most of the customers with certain educational levels, usually higher than high school, were able to define "environmental vulnerability"; mentioning it was "environmental problems" (problemas del medio ambiente). When they were asked if

they knew about environmental issues around the farm they all agreed on not knowing any. The totality of neighbours interviewed did not ascertain the definition of the “environmental vulnerability” concept. After I told them its definition and its synonyms such as environmental risk, danger (peligro), or deterioration (deterioro), they all agreed on not having seen too much change in the environment after the farm opened. I interviewed a local store in Plan del Rio, from which the farm purchases some produce and carbonated beverages when it is urgent. Neither the workers nor the owner can travel to neighbouring communities to take advantage of a cheaper price and the two employees with no post-secondary studies were not able to define the term “environmental vulnerability”. However, after using the phrase “environmental risk, danger or deterioration” they both agreed on not noting any sort of “contamination around the farm” (contaminación en la granja).

Economic Vulnerabilities

The owner of El Fuerte 1847 mentioned a preoccupation with the expensive electricity bill, which was long time ago subsidized by the government. The water bill, in comparison, he argues that they can still afford, despite observing a generalized increase in all the bills and prices of products. He precisely said: “our main problem is that the cost of electricity is extremely high. Many years ago we had subsidy in electricity but it has been reduced little by little.”

The interviewed workers mentioned “electricity's price” as the main economic problem the farm is currently experiencing, despite the fact that they do not know how much it is; they have heard the owner complain about it. Exclusively one waiter, who is enrolled at University in neighboring Xalapa, briefly summarized how the farm transitioned from receiving credits from the government to not receiving anything at all. The opinion of the totality of customers interviewed regarding the economic problems the farm might be experiencing is rather optimistic. All of them mentioned the farm is doing “good” (le está yendo bien), it is “growing” (está creciendo) and they are having more customers over time. Neighbours suggested prices are generally increasing and that may affect the

farm. In addition, neighbours were more aware of the impact of the highway blockages due to the Teachers Union's Protests, arguing that it is nearly impossible to reach the town when the protesters block the transit. Suppliers were also aware of the generalized increase of goods and services, arguing they have heard people complain about using more money to buy the same quantity of products than a few months before.

Social Vulnerabilities

The owner ignored the term “social vulnerability” (vulnerabilidad social), however, he mentioned his business does not have any social issue (problema social) because “everybody is working fine in here”. Workers interviewed indicated not to know any social issue or risks about working on the farm. Their concerns pointed out towards the lack of consumers because of the highway blockage by protesters. To this regard, these protests were a reaction of a set of educational reforms proposed by President Enrique Peña Nieto and approved by Congress. Teachers all over the country marched at least 15 times over three months (August-October) to protest against this legislation. The reforms included teachers’ evaluation policies and standardized testing like those in the US “No Child Left Behind” Program. The legislation infuriated Mexican teachers, because they wanted more focus on resolving underlying structural problems related to education. The new test-based hiring and promotion system would allow the government to take a large measure of power from teachers’ unions, which were accustomed to buying or inheriting their positions and had had virtual immunity from the state.

Exclusively, workers currently enrolled at any post-secondary institution were able to provide a definition of “social vulnerability”, using words such as “social issues” “personal risks” “society's problems”. Equally, most of the customers with a certain education level, usually higher than high school, were able to define the term social vulnerability; mentioning it was “social risks”, “security issues” and “problems of people”. When they were asked if they knew about any social issue regarding the farm, their answers pointed out to the country's general social instability demonstrated in the many protests. Interestingly, neighbours are not recurrent farm consumers. They exclusively

go there for special festivities such as Mother's day and Birthdays; in consequence, they are not highly familiar with the farm's social vulnerabilities. In fact, they generally identified the concept as “problems of the farm” and “worker's problems”. The suppliers interviewed were able to understand the concept of social vulnerability. They mentioned they share the same social problem with the farm because of the highway blockage and it was a circle in which they are having fewer sales due to the farm and other local businesses are having fewer customers because of the blockage.

Term Sustainability

The owner indicated not knowing what sustainability was, however when asked what comes to his mind with the word, he mentioned “the environment” (el medio ambiente). He also responded not being 100% sure if they had sustainable practices, but he highlighted that they have never had any complaint about it and that authorities have measured water's quality and the environmental impact and the farm has always had satisfactory results. When the owner was asked about the definition of “sustainable marketing”, he mentioned it could be “environmental administration” (la administración del medio ambiente). He also admitted being interested in applying sustainability if “it helps us to grow and expand our sales”.

In addition, when asked if they recycle he answered: “not really, we only collect the pop's cans to the people who come to get them and we try to keep the metal garbage to those guys that come to buy old metal trash”.

Contrary to Rancho Viejo's farm, “El Fuerte 1847” does not employ food scraps as fertilizer; as said by the owner: “we feed feral dogs and hens that are usually around with the tortillas and rice that people do not eat.” In the case of bones, and vegetables, “we throw them away”.

When asked about the increase of price when adopting sustainability the owner mentioned the following: “I am not sure... you would have to ask them.”, which I infer he

would decide to do so if most of the customers agree on buying the products after a 10-15% increase on the price.

From the workers interviewed, only the ones with post-secondary education were able to give a definition of sustainability; explaining it was “the environment” (el medio ambiente) and “protecting the environment” (proteger el medio ambiente). Other workers mentioned to have heard that word on either television or being mentioned by someone else, however they could not explain what sustainability was. Once again, the trend of being able to define -or at least mention synonyms- sustainability by people with certain level of education was observed when farm consumers were interviewed. Most of the interviewees mentioned “environmental protection” (protección del medio ambiente) and just “the environment” (medio ambiente) as sustainability synonyms. Not surprisingly, neighbours were not able to define the word sustainability, with the exception of one, mentioning that had heard that word before, perhaps on television, and explaining it was the “protection of the environment”. Suppliers were also hesitant on what sustainability meant and provided a synonym with difficulty, which was “environmental protection” (protección medio ambiental).

General Conclusions

I identified a high lack of knowledge regarding other fish farms within the state. Research participants were not fully informed about specific situations other fish farmers are facing. They ascertain about their existence but have never been in the other area or bought their products.

Whereas the first farm studied on this research is more affected by the lack of the river's level, El Fuerte 1847 is more concerned about the high and increasing price of the electricity bill. When the farm started operations, the federal government subsidized electricity for fish farms; however, it was gradually reduced in a time frame of eight years. Currently, the farm has to pay for the totality of its electricity bill. In addition, according to the current rates, the more electricity they consume, the less subsidy they obtain.

Due to its location between two principal cities, this farm is more affected by the conditions of the highways and roads. The protests surrounding the Teacher's Union Reforms that lasted several months in several States in Mexico affected El Fuerte 1847. At least six times the highway that connects Xalapa with Veracruz was taken by the protesters for periods of two, three and in some occasions as far as 12 hours, to gain attention from the government and stop the reforms proposed by the president Enrique Pena Nieto.

In comparison to Rancho Viejos' farms, El Fuerte 1847 is rather optimistic in terms of the future. They are planning to undergo some general renovations to improve some of the ponds so they do not collapse. They want to build some bungalows so people can stay overnight and among their expectations, they are going to build a fully equipped venue for having social events, such as weddings, birthday parties, and so on.

To conclude, when asked about how he foresees the development of the farm the owner responded with the following:

Well, I think we are going to do some renovations. We need to improve some of the ponds so they do not collapse. We want to build some bungalows so people can stay overnight and in our expectations are to build a fully equipped venue for having social events, like weddings, birthday parties, among other things.

Generally speaking, what I found in "El Fuerte 1847" fish farm was:

1. It seems to have certain success, economically speaking.
2. The problems it mentions are related to increasing prices of goods and services, specifically electricity's price.
2. The farm received support from the government in the form of monetary credits and tax exceptions.
3. The farm attributes part of its problems to inadequate actions of different levels of government.
4. This farm's owner admits to be optimistic about the farm's future.
5. It reaches only local markets (Plan del Río, Rinconada).

6. The farm employs certain level of waste separation, recycling, and environmental preservation, however these actions are occasional and are not written in any form of formal document.
7. It has some notion of business management; however, the farm does not possess any formal document such as mission and vision statements, and general objectives.
8. The farm was moderately affected by weather's conditions (Hurricanes Ingrid and Manuel), but highly affected by Teacher's protests and road closures.

Farm PezCo

The third and last farm visited by the researcher is located in the coastal municipality of Alvarado, however the farm's propriety is not located in a coastal zone. Alvarado has an extension of 840 km² with a mean temperature of 26 C and is located 60 kilometres south of Veracruz City.

PezCo, with 101 hectares and 2700 meters bordering Papaloapan River, started operations back in 2000; however, it was not until 2009 that it increased production thanks to a "macro-investment" as the former Governor of Veracruz called it, consisting of \$1.6 million pesos. (\$133,330 current Canadian Dollars). With that amount, they were able to improve the infrastructure to reach a total of 60 tons of fish in the first stage of the renovations. In the second stage that was planned to start in 2011 and finish in 2015, they expected to reach 200 tons of fish a month. The production as of mid-2013 was 150 tons a month. The farm has in total 32 floating cages with approximately 40 thousand organisms each in a fattening stage and seven tanks of geomembrane with around 300 thousand organisms in a pre-fattening stage. The farm employs around 100-150 people each week among cleaners, veterinaries, biologists, engineers, administrators, accountants, drivers and general workers that load the trucks. In comparison to the other two farms studied, PezCo does not have an adjacent restaurant to sell its production.

The farm commercializes its output in restaurants and fish markets in the municipalities of Alvarado and Veracruz, in a fresh fish version and in packaged frozen fillets with its own brand and nutritional information.

The manager mentioned he knew the farm had started as the other ones “being a small company, with scarce knowledge, lack of money and with no idea on how to run a business”. Therefore, the company had to look for shareholders to survive, and just after that, it received financial resources from the State. PezCo started producing alevins early in 2013 with the intention of saving costs because they used to purchase them from companies in Veracruz City. The management of PezCo mentioned that the next step would be to commercialize the alevins to local farms and then to other farms within all the State of Veracruz. It is worth noting that unlike “El Fuerte 1847”, PezCo has 50% of the electricity bill subsidized with resources given by the Federal government through CONAPESCA.

Note that due to the location of PezCo, in between Alvarado and Veracruz City, and to its vast territory, there are no immediate neighbours or dwellings; in consequence, this study does not contain information about the neighbour’s perceptions. In addition, due to differences in schedule, concerting interviews with farm’s suppliers was not possible.

The farm is considered in local newspapers as a “success” and “leader” in the industry. The farm plans to build a processing factory to service international markets. Another plan is to prepare and employ the 36 hectares currently not used with an investment of nearly 60 million pesos (\$480,000 Canadian Dollars) to reach a total annual production of 1500 tons. This amount is expected to be obtained from the profits and from national resources.

Environmental Vulnerabilities

The manager mentioned not having knowledge of any vulnerability surrounding the farm, with the exception of natural hazards such as hurricanes and floods during the

rainy season that happens during the summer that affect deliveries, especially in Veracruz City. Workers' opinions coincided with that of the manager in terms of not having knowledge of any environmental issue around the farm, with the exception of natural phenomena such as hurricanes. The restaurant's manager I interviewed in Veracruz City, who is a direct customer of PezCo mentioned not to ascertain any environmental vulnerability around the farm. He added that no one has ever complained about the quality of the fish since they started working with PezCo back in 2010.

To this regard, the manager emphasized the following:

I think the farm is strategically located between two major cities (Veracruz and Alvarado) and it makes it safe in terms of lack of resources. The major problem around here is in hurricane season. We are close to the sea and it gets bad around twice, three times a year. The good think is that the trees protect us from the strong winds. We have had problems with deliveries of products due to floods in Veracruz but, everybody knows how bad it gets when it rains so heavily in that city, so our customers understand.

Economic Vulnerabilities

The manager mentioned not currently having any sort of economical vulnerability, According to him, since the “macro-investment” in 2009; he has seen a good development of the farm. Production has increased as well as sales and with the recent production of alevin, they plan to reach local and international markets in a near future.

What he answered was:

Right now, we are experiencing a good time in term of sales. We had some issues last year with the increasing price of some goods and fish food, however since early this year we started producing our own young fish (juvenile fish), so it helped us in saving some money. Before that, we used to buy the juvenile fish from companies in Veracruz, but now we have the knowledge and the technical capacity to do it by ourselves. In addition, we are thinking about start selling the juvenile fish to other farms, first in the region and then in all the state.

Workers interviewed coincided in not being able to mention any economic vulnerability since the “re-investment” in 2009. They mentioned before the “re-investment” there were not so many tanks and cages, and obviously, there were fewer employees and less production. The restaurant's manager, who receives PezCo products, mentioned not knowing a specific vulnerability of the farm, however he said he had seen his partner grow and have more diverse products, presentations and a more efficient method of delivery because, he argues, they now deliver faster than back in 2010.

Social Vulnerabilities

The manager admitted not knowing about any issue regarding the workers because they treat everyone in a good manner and try to keep security at the highest level. Workers described “social vulnerability” as “problems of the people” (problemas de la gente) “risks employees have at work” (riesgos que los trabajadores tienen en el trabajo) and “risks people face” (riesgos que la gente tiene). They also mentioned not knowing any social vulnerability surrounding the farm. The restaurant's manager could not identify any social vulnerability of his provider, arguing they do not share information about their employees.

Term Sustainability

The manager defined sustainability as “the idea of using what you really need to not compromise the resources for the future generation”. The owner claims to be a “socially responsible” business because they proudly employ persons with disabilities. Workers admitted having heard about the term sustainability but were not able to provide a definition. They all mentioned “the environment” as a synonym. The restaurant’s manager defined sustainability as “protecting our resources to not diminish them and being able to re-use them when possible”. When asked if they employ sustainable practice, the manager answered the following:

At some extent, yes. We try to separate our garbage to be recycled; however, we do not know what the government does with that. I mean, we do our best effort in separating our garbage, but we do not really know if the government is actually recycling it. I have heard stories about the garbage trucks combining recyclable and non-recyclable garbage once they put it on the truck, but still, we do it. We also try to collect compostable waste to be used as fertilizer in the future. In the future, we will try to use more plant-based products, unfortunately, those are more expensive and we have not gotten the approval from the decision-making persons. I know that the priority right now is to find a market for the juvenile fish; we are expecting to start distributing them by next year.

The manager was able to provide a definition of sustainable marketing, he said: “it is how a business can implement sustainable practices through all the levels of a certain company”. In addition, he commented sustainable marketing “sounds good in theory but I would like to know more about its implications, costs, and benefits and how to implement it.”

General Conclusions

The manager said he predicts the development of the farm as follows:

To be honest, I think the company is developing well. I have seen many changes in the last seven years. When I first started, the farm used to sell the product only in the fresh presentation. Now we have it frozen in fillets, with its own package, brand and nutritional information. It has been a slow process, but I hope to see the company growing more. In the coming years we expect to take more action on cleaning the water after we use it in the tanks. I must admit that raising fish does not pollute water as other activities; however, there is always something in the water that we have the compromise to clean. In addition, in a medium term, we want to expand our distribution network and maybe reach international markets.

Interestingly, the manager also commented on the current situation of the industry as follows:

I think one problem is the lack of organization within the producers. There are some initiatives of forming a group of producers but it has never materialized, so there is lack of transfer of knowledge. I know that some farms have had issues with the money. This industry was highly subsidized around 20 years ago and suddenly they stopped. I have heard many cases in which the farm had to stop operations because it had no more money to keep running. The government's help lasted for 5-10 years and then it stopped. Some producers had time to learn and get prepared and some did not. On the other hand, I have heard stories of peasants creating a farm, legally speaking, just to get the subsidy from the government. After 6-8 months, when the authorities visited the supposed farm, they found nothing. People used to give excuses on why there was not a farm where it should be.

Regarding the increase of price when adopting sustainability mentioned by Emery (2011) the manager said the following:

I think, right now, there is certain interest for those organic or green products, but people are also sensitive to price changes. I guess that suddenly to tell them that prices are going to increase, would difficult the purchase of our products. Maybe with time would be more and more common to use organic or green products. We have a lot of competence and increasing prices could drop our sales.

However, he mentioned "...a business can implement sustainable practices through all the levels of a certain company."

Generally speaking, what I found in PezCo was:

1. An economic success according to some stakeholders.
2. A formal business structure and knowledge.
3. Some degree of sustainability and sustainable marketing knowledge.
4. The farm plans to incorporate sustainability in all the company's levels in the future.
5. PezCo separates garbage, recycles, and composts some of its waste, however is dubious about the government's proper management of the waste.
6. The farm does not complain about any environmental issue, with the exception of natural hazards such as hurricanes.
7. The farm obtains the water from regular pipes (Papaloapan River)
8. PezCo does reach external markets.
9. The farm overcame the lack of money through private investment and government's investment.
10. It has certain lack of knowledge of other fish farms and the sector's situation.

Chapter 5. Final Remarks and Recommendations

To summarize, this section explains how the results found in each farm answer the two research questions that guided the present research.

First, in “Arcoiris de Tlalnehuayocan” the general situation is rather complex because of the several vulnerabilities this farm has. On one hand, there is the lack of water resource they use for the ponds that is instead directed to satisfying water needs of the growing population of Xalapa. On the other hand, there is the old Decree that prohibits the usage Pixquiac River’s water. Answers for the first research question, “how do stakeholders of commercial Aquaculture in Veracruz describe the socioeconomic and environmental vulnerabilities related to their farming operations?” for this farm were focused on

- a) Environmental: Lack of water resources, exposure to being affected by intense rain.
- b) Economic: Reduction of consumers, low profits, no subsidies or credits from the government.
- c) Social: Dubious safety of workplace, uncertainty of long-term employment in the farm.

I also concluded that these vulnerabilities are intertwined because according to the answers, stakeholders describe the reduction of consumers is due to the constant intense rain experienced in the region that affects the road’s condition and then discourages consumers from visiting the farm, which finally affects the profits. In addition, the fewer consumers are around, the more unsafe the workers feel.

Second, the farm’s “El Fuerte 1847” stakeholders described the socioeconomic and environmental vulnerabilities as follows:

- a) Environmental: No major vulnerabilities were identified by any of the

stakeholders interviewed.

- b) Economic: High cost of electricity bill, lack of subsidies and occasional reduction of consumers.
- c) Social: Protesters on the road that leads to the farm.

In this case, the vulnerabilities are intertwined because the road closures due to protests makes the farm temporarily inaccessible, which ultimately reduces the number of consumers. As the data showed, this farm is more affected by the political and social situation than by environmental hazards and, despite the elevated cost of the electricity bill, the farm still is profitable and optimistic in regards to its development.

Third, PezCo's stakeholders described the socioeconomic and environmental vulnerabilities related to the farming operations as follows:

- a) Environmental: Farm exposed to hurricanes.
- b) Economic: No vulnerabilities were identified about this topic after the "macro-investment".
- c) Social: No vulnerabilities were mentioned in regards this topic.

To respond to the second research question "how, and to what extent, could sustainable marketing contribute to mitigating environmental and social vulnerabilities in Aquaculture in Veracruz, Mexico?" Each of the farms was studied to analyse the role each actor of sustainable marketing system which include *businesses*, *people* and the *government* (Emery, 2011). Each group has a part to play and no one, or even two, can successfully lead on sustainable consumption over the long term. Interventions have to be tailored to the issues, sector, products, target markets, and their level of motivations and perceived barriers. *People* need to demand more sustainable products and services to assure the whole acquisition process is fair for everyone and at the same time environmentally-friendly. *Businesses* should be able to act as an agent of change by placing themselves in the center of their network of stakeholders, acting as a hub to maximize the sustainable outcomes of business activity by influencing and utilizing their contributions. In other words, businesses need to engage with their suppliers, employees and consumers, work on partnerships with another industry-related and non-related businesses, collaborate with all levels of government and finally, support the

local community. The *government* needs to guide action through legislation, regulations, incentives and voluntary agreements; it also has to lead by example, as with its own sustainable procurement policies. (Emery, 2011). It is worth mentioning that my intention is not to judge the actions or decisions of certain levels of government as “good” or “bad”. The following two sections answer the second research question and provide recommendations for marketers and policymakers of the farms studied and for the sector as a whole.

Implications for Managers/ Owners

Sustainable management of fish farms require that environmental, social and financial vulnerabilities must be managed throughout from the farm to the plate. Importantly, financial sustainability rests on the ability of these farms to manage these risks while finding profitable markets for their product. Although only three farms were investigated and therefore these results are only tentative, the findings of this study suggest that the vulnerabilities that have to be managed depend on the size and context of individual farms. Implications for managing the environmental, financial and social vulnerabilities identified in the research are presented below.

Managing Environmental Vulnerabilities

The findings indicate the regulatory problems as well as the expanding alternative demands on the water supply related to Arcoiris de Tlalnehuayocan’s context complicates the implementation of a sustainable strategy. Despite these, “Arcoiris de Tlalnehuayocan” employs certain sustainable practices to take care of the environment such as recycling and composting in spite of not being fully self aware of the concept of sustainability. In addressing the issue, I would suggest that given the majority of aquafarms in Rancho Viejo are owned by small farmers, cooperating and joining together could maximize their voice and make them more visible to the respective levels of government or any other organizations that could design a strategy to improve their situation. In addition, findings imply for the small farms in Rancho Viejo that the

management of environmental risks such as the supply of water and deforestation is largely out of their control and given their small size, they could join in a business network or cooperative to increase their presence and perhaps find more sustainable solutions for water supplies.

“El Fuerte 1847”, the mid-sized farm, could incorporate sustainable practices in their daily operation. Simple actions such as recycling or composting could integrate workers and perhaps consumers, and definitely could be a distinction for the farm. In addition, this farm could avoid related practices that affect their reputation for sustainability. An example is the purchasing of doubtful-origin and perhaps endangered birds that they keep in cages as an attraction for kids that visit the farm. The manager mentioned the following when I inquired about the birds in the cage:

There are people who pass by on the street selling the parrots. They cost like \$180 pesos (less than 18 CAD) each one. We found some of the hens wandering around and then we kept them. Nobody came and claimed them as their property so here they are. I think they are all fine. We take care of them, as we would do with a dog or cat. In addition, they are a good attraction for the children. We also have some turtles and a pejelagarto (garpike) that friends of mine gave me as a present.

In my opinion, “Arcoiris de Tlalnehuayocan” is on the right track in terms of sustainability efforts. The manager has some knowledge about sustainable practices and in fact, the farm claims to be a social responsible company. Nevertheless, sustainability still needs to be implemented in all the business structure and in formal documents to, as mentioned above, establish a sustainable network that disseminates sustainable thinking and values.

Managing Financial Vulnerabilities

Arcoiris de Tlalnehuayocan's results strongly indicate that financial vulnerabilities represent major risks to the long-term survival and sustainability of this small aquafarm. The farm requires additional financial resources to maintain their production and there is an urgent need to boost customers to their farm. Cost effective strategies that should be considered for boosting revenues include attracting consumers to their restaurant by partnering with tour operators, cooperating with other small farmers to host more festivals and weekend events that can be promoted to nearby larger cities. Promoting the restaurant as a location for small and medium size enterprises to hold dinners and small events could be another initiative that may be effective for this small-scale operator.

The success of El Fuerte 1847 suggests it is possible to manage financial vulnerabilities with the appropriate strategies and decisions. Despite the elevated cost of electricity, the privileged localization of the farm and the appropriate management has contributed to an increase in the number of consumers and hence the increase in profits. However, increasing patronage from the local community still represents an opportunity for growth. The farm could design a strategy to increase customers from the community by diversifying the menu to provide variety in the dishes as added incentives. Having specials for locals on slow days and periods is another. In terms of future growth potential, I would suggest trying to diversify their consumers beyond exclusively relying on people passing by. Suggestions similar to those presented above in the case of Arcoiris de Tlalnehuayocan should also be considered. Another revenue generating opportunity would be to commercialize the juvenile fish to take advantage of their achievement in this area as "PezCo" intends to do.

"PezCo's" results suggest that the "macro-investment" by the federal and state government contributed to reducing their financial vulnerabilities and to some extent the social and environmental ones. Further results suggest the farm is aligning with the sustainable/environmentally- friendly and social responsible thinking to distinguish it from other farms and provide the farm with a competitive advantage. While it is clear that government support has been an advantage for "PezCo", it is clear that this company has used prudent management practices to sustain and grow to its advantage.

Managing Social Vulnerabilities

In order to engage the company with employees, strategies to improve democratic systems of involvement such as organizing social events for the employees, as well as training could be implemented. Engaging companies with suppliers could be achieved by participating in partnered projects, workshops, conferences, and establishing open days to know more about their suppliers. Finally, companies must engage with the local community through special events to present products in order to improve the perception of the farm and perhaps increase the local consumption in the case of Arcoiris de Tlalnehuayocan.

Findings suggest that social risks in El Fuerte 1847 farm, such as road blockages by protesters are out of their control. Perhaps the restaurant could lure back customers after these events or in fact invite protesters to their restaurants with special coupons in event of these crisis.

Despite few social vulnerabilities being identified in PezCo, the farm could incorporate their social-directed goals in their formal documents to make it more tangible at an organizational level to maintain their socially responsible agenda.

Enhancing Consumers Awareness

The results suggest that there is a need to increase target consumer awareness of the benefits of enjoying sustainably farmed fish. For example, despite Arcoiris de Tlalnehuayocan farm being in close proximity a major city, fewer and fewer consumers

are making the short drive to the farm. One suggestion would be to promote the restaurant as a destination restaurant as part of eco-tourism tours.

Fish farms could also engage with each other and with other stakeholders to create and maintain a sustainable business network that expands and promotes sustainable thinking and practices. For instance, in order to engage with consumers, marketers could (in the case of Arcoiris de Tlalnehuayocan and El Fuerte 1847) provide information on the nutritional value of their food and ask for feedback after consuming their products. "PezCo", for instance, could participate in fairs to inform the stakeholders about their operations or provide their consumers with marketing material to reduce the disconnection already mentioned.

Finally, as pointed out by Emery (2012), marketers must design, implement and evaluate strategies from the product design to the disposal of it. To this regard, marketers need to identify consumer's needs that can be satisfied with a more sustainable **product**. Then, it is desirable to consider the **raw materials** legislations and limitations as well as trying to lower the impact of resource **extraction** to improve resource efficiency and lower impact on supply chain, in which **people's** wellbeing must be assessed. Another important consideration must include the product's **packaging** that must be used in minimal amounts with environmentally friendly materials. The eventual **transportation** of products needs to be studied to improve energy efficiency and consider shortening the supply chain. Marketers must also test **products in use** to corroborate their safety and to acknowledge if it is environmentally friendly when they are used under normal conditions. Then, a product's **disposal** must be evaluated to determine if it is easy to reuse, recycle or dispose. Finally, the information contained in the product or claimed by the company must be assessed to determine if it is appropriate and transparent. Regarding supply chain sustainability, supply chain management objectives must shift from the narrow, short-term focus on creating more value at less cost for the business, to a broader long-term focus of creating more tangible social, economic and environmental value for all supply chain participants and their dependants at a lower overall cost to the planet's resources. In addition, sustainable procurement aims to balance the procurement needs of the organization with the broader environmental, social and economic commitments of the *Triple Bottom*

Line, avoiding negative impacts while trying to bring positive impacts throughout the supply chain.

Implications for Consumers

Consumers need to demand more sustainable products and services to ensure the whole acquisition process is fair and environmentally-friendly in order to make sustainable marketing possible. The role of a sustainable marketer is vital here to change consumer attitudes and behavior towards sustainability and adopting sustainable consumption habits and practice. Ultimately, sustainable marketing aims to change people's lifestyle, not only of those segments that will be most susceptible to change. Segmentation strategies that aim to identify sub groups of consumers based on their willingness to adopt sustainable habits is the first step in developing appropriate strategies. Each segment in turn requires a different marketing intervention according to whether segments are willing, reluctant, resistant or hostile to change.

In this manner, marketing communications need not only to persuade, but also inform and educate about sustainable consumption habits and dissuade from unsustainable practice. Thus, educating, persuading and convincing society of the need to adopt new habits such as recycling, shopping locally for food, reducing food waste, composting, reducing energy usage, etc. are sustainability challenges that can be met by using sustainable marketing techniques adapted from social marketing in collaboration with government, local authorities, NGO's and business. In consequence, the marketer has to guide the consumer through the whole purchase decision-making process to alleviate at each stage the types of perceived risk by providing the right information and support at each of the crucial times and maintaining contact with the consumer in the post-consumer period. (Bunting, 2013)

When communicating sustainable marketing, it is common to employ negative emotional features such as fear and guilt. Studies have demonstrated that people are more prone to purchase products or services when they contain information about how

the product or service impact positively or negatively to consumer's health through the quantity of pesticides or chemicals (the beneficial fatty oils fish have, for instance). It is also important to avoid the exaggeration of the environmental benefits of any product, also referred as “greenwash”. (Emery 2011).

In this regard, it is essential to explore the Mexican context in terms of communicating sustainability. It is important that each stakeholder knows its role and how he or she can contribute to a more sustainable development. Undoubtedly, marketers working in Mexico will have a hard time due to the social conditions currently being experienced. Young people are more often questioning marketing messages and they are distrustful of other media, as they perceive these to be associated with political parties, and the television duopoly. In consequence, marketers have to be extremely creative and careful to design an effective strategy. (Emery, 2011)

Implications for Policymakers

Governments as policymakers have important roles to play in ensuring that fish farms are environmentally, socially and financially sustainable and that they fulfil the mandate to alleviate poverty through the provision of sustainable sources of protein. Regulations of farm product safety, environmental regulations, financial support as well as provision of infrastructure and social safety all influence the action of companies and their consumers. These responsibilities fall on government at all levels. Hence, the government has a significant influence over a product lifecycle through legislation, regulations, incentives and voluntary agreements. Governments have to establish the right infrastructure and incentives to provide a platform for businesses to build upon. I suggest improving the allocation process of and evaluation of the incentives granted to various stakeholders to ensure financial incentives and other resources are in line with development priorities.

With respect to Arcoiris de Tlalnehuayocan, the government could contribute with a more transparent and less bureaucratic system to address the environmental

complaints that residents of Rancho Viejo have submitted. For example, regulators could involve industry, government and other stakeholders in the design of an alternative solution for the farmers if the priority is to supply Xalapa with potable water instead of legalizing the usage of Pixquiac River's water for farming purposes. Some of the alternatives mentioned by the key informant who is a legal adviser for the NGO Sendas include the potential of shifting from fish cultivation to an orchid production and promoting Rancho Viejo as a touristic site to enjoy a locally produced fresh meal and perhaps promoting the region as a distinct eco-region to be explored and preserved. In addition, the local government could improve the road that connects Xalapa with Rancho Viejo to encourage people to visit the community.

The local government component in El Fuerte 1847 could contribute with the improvements to the waste collection system in order to encourage businesses and people to recycle. A Collaboration of state and federal levels of government could consider subsidizing a portion of electricity bills for medium-size fish companies. Although El Fuerte 1847 can still afford the elevated price of electricity, subsidizing a portion of that cost could help the farm to invest in other areas they have planned, such as the social venue and bungalows.

In the case of PezCo, since the government gave financial resources to the farm it has developed as expected. This farm appears to be the most well balanced of the three cases studied in terms of the sustainability pillars. However, I noticed a disconnection of the farm with its direct consumers (restaurants) with the farm itself. Because most of the farm's consumers are restaurants with scant knowledge of the context/situation of the farm. Findings imply that the fact the government invested in the farm resulted in an increase of production and the possibility of reaching a broader market.

I would suggest the three levels of government not only employ sustainability concepts in theory contained in reports and regulations, but also in tangible projects and overall to their own procurement policies. Further research about sustainability specifically applied to aquaculture farms is needed in a Mexican context. In addition, more studies are needed regarding sustainable marketing in Mexico and about

sustainability's perceptions as well as sustainable consumer's profiles and it is undoubtedly needed to increase the knowledge of the sustainability concept and values. The effort can be made by the three levels of government, universities, NGO's and businesses to inform, educate and influence people to adopt sustainability not exclusively in their purchase habits but also in their lifestyle.

Finally, despite the increasing implementation of the sustainability concept and habits to different levels of society and industries, for instance the Law of Sustainability in Aquaculture, it is necessary that the three agents of change in regards to aquaculture articulate coordinated efforts to reach a long-term change that starts from the product design, packaging, supply chain, legislation, regulations, incentives, knowledge of the industry, natural resources, and so on to ultimately having a more sustainable community.

Research Limitation and Future Research

The sample is limited in size and to Mexico. So future research should look at other contexts and other types of aquaculture farms. Research was primarily qualitative in nature. While this provides rich insights, more quantitative studies could look at the representativeness of these findings. In addition, given the low level of understanding of sustainability among stakeholders found in this research, future research should examine this construct more deeply to fully understand how sustainability could be better integrated into the aquaculture supply chain.

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Appendix A.

Interview Guide for Company's Owner

My intention is to conduct semi-structured interviews, allowing the conversation to determine the nature and content of the questions to be asked. However, as a general guide, interviews will probably address some or all of the following areas of enquiry:

- What is your name?
- How long have you been working for this company?
- How do you describe the operation of this company?
- How many workers do you employ?
- What is your principal market?
- How do you describe the marketing mix of this company?
- What are the major problems your company/sector face?
- What would you propose to improve the sector?
- Have you heard about sustainability? How could you define it?
- Would you say that your company employ sustainable practices?
- Have you heard about sustainable marketing? If so, how do you describe it?
- How do you foresee the development of your company?
- What problems do you foresee for your company and the sector?
- Does this company have any identified issues regarding the workers/environment/resources?
- How do you plan to address these issues?

Interview Guide for Company's workers.

My intention is to conduct semi-structured interviews, allowing the conversation to determine the nature and content of the questions to be asked. However, as a general guide, interviews will probably address some or all of the following areas of enquiry:

- What is your name?
- What is your position in the company you work for?
- How long have you worked there?
- How could you describe your experience working there?
- How do you understand the operation of the company you work in?
- Have you heard about sustainability? If so, how do you describe it?
- Have you heard about sustainable marketing? If so, how do you describe it?
- Do you think the company you work in employs sustainable practices?
- What company's/sector's problems could you mention?
- Have you had any problem with the manager/owner/person in charge of the company you work in?
- What issues could you mention regarding the company/sector?
- How do you think these issues could be solved?
- What is the principal company's products consumer?
- What is the principal company's supplier?
- What do you know about socioeconomic and environmental vulnerabilities?
- What are your principal concerns?
- How do you describe the environment surrounding the company you work in?
- Do you belong to any community group?

Interview Guide for Company's Neighbours

My intention is to conduct semi-structured interviews, allowing the conversation to determine the nature and content of the questions to be asked. However, as a general guide, interviews will probably address some or all of the following areas of enquiry:

- What is your name?
- How long have you lived in your current address?
- Was the fish farm established when you started to live in your current address?
- Do you know what the company's activities are? If so, describe them.
- Do you know who the company's owner is?
- Do you know who the company's consumers are?
- Do you consume the company's products? If so, how is your opinion of them?
- What is your opinion on the company?
- Have you ever had any issue with the company? If so, describe it.
- What do you know about the fish-farming sector?
- Have you heard about sustainability? If so, how could you describe it?
- Do you think the company employs sustainable practices?
- What are your principal concerns?
- What do you know about socioeconomic and environmental vulnerabilities?
- How do you describe the environment surrounding your home?
- Do you belong to any community group?
- Have you ever worked for the company? If so, how was your experience?

Interview Guide for Company's Suppliers

My intention is to conduct semi-structured interviews, allowing the conversation to determine the nature and content of the questions to be asked. However, as a general guide, interviews will probably address some or all of the following areas of enquiry:

- What is your name?
- What is your position?
- What is your company's name?
- How long have you been doing business with the fish farm?
- How do you describe your buyer?
- What kind of products do you sell to the fish farm?
- How do you describe your relationship with your buyer?
- Have you heard about sustainability? If so, how do you describe it?
- Have you heard about sustainable marketing? If so, how do you describe it?
- Do you think your buyer employs sustainable practices?
- What do you know of socioeconomic and environmental vulnerabilities?
- How do you describe the environment surrounding the fish farm?
- Have you heard about any problem surrounding the fish farm operation?
- What do you about the fish-farming sector?

Interview Guide for Company's Consumers

My intention is to conduct semi-structured interviews, allowing the conversation to determine the nature and content of the questions to be asked. However, as a general guide, interviews will probably address some or all of the following areas of enquiry:

- What is your name?
- What is your occupation?
- How long have you consumed the company's products?
- Where do you go to buy the products?
- What is your opinion about the products?
- Do you think the products' price- quality/taste relation is good?
- What would you improve in the products?
- How and why did you decide to buy the company's products the first time?
- Have you heard about another brand/fish farm?
- Have you tried another brand's/fish farm's products?
- Have you heard about sustainability? If so, how do you describe it?
- Have you heard about sustainable marketing? If so, how do you describe it?
- Have you heard about socioeconomic and environmental vulnerabilities? If so, how do you describe them?
- Do you think the fish farm employs sustainable practices?
- What do you know about fish-farming in general?
- Do you know any problem that the fish-farming sector has right now?
- What are your concerns as a fish farm's product's consumer?