PUBLICACIONES FUNDACIÓN TERRAM

APP Nº 36: THE ETHICS OF WORLD FOOD PRODUCTION: THE CASE OF SALMON-FARMING IN CHILE[1]

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1 Introduction

In his recent book, Duncan Foley refers to Adam Smith's fallacy as the idea that it is possible to separate an economic sphere of life, in which the pursuit of self-interest is guided by objective laws, from moral questions. In fact he argues 'the moral fallacy of Smith's position is that it urges us to accept direct and concrete evil in order that indirect and abstract good may come of it. The logical fallacy is that neither Smith nor any of his successors has been able to demonstrate rigorously and robustly how private selfishness turns into public altruism'[3].

The truth is that economics, or the production of goods and services, is full of morally questionable issues, from climate change to the trade of endangered species. Some of these have been explained with economic reasoning, typically using the theory of market or government failures. But ultimately the essentially reasoning of Adam Smith's invisible hand remains: the pursuit of self-interest is socially beneficial and morally acceptable.

This paper presents the case of salmon-farming in Chile, which in the view of the author is a case where many of the emergent ethical questions in relation to the globalization process are present. There are no answers, just questions. The basic idea is whether we can continue with a globalization process without at least some ethical considerations, or must we continue to be trapped in Adam's Smith fallacy.

2 The essence of the production of Salmon

When one speaks of salmon, immediately an image of a bucolic river in the middle of the mountains with bears lounging about fishing as salmon swim upstream comes up. However today salmon is a modern, globalized industry in which most salmon is reared in net-pens.

In 1981 world salmon production was approximately 600 thousand tons a year, half of which was coming out of Alaska, and no more than 3% of salmon was cultivated in fish farms. Today, world production is over 2.4 million tons, of which close to 70% is farm cultivated.[4]

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3 Foley, 2006, p3
4 SalmonChile (2005)

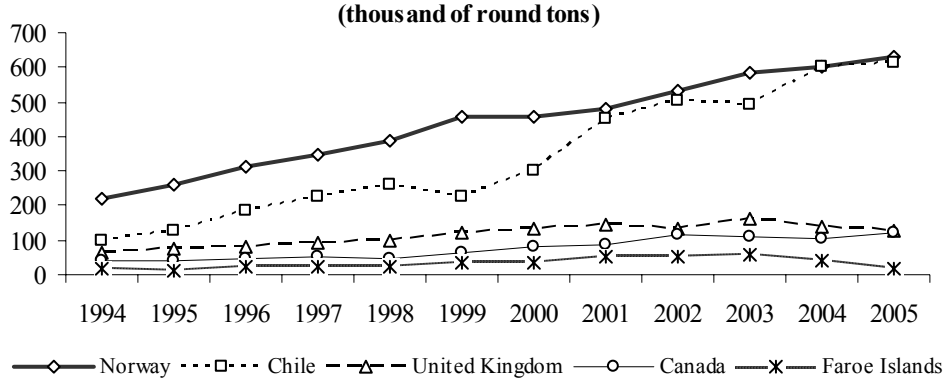
Salmon-farming has become a major transnational food industry, serving the world market efficiently, through a production and distribution system that can have a salmon served on the plates of the restaurants of a major city in just days after its harvest thousand of miles away.

3 World Production of Farmed Salmon

Pushed by net-pen production and the increasing production from Chile, salmon production has experienced a spectacular growth in the last ten years. Whereas world production of cultivated salmon in 1994 was around 500 thousand round tons, in 2005 it stands at 1.6 million. That is, in ten years, production has tripled.[5]

Moreover the producers have changed significantly, whereas Chile in 1990 was practically not producing salmon, in 1994 it produced 20% of farmed world production and nearly 40% in 2005.

Diagram 1. Principal producers cultivated salmon 1994-2005 (thousand of round tons)



Source: SalmonChile

By 2006 Chile is expected to overtake Norway and become the first world producer. Moreover, according to industry estimates Chile, which has no major restrictions to continued production, is expected to double production in the next 6 years, producing over 1.2 million tons a year.[6] This is an amazing figure considering salmon is not an indigenous species to Chile, or to the whole southern hemisphere for that matter, and that Chile is very far away from its principal markets.

4 The effects of globalization

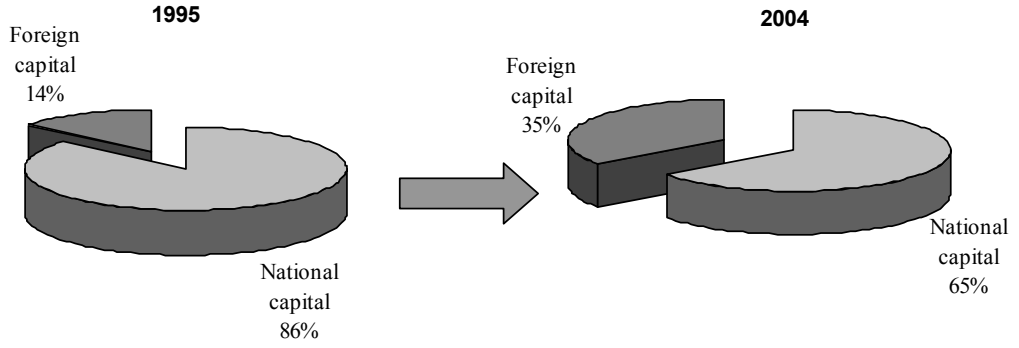
So why has Chile became such a major salmon producer? The reason is at the heart of the current economic model and the capacity Chile has had to take advantage of the globalization process.

In the eighties Fundación Chile, a government autonomous technological institute, begun experimenting with salmon-farming in the south of Chile. The ideal environmental conditions of the Chilean coastal line, the possibility of using fresh water lakes for the early stages of the growths of salmon and the availability of feed

5 Ibid
6 SalmonChile (2005)

(Chile is world producer of quality fishmeal) suggested that conditions were adequate for the introduction of salmon-farming.

Diagram 2. Salmon-Farming ownership (1995-2005)



Source: SalmonChile

Table 1. Ranking of principle Salmon Farming Companies 2005

Ranking	Companies	MUS$	% Participation	Capital Composition Patrimonial Origins
1	AquaChile	189.6	13.2	Chilean. Vertical integration with Pacífico Sur and Aquagen. Families Puchi and Fishe
2	Marine Harvest	160.5	11.2	Dutch Nutreco holding also megres with Mares Australes.
3	Cía. Pesquera Camanchaca	99.6	6.9	Chilean. Families Cifuentes and Fernandez
4	Salmones Multiexport	95.1	6.6	Chilean, belonging to holding Multiexport S.A
5	Salmones Mainstream	88.5	6.2	Norway Statkorn. Group EWOS.
6	Fjord Seafood Chile	75.3	5.2	Integrated for Cermaq Norwegian ASA. Bought Salmones Linao Ltda. and Salmones Tecmar Ltda.
7	Cultivos Marinos Chiloé	74.5	5.2	Chilean, property José López
8	Pesquera Los Fiordos	65.9	4.6	Chilean, Holding Agrosuper property of Gonzalo Vial.
9	Salmones Antártica	64.2	4.5	Japanese company Nippon Suisan Kaisha. Initially he was filial of Chile Foundation.
10	Pesquera Eicosal	54.9	3.8	Dutch Nutreco holding
	Otros	**471**	**32.7**	
	Total	**1,439**		

After a slow start in the late eighties, with the return of democracy and an even further opening of the economy, the salmon-farming industry flourished. Growth was steady during the nineties, but really took off after the Asian crisis in 2000. One of the reasons for this second take off stage was a process of consolidation and transnationalization of the industry.

The need to strengthen and improve distribution chains forced companies to merge, significantly increasing the concentration of property and incorporating transnational capital. By 2004 foreign capital and the direct foreign management of companies was well in place. Everything indicates that the process of concentration

and transnationalization will continue. In 2004 the ten biggest companies produced nearly 70% of total production, of which 5 were foreign owned.

5 What are the issues

5.1 Food Security

There is a perverse logic to the production of salmon in fish farms. Salmon is a carnivorous fish and therefore requires other fish for food. This is a remarkable fact and is at the heart of questions currently raised concerning the sustainability of the industry. To produce a food source which is at the top of the food chain is clearly inefficient and even morally questionable, yet we don't have that image of salmon. But since salmon-farming does not seem shocking, consider the following image.

Imagine the European and American consumers have acquired a taste for lion steak. Imagine also that African entrepreneurs, seeing a business opportunity start to produce lions on a mass scale, in lion-farms. Imagine also that they feed them with wild cattle. Would that image be shocking? The truth is that there is no substantial difference between salmon production and lion production. The production of both reduces the amount of food available to the world. But would lion-food be something ethically acceptable?

This brings us to the first issue in relation to salmon production: food security. Salmon is a carnivorous fish, and as such requires to be fed with other fish. The process is actually a bit more sophisticated. Salmon are fed with industrially produced feed pellets, these are produced with a combination of fish-meal, fish-oil and grains. The exact combination is difficult to determine, since, unsurprisingly, industry keeps the exact figures reserved, and also because different geographically located industries have different degrees of availability of inputs, regulations and costs, as well as producing for customers with different tastes.

The world average figures places the food conversion efficiency (FCE) the amount of kilos of fish required to produce one kilo of salmon between 2 to 4 kilos.[7] However, in the case of Chile, due to the availability of cheap fish meal and fish oil, that figure is much higher.

In a report commissioned by the World Wildlife Fund, Albert Tacon places the FCE for Chile at between 2.9 and 4.2[8] However, Tacon does not consider fish-oil in his FCE calculations. In the case of Chile this is very relevant, since the use of fishmeal in feed has fallen significantly, suggesting an improvement in FCE, but parallelly fish oil use has increased.

The industry has argued the FCE has improved, and in effect it has, if one calculates only on the basis of fishmeal use. But incorporating fish-oil, the figures change dramatically, namely because more fish are required to produce fish oil than fishmeal.

According to a recent study by Fundación Terram, introducing fish-oil into the equation implies a feed conversion efficiency rate of nine[9]. That is, in the case of Chile, it takes 9 kilos of wild pelagic fish to produce one kilo of salmon.

7 Naylor, et al, oct, 2003
8 Tacon, 2005
9 Pinto, et al 2006

If these estimates are correct the potential impact on wild fisheries is immense. Moreover, it must be noted, that unlike wild pelagic fisheries, Southern Pacific fisheries are based on Jack Mackerel, a big edible fish, with the same nutrient and health value as a salmon. In effect then salmon production reduces the amount of global food by up to 8 times.

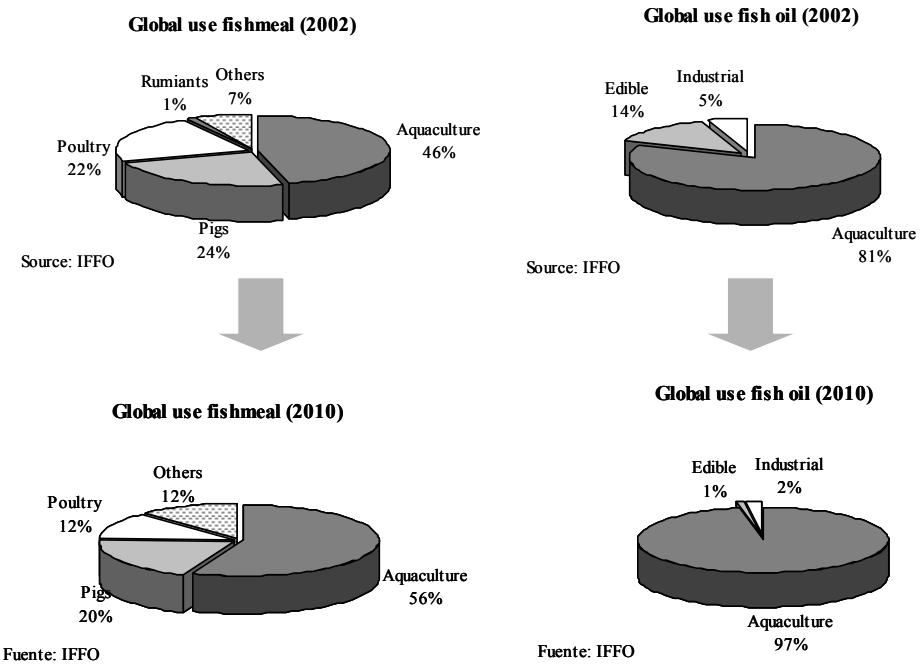
Currently Chile is consuming around a third of its fishmeal production, and all of its fish-oil production[10]. Therefore the restriction to continued salmon-production is not the availability of fishmeal, but fish-oil. We would expect then an increase in the prices of fish-oil. The average annual increase in real fish oil prices, in the last ten yeas, is approximately 18%, whereas fishmeal is only 2%[11], thus showing that increasingly fish-oil is the limiting factor in feed production today, not fishmeal.

Moreover, if current production trends continue, salmon production will be consuming the fish-oil of the all the southern-pacific pelagic fisheries (Chile and Peru) generating a pressure on wild fish stocks which, without adequate regulation, may not be sustainable.

The irony of course is that aquaculture was pitched as the solution to the unsustainable pressure on world fisheries. It was argued that humans were moving from hunters of the sea to cultivators of the sea. This trend would generate a new significant food resource and diminish the pressure on overfished wild stocks. However, with the onset of salmon farming, and in general carnivorous aquaculture, quite the opposite has occurred, that is, aquaculture has become the major pressure on wild fish stocks.

10 ibid
11 ibid

Diagram 3. Global use and projections of fish oil and fishmeal



According to the International Fishmeal and Fishoil Organization (IFFO) (see diagram), whereas in 2002, the aquaculture industry consumed about 46% and 81% of fishmeal and fishoil respectively, the projection for 2010, is for those figures to increase by 56% and 97% respectively[12]. Is this sustainable? We will have to wait and see, but the point is worth making that most fish stocks are currently overfished and at risk.

12 IFFO, 2001

5.2 Environmental Issues

There are three significant environmental issues related to salmon-farming in Chile.

Salmon Escapes

The first is salmon escapes. There are no official statistics on this matter and no systematic evaluation. But there are occasional studies, these have determined that salmon do escape and that they live long enough to feed off local fauna[13].

How many fish actually escape and how long they live in the wild or whether they are able to reproduce is hotly debated. According to multiple sources, figures could be between 2.7 to 5.6 million fish a year[14]. The large difference is due to the fact that industry estimates are in tons lost, not individuals, so depending on the size (or weight) assumed for each individual will depend on the actual numbers.

But whatever the actual numbers, even the most conservative estimates are large. The reason for this is that when escapes occur they are in thousands. In a recent single event as much as 130 thousand fish were estimated to have escaped.[15]

There are two reasons why escapes are problematic, the first is the economic loss, both to salmon producers and to artisanal fisherman. Salmon is a voracious fish, which will feed off other fish, many of which are the basis of the artisanal economy. Again, estimates of the impact to local fisherman are difficult to determine, but fisherman constantly report a significant reduction in their catches and at least they see a direct relation with the growing salmon industry.

According to German Pequeño, salmon escapes consume between 1.4 to 1.8 thousand tons of fishing resources, implying an economic impact to the artisanal economy of around US$2.4 million a year.[16] Though these figures are relatively small compared to the income generated by the salmon industry, the impact on the livelihood and culture of local fisherman and especially Indian communities is significant and also breeding ground for conflict.

Moreover, in current Chilean legislation, salmon are considered ‘escaped’ and not ‘free’. Therefore local fisherman cannot fish them because they still belong to the farm from where they presumably escaped. Fishermen selling salmon are prosecuted, this also generates significant resentment.

However the main problem with salmon escapes is not economic but biological. The impact of millions of voracious salmon feeding in an ecosystem which is not accustomed to the predatory nature of salmon nor the sheer scale of its introduction may be immense.

The invasion (deliberately introduced or not) of exotic species at a massive scale into ecosystems unprepared for them, is one of the largest environmental concerns to date[17]. What will be the effect in Chilean ecosystem is difficult to determine, but clearly it is not neutral and will generate a significant change in biodiversity.

Use of antibiotics

13 Soto, et al
14 Pizarro, 2003
15 ibid
16 Pequeño, 2004
17 Lodge 1993, Vitousek, 1994

Another feature of Chilean salmon production, a consequence both of the exotic nature of the fish, and the scale of production is the appearance of diseases. The marvels of modern veterinary science deal with this diseases by treating the fish profusely with antibiotics and chemicals.

The antibiotics are similar to those with which humans are treated. Though there is evidence that the fish excrete the antibiotic, before being harvested, the antibiotic residues remain in the water. Not only does antibiotic residue have a significant impact on biodiversity, but generates strands of bacteria resistant to them, many of which are braodly applied to humans[18].

Without more information it seems an absurd risk to human health to introduce massive amounts of antibiotics into coastal water systems.

Nutrients

The characteristic environmental impact of salmon-farming is the nutrients it adds to the water system generating eutrophication, that is reducing the amount of oxygen. Nutrients are essentially the uneaten feed and the organic waste of the fish. This produces nitrogen and phosphorous, which generates the problem.

The nutrient impact is significant, basically killing the seabed underneath the net-pens, and attracting algae blooms, which in turn generates a change in the biodiversity of the ecosystem. However the main problem is not around the net-pens, since if the impact was exclusively there, the environmental impact would be spatially constrained. Rather the problem is to what extent the nutrients, particularly nitrogen disperse, generating an environmental impact in a much wider area.

The overall impact will depend on the resilience of the ecosystem, or its carrying capacity. If the carrying capacity is surpassed the ecosystem will collapse. Curently there is no information in relation to the carrying capacity of Chilean coastal ecosystems.

5.3 Labor Conditions

Salmon-Farming presents two different types of labor models –and therefore problems- one is the fish-farm. These are located in isolated and remote places, in adverse climatic conditions, precarious infrastructure and difficult working conditions for women. The other is the processing plants. These are assembly line type production, of the ‘fordist’ type, where there is repetitive work and low temperatures.

In the first case, workers are few, with an increasing use of capital equipment, for instance, in many farms labor is now replaced by machines that feed the fish. In the second case, labor is extensive, and most of the approximately 50.000 workers are in the processing plants.

These two types of work naturally raise different types of issues. Common to both though is low wages. According to different studies average wages are around C$200 thousand a month, approximately, US$400.

18 Cabello, 2003

This wage is insufficient for a single family earner of a family of four to raise his family out of poverty. That is the per capita income generated by that wage is around the national poverty line.

Table 2. Income distribution in the tenth region.

Decil	Nº homes by decil	People by homes by decil	Autonomo income by homes	Income per capital by homes
I	43,736	4.31	62,767	14,563
II	37,772	4.42	135,893	30,745
III	**34,002**	**4.20**	**184,986**	**44,044**
IV	27,288	4.18	243,231	58,189
V	29,026	3.85	272,304	70,728
VI	24,974	3,66	338,589	92,511
VII	21,619	3.57	446,834	125,164
VIII	24,194	3.43	576,885	168,188
IX	22,903	3.19	786,158	246,445
X	17,709	2.83	1,967,081	695,082
Total X Region	**283,223**	**3.76**	**401,178**	**106,696**
Total Chile			**528,507**	**140,560**

Source: Elaborated by Terram Foundation based on Casen 2003

The table shows the distribution of income for the tenth region. People are ordered according to income from less to more, the lowestincome being in the first tenth and the highest income in the last tenth. The average wage of salmon worker places him, in a family per capita income, below the third tenth of the population of the region.

The reason that salaries are so low is due to the practice of subcontracting and outsourcing, another characteristic of the current globalization process. Around 60% of the labor force of the industry is subcontracted.[19]

Some salmon farming companies have up to 40 service company contracts. Sub-contracting produces different problems such as enforcement difficulties, lower wages and the proliferation of temporary jobs. It is clearly a way firms have to keep wages down.

Salmon farming is a high risk activity, many on-the-job accidents are reported as well as job related illnesses. It is the industry with the highest accident rate in Chile: farms around 11.2% and processing plants 13.9%[20]. According to a survey 30% of the workers suffered an accident or work related illness during the 2004.[21]

The companies conduct does not help to improve the safety and security of workers. Lack of adequate workers' protection was the primary issue sanctioned by the authorities in the industry in 2005 (34%)[22].

In 2006, 18 workers died during operations, especially divers[23]. There are no contingency plans or infrastructure for adequate medical attention. In Chiloé – where over half the production is carried out- there are 2 hyperbaric chambers, neither of which is in adequate working condition.

19 Víctor Inostroza, Inspector del Trabajo de Castro (Ecoceanos News, October 2004)
20 Instituto de Seguridad del Trabajo (IST), 2003
21 Pinto & Kremerman, 2004
22 Ibid
23 Ecoceanos, 2005

The female participation in the salmon farming work force is estimated to be between 30% and 70%. The differences are related to the definition of industry workers, whether subcontractors are included or not.

Among the issues raised by an increasing female workforce are: deficient protection to maternity and a growing number of judicial conflicts due to this. According to the ex director of Sernam (Women's Ministry), Karen Muller, many women who make use of their maternal rights are later fired. And rather than an issue of women's specific skills in filleting, as has been argued, the reason for such a high participation of a female labor force is the possibility of paying lower salaries.[24]

Complaints of sexual harassment are constant. According to a survey, 30% of union leaders believe that abuse is frequent and 30% occasional[25]. In isolated farms harassment is more frequent. Though not well documented anti-union practices are common. In only a few companies the unions have the proper recognition from the management.

6 Social impacts

Social impacts are even more difficult to document. There are, as yet, no studies on the social or cultural impact of the accelerated growth of this industry. However it is evident that an industry of the size and relevance is generating a significant change in the livelihoods of the people of the South of Chile.

There are some telling signs of social changes. One interesting sign, yet to be studied fully, is that according to official statistics, alcohol abuse in women in the tenth region, where the industry is located, is double than any other region in Chile.[26]

Naturally it is not been argued that the industry drives you to drink, rather that the change from a bucolic agrarian and fishing region, to a region producing a global product on the basis of a fordist production system, with an increased participation of women in the labor force, is bound to generate social stress. One indicator is the increased use of alcohol in women, surprisingly not in men which maintain the same average as other regions. Other interesting indicators are the increased drug use, a 28% increase in the period 2002 to 2004, the fourth largest growth in the country, as is crime, which is also on the rise.[27]

Are these indicators the expression of a change in traditional families?. Did the introduction of global industry change values, traditional ties and cultural outlook? In itself this may not be surprising, all processes of modernization generate significant social change. But the issue with this industry and the accelerated pace of globalization is the speed. Surely the speed and scale of change is a factor of undue stress on the social fabric of a traditional community.

7 Food for thought

24 Díaz, 2002
25 Pinto & Kremerman, 2005
26 Conace, 2004
27 Conace, 2004, Ministerio del Interior 2004

The conference calls to look at the ethical issues of globalization. Salmon-Farming is undoubtedly an iconic product of globalization. Who could have imagined that Chile would be mass producing an exotic fish, tapping into the potential benefits of globalization. Without a doubt salmon-farming has increased income and made fortunes. More than 50 thousand jobs have been created, and now salmon is the second export product of Chile after copper, generating returns of US$2 billion in exports a year, an amazing result for an industry not much older than a decade.

And yet the questions remain. A middle income country is producing food sold to high income countries by reducing the amount of food available in the world. Does it make sense to produce food, for countries that are already overfed, which directly reduces the amount of food available in the world, when there still exists hunger in the world? Surely there is something illogical, even irrational in that process.

Moreover, a production process that generates enormous environmental impacts and serious concerns in relation to labor practices; as well as significant changes in local communities' social structure.

None of this is really new, the world has experienced rapid economic change and environmental degradation. But there are few experiences of all factors combined: food security, environmental degradation, labor concerns and social stress, in the context of accelerated transnationalization.

Globalization is an ambiguous concept and means different things to different people. From the economic perspective, clearly the centre is financial capital and globalization of markets. Globalization then means the intention of universalizing market criteria and deregulating economic, political and legal relations. Growth is portrayed as the ideal, and the solution to all concerns.

But another component of globalization is information and communication. A world that becomes closer and more interconnected. Can workers in the south of Chile accept their wage rate when they know, that it is 9 times lower than their Norwegian counterparts, doing the same work and working for the same company?

One of the arguments against the concerns expressed on food security, has been of local versus global issues. That is, Chile doesn't have a problem with hunger or malnutrition, this occurs far away. So what does it matter to produce salmon in this way. But surely, the possibility of producing salmon is related to the process of globalization, which is one of global 'opportunities', but also global 'responsibilities'. And the local differences are blurred when we all become global citizens.

The industry argues that prices regulate input use and ensure that there will be no overexploitation of resources. The argument goes that as fish biomass becomes scarce, prices will signal that relative scarcity and the industry will move to alternative inputs, such as vegetable oils, therefore ensuring the conservation of capture fisheries. They also argue, that wages are regulated in the market, if workers are discontent, nobody is forcing them to work in the industry. Finally they argue that public resources, such as the use of the coast and lakes, are regulated by the State, they just comply with regulations.

These arguments are powerful and are concrete examples of the powerful insight of Adam Smith's invisible hand. But they do not recognize the problem of scale, the asymmetries of information, the carrying capacity of ecosystems or the threshold of biological populations, nor the capacity of States, especially in developing countries, to regulate rapidly growing industries. In effect these arguments see the

world as a frictionless, spaceless environment, with perfect information, that is the ideal neo-classical world.

More to the point these argument have no ethical content. Yet again we are faced with the fallacy. Can we really separate market solutions from ethical concerns, I think not.

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Conoce www.conace.cl, drug and alcohol statitics

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