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Thinking Globally, Acting Locally: Cleaning up Global Aquaculture through Eco-Labeling in the United States

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I. INTRODUCTION

Aquaculture is the practice of farming aquatic organisms in a controlled environment and encompasses the production of fish, mollusks, crustaceans, or aquatic plants.[1] This definition implies that some form of intervention has taken place in the rearing process in order to enhance production, which includes regular stocking, feeding and protection from predation.[2] As wild fish stocks rapidly diminish, increased consumer demand for fish and other marine products has led to a global expansion in aquaculture.[3] The Food and Agriculture Organization of the United Nations ("FAO") reports that global aquaculture produced 41.9 million metric tons of seafood products, representing 31.5 percent of total fishery production in 2002.[4] In 2002, the production of fish, mollusks, and crustaceans increased in total volume by 5.3 percent over the previous year and was valued at $53.8 billion, representing a 5.7 percent growth over 2001.[5] One estimate projects that aquaculture will increase from 31 percent of current global fish production to 41 percent by 2020.[6] Unfortunately, aquaculture's expansion has been marked by the industrialization of more traditional practices, leading to significant environmental degradation and social conflicts.[7] Without some form of environmental regulation or market-based controls, the negative externalities of industrial aquaculture will only worsen as global demand increases.

During aquaculture's recent and unprecedented global expansion, there has also been a marked increase in the United States ("US") of "green consumerism"-- when consumers base purchasing decisions on the environ-

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1. Kathryn White, Brendan O'Neill & Zdravka Tazankova, *At a Crossroads: Will Aquaculture Fulfill the Promise of the Blue Revolution?*, SeaWeb Aquaculture Clearinghouse 5 (2004), http://www.seaweb.org/resources/sac/pdf/At_Crossroads.pdf (accessed Mar. 18, 2005).

2. *Id.*

3. *Id.* at 4.

4. Stefania Vannuccini, *Overview of Fish Production, Utilization, Consumption and Trade* 2 FAO, Fishery Information and Statistics Unit (November 2004), ftp://ftp.fao.org/FI/STAT/overview/overview.pdf (accessed Mar. 26, 2005). Aquatic plant production through aquaculture, not included in these figures, was 11.6 million metric tons valued at $6.2 billion in 2002. *Id.*

5. *Id.*

6. *Developing Countries to Dominate Fish Consumption, Production* (Oct. 6, 2003), http://www.eenews.net/Greenwire/searcharchive/test_searchdisplay.cgi?q=developing+countries+to+dominate+fish+consumption&file=%2Fgreenwire%2Fsearcharchive%2Fnewsline%2F2003%2Foct6%2F10060319.htm (accessed Apr. 1, 2005).

7. White, O'Neill, & Tzankova, *supra* n. 1, at 4.

mental ethics of producers.[8] Tapping into this "green consumerism" is one way to influence the environmental practices of the aquaculture industry. While the US exports a relatively small amount of products produced through aquaculture,[9] it is the world's second largest importer, accounting for 16 percent of all imports.[10] Already, there is evidence of consumer demand for fish caught or raised in a manner that minimizes environmental impact. A "sustainable seafood" movement has taken hold with a small but growing number of consumers, focusing on the need to preserve wild stocks and to practice sustainable aquaculture.[11] For example, there is a small but growing market for organically raised salmon.[12] A plan that matches the spirit of "green consumerism" with the demand for aquaculture's products could alter the environmental practices of the aquaculture industry, ultimately leading to a form of self-regulation.

This paper proposes a method to gain industry cooperation and compliance through the process of eco-labeling (also known as environmental labeling).[13] This involves a voluntary, federally coordinated plan that informs consumers whether a particular product has met a minimum set of environmental production standards. In this way, consumers can make informed choices, and reward producers practicing sustainable and less environmentally harmful methods of aquaculture. First, the paper gives the reader a background in aquaculture. Next, it defines the problem by analyzing the environmental harm caused by the aquaculture industry. Finally, it discusses how the US plan would work to effectively mitigate this harm.

II. AQUACULTURE BACKGROUND

A. *Aquaculture Generally*

Aquaculture is legally defined as "the propagation and rearing of aquatic species in controlled or selected environments."[14] It generally consists of

8. Roger D. Wynne, *Defining "Green": Toward Regulation of Environmental Marketing Claims*, 24 U. Mich. J.L. Reform 785, 785-86 (1991).

9. Vannuccinni, *supra* n. 4, at 2.

10. *Id.* at 3.

11. *See* Monterey Bay Aquarium, http://www.mbayaq.org/cr/cr_seafoodwatch/sfw_aboutsfw.asp (accessed Feb. 21, 2005).

12. *See, e.g.* Renee Schettler, *Organic Salmon? Says Who?* Washington Post F01 (April 7, 2004) http://www.washingtonpost.com/ac2/wp-dyn?pagename=article&contentId=A54377-2004Apr6&notFound=true (accessed Apr. 8, 2005).

13. Some commentators make a distinction between the terms "eco-labeling" and "environmental labeling," specifically that eco-labeling is a type of environmental labeling. However, the trend is such that both terms have become blanket statements for all types of environmental labeling. *See* Elliot B. Staffin, *Trade Barrier or Trade Boon: A Critical Evaluation of Environmental Labeling and Its Role in the "Greening" of World Trade*, 21 Colum. J. Envtl. L. 205, n. 13 (1996). Note: there are alternate spellings of the term "eco-labeling," including: "ecolabeling," "eco-labelling," and "ecolabelling." The term used in most U.S. sources is "eco-labeling." For this reason, and the for the sake of consistency, this paper will use that spelling. However, the alternate spellings will appear in direct quotations from other sources.

14. 16 U.S.C. § 2802 (2000).

placing fish in a controlled environment conducive to survival and growth.[15] Raising of fish and shellfish, aquatic plants such as seaweed, and amphibians and reptiles, is considered aquaculture.[16] Aquaculture products are used for food, stocking wild populations, ornamentals (for aquariums), and bait.[17] Aquaculture is practiced in coastal areas, mangroves, wetlands, natural and artificial ponds, and in artificial structures that re-circulate water. Historically, most aquaculture was practiced via small-scale traditional methods.[18] Such methods generally had (and have) minimal environmental impact.[19] However, the rising global trend is industrialization of aquaculture, where high-value species such as salmon and shrimp are farmed on a large scale. Unlike traditional methods, industrialization often leads to harmful environmental externalities.[20]

B. *Promise and Problems*

1. *The Promise*

The world faces an epidemic in overexploited wild fisheries.[21] Aquaculture is a way of meeting the global demand for fish while avoiding the large-scale depletion of wild fish stocks. Nonetheless, wild fisheries still suffer from the "tragedy of the commons."[22] Fishermen have an incentive to take as many fish as they can, leading to resource depletion.[23] Aquaculture is a potential means to avoid the "tragedy of the commons."[24] In the case of a fish farm, the fish are already owned, and the owner has the motivation to sustain the supply.[25] In theory, only the law of supply and demand limits aquaculture production. Production could increase until supply meets demand, a condition that is a practical impossibility for wild fisheries.

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15. Rosamond L. Naylor et al., *Effect of Aquaculture on World Fish Supplies*, 405 Nature 1017 (Nature Publishing Group, London 2000).

16. Rebecca Goldburg & Tracy Triplett, *Murky Waters: Environmental Effects of Aquaculture in the United States* 19 (Envtl. Def. Fund 1997), http://www.environmentaldefense.org/documents/490_AQUA.PDF (accessed Apr. 1, 2005).

17. *Id.*

18. White, O'Neill & Tazankova, *supra* n. 1, at 3.

19. *See* Barry A. Costa Pierce, *Farming Systems Research and Extension Methods for the Development of Sustainable Aquaculture Ecosystems*, in *Ecological Aquaculture* 103, 103-05 (Barry A. Costa Pierce ed., Blackwell Publishers 2003).

20. *See id.*

21. Around 47 percent of the major marine fish stocks are "fully exploited," meaning that their maximum sustainable limit has been or is very close to being met. Stated another way, these stocks have no realistic prospect of expansion. 18 percent of stocks are "overexploited" and 10 percent are "significantly depleted," leaving only 25% of stocks classified as "under-exploited" or "moderately exploited." Food and Agric. Org. of the U.N., *The State of World Fisheries and Aquaculture 2002*, Part I, *World Review of Fisheries and Aquaculture* 23, http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/005/y7300e/y7300e00.htm (accessed Apr. 5, 2005).

22. Ronald J. Rychlak, *Ocean Aquaculture*, 8 Fordham Envtl. L.J. 497, 501 (1997).

23. *Id.* at 500-01

24. *Id.* at 501.

25. *Id.* at 501-02.

Population growth in developing nations is occurring nearly six times faster than in the developed world, with the poorest subset of nations experiencing the highest rate of all.[26] The population of less developed nations is expected to increase from 4.9 billion currently to 7.7 billion by 2050.[27] As discussed above, global demand for fish has grown and supply has fallen. This has raised the price of wild fish and changed how fish are consumed.[28] Fish was the "poor man's protein" because of its affordability and accessibility in developing nations.[29] The "Blue Revolution" (as aquaculture's dramatic expansion has been dubbed)[30] has the potential to mitigate this condition by providing cheaper and more abundant supplies of fish. Just as the "Green Revolution" in terrestrial agriculture helped developing nations by dramatically increasing productivity through the use of pesticides and technologically enhanced seeds, this "Blue Revolution" can also bring relief to populations at risk of food shortages. In fact, aquaculture's expansion has already led organizations such as the FAO to recognize its importance in meeting the needs of the expanding world population.[31]

Aquaculture could be a boon to developing nations both in terms of food security and attracting foreign capital. Small-scale, pond aquaculture is a possible solution to problems of food shortages because it does not require access to large amounts of capital or technical expertise[32] and is a highly efficient way to produce food on a small-scale. Aquaculture could also benefit those not directly involved by providing affordable food to local communities.[33] Similar subsistence methods could be practiced in much of the developing world, enhancing food security for rapidly growing populations. Furthermore, the environmental impact of this type of subsistence aquaculture is minimal.[34]

Large-scale marine aquaculture could also benefit developing nations. As demand for fish in the developed world rises, developing nations are increasingly promoting large-scale fish farming operations.[35] Such large-

26. U.N., *Population Prospects: The 2002 Revision* 1 http://www.un.org/esa/population/ publications/wpp2002/ (accessed May 7, 2005) [hereinafter *Population Prospects*]. Developed nations' populations are growing at a rate of .25% annually while the rate in developing nations is 1.46%. The subset of the 49 poorest nations is growing at a rate of 2.4% annually. *Id.*

27. *Id.* at vii.

28. Meryl J. Williams, *Aquaculture and Sustainable Food Security in the Developing World*, in *Sustainable Aquaculture* 15, 18 (John E. Bardach ed., 1997).

29. *See id* at 18 (explaining how even the landless poor could take advantage of open access fishing resources in the past).

30. White, O'Neill, & Tzankova, *supra* n. 1, at 4.

31. *See* FAO, *Code of Conduct for Responsible Fisheries* 1 (Rome, 1995), http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/v9878e/v9878e00.htm (accessed April 8, 2004) (calling for the responsible development and management of aquaculture).

32. *See id.* at 19.

33. *Id.* at 20.

34. Costa-Pierce, *supra* n. 19, at 103-05..

35. John S. Corbin & Leonard G.L. Young, *Planning, Regulation, and Administration of Sustainable Aquaculture*, in *Sustainable Aquaculture* 201, 203-04 (John E. Bardach ed., 1997).

scale projects are a means of attracting foreign investment.[36] Job creation and foreign investment could help developing nations meet the needs of their growing populations.

2. *The Problems*

Aquaculture pollutes the water with effluents from the fish-rearing process.[37] These

effluents include, among other things, unconsumed feed and fish excrement.[38] Up to fourty percent of fish feed can go uneaten, with most of the consumed feed ending up as fecal matter.[39] This waste accumulates in the sediments underlying fish farming operations, leading to oxygen depletion in and around the netpen area.[40] Finfish also excrete nitrogen and phosphorous, leading to the growth of toxic algae blooms, which results in even greater oxygen depletion.[41] Finally, fish farming operations can lead to benthic (bottom) layer damage. Under some circumstances, wastes rich in carbon and nutrients can produce anaerobic sediments, which can produce methane and other gases toxic to aquatic life.[42] All of the above factors may lead to the premature death of aquatic organisms and the elimination of valuable habitat.

Escape of stock from netpens and other enclosures is also a problem. [43] Aquaculture concentrates high numbers of organisms in one area and can lead to the propagation of parasites and disease.[44] Escaped stock can spread this to wild stocks, causing disastrous effects to wild species and their associated ecosystems.[45] Furthermore, even the escape of healthy fish can have harmful consequences. Hatchery produced fish are less genetically varied than wild stocks.[46] When these fish interbreed with wild stocks, it is likely that a genetically weak offspring will result.[47] A healthy wild stock may be able to handle a small dilution of the gene pool, but a threatened population like the Atlantic Salmon is in danger of being overwhelmed in such a sce-

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36. *Id.*
37. Goldburg & Triplett, *supra* n. 16, at 35.
38. *Id.*
39. *Id.*
40. *Id.* at 35-37.
41. Craig Emerson, *Aquaculture Effects on the Environment*, Cambridge Scientific Extracts (December 1999) (explaining how phytoplankton can produce toxins lethal to other ocean life and that some toxins can concentrate in filter-feeders such as mussels, causing a health risk to humans), http://www.csa.com/hottopics/aquacult/overview.php (accessed May 7, 2005).
42. *Id.*
43. Mary Liz Brenninkmeyer, *The Ones That Got Away: Regulating Escaped Fish and Other Pollutants from Salmon Fish Farms*, 27 B.C. Envtl. Aff. L. Rev. 75, 84 (1999).
44. John E. Bardach, *Aquaculture, Pollution, and Biodiversity*, in *Sustainable Aquaculture* 87, 91 (John E. Bardach ed., 1997).
45. *Id.*
46. *Id.* at 95.
47. *Id.*

nario.[48] Any escape, either by healthy or diseased fish, can be harmful to wild stocks. For example, invasion by nonnative species from fish farms is believed to have been a factor in the decline of seven fish species now classified as endangered or threatened under the Endangered Species Act.[49]

Certain methods used in industrial aquaculture are directly harmful to wild stocks. Fish farms often use wild caught fry (juvenile fish) to provide stock for fish farms.[50] The problem arises because the "bycatch" rates in such operations can be extremely high.[51] For example, eighty-five percent of fish caught for milkfish farming in the Philippines are left on the beach, resulting in around 10 billion fry of other fish species being wasted annually.[52] Fry bycatch in just one area of West Bengal, India is estimated to be up to 2.6 billion fish annually.[53]

Another huge drain on wild stocks is the practice of removing small fish and species unpalatable to humans from the oceans to be converted to fishmeal, which is used for feed in aquaculture and agriculture.[54] In the North Sea, over-harvest of fish for fishmeal was found to be directly responsible for the decline in the cod population.[55] Moreover, use of fishmeal is a very inefficient use of resources, as it generally leads to a net protein loss.[56] When raising certain fish species, more pounds of fish are used than are ultimately produced.[57] Carnivorous species like salmon, for example, need between two and one-half to five times as much biomass as is ultimately produced.[58] This production discrepancy leads to a global net loss of protein.[59] Such environmentally unsustainable practices contradict claims that aquaculture will help wild fish stocks to rebound.

Aquaculture can also be problematic for other aquatic organisms, due to habitat loss. Shellfish aquaculture operations often directly take the place of dolphin habitat,[60] and high concentrations of fish farms can lead to dis-

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48. Jeremy Firestone & Robert Barber, *Fish as Pollutants: Limitations of and Crosscurrents in Law, Science, Management, and Policy*, 78 Wash. L. Rev. 693, 711 (2003).

49. Goldburg & Triplett, *supra* n. 16, at 51-52.

50. Naylor, *supra* n. 15, at 1020 (citing examples of milkfish farming in Indonesia, tuna in Australia, and shrimp in south Asia and South America).

51. *Id.* at 1020-21.

52. *Id.* at 1021.

53. *Id.*

54. *See* Ronald W. Hardy & Albert G.J. Tacon, *Fish Meal: Historical Uses, Production Trends and Future Outlook for Sustainable Supplies*, in *Responsible Marine Aquaculture* 311-17 (Robert R. Stickney & James P. McVey eds., 2002). "Fish meal is a dry powdered material produced from species of pelagic fish that are captured primarily for the purpose of producing fishmeal and fish oil." *Id.* at 317.

55. Naylor, *supra* n. 15, at 1021.

56. *Id.* at 1019.

57. *Id.*

58. *Id.*

59. *Id.* To be fair, this is not an aquaculture problem per se. The majority of global fishmeal is actually used in the raising of poultry, beef, and swine. However, aquaculture is often touted as the means for saving wild fisheries. Taking more fish out of the ocean to produce less fish through aquaculture hardly seems like a way to save wild stocks, directly undermining such claims.

60. Bernd Wursig & Glenn A. Gailey, *Marine Mammals and Aquaculture: Conflicts and Potential Resolutions*, in *Responsible Marine Aquaculture* 46-47 (Robert R. Stickney & James P. McVey eds.,

placement of dolphins, manatees, sea otters and other marine mammals.[61] Fish farms can also have a direct negative affect on predatory mammals and birds by bringing them into conflict with the industry itself.[62] In the US, killing of many of these predators is prohibited,[63] but elsewhere such predators are afforded little or no protection.[64] Either directly or indirectly, aquaculture facilities can lead to displacement or even destruction of endangered or threatened animal populations.

Aquaculture operations, specifically shrimp farms, can have disastrous effects on mangroves, which are vital to the health of marine ecosystems.[65] Fallen leaves in mangroves become the bottom of the food chain, accounting for up to 80 percent of the "total energy budget" in coastal areas, vital in providing cover for young fish.[66] Mangroves are also important to biodiversity, providing habitat to fish, reptiles, and migratory birds.[67] Mangrove vegetation is often cleared away to make room for shrimp farms.[68] In Asia, the average intensive shrimp farm lasts only two to five years before pollution and disease force the owners to move to a new area.[69] This practice of polluting and then moving on has led to the loss of vast areas of mangroves in Asia and South America.[70] This loss has a direct negative impact on wild stocks,[71] further undermining claims that aquaculture will aid the replenishment of wild fisheries.

Aquaculture can also negatively affect human and animal health due to the use of chemicals.[72] Antibiotics are used to combat disease.[73] The major threat from such usage is its relation to the development of antibiotic-resistant bacteria.[74] There are bacteria pathogenic to humans found in fish,

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2002) (citing an example in New Zealand where shellfish farming has displaced dolphins, seals and other mammals in coastal areas).

61. *Id.* at 47.

62. In shellfish aquaculture walruses, sea otters and marine otters prey on the stock. Sea lions, seals and other marine mammals prey on coastal finfish farms. Numerous bird predators also conflict with the industry, eating stock and often damaging equipment allowing for mass escape of fish. *Id.* at 48-56.

63. *See e.g. Endangered Species Act*, 16 U.S.C. §§ 661 *et seq.* (2000); *but see* Goldburg & Triplett, *supra* n. 16, at 59 (citing examples of changes being proposed even in the U.S. to allow killing of predatory birds in some areas).

64. Goldburg & Triplett, *supra* n. 16, at 60.

65. *See* Daniel Suman, *Can You Eat a Mangrove? Balancing Conservation and Development in the Management of Mangrove Ecosystems in Cuba*, 16 Tul. Envtl. L.J. 619, 621-22 (2003).

66. *Id.* at 621.

67. *Id.* at 621-22.

68. Alfredo Quarto, *The Rise and Fall of the Blue Revolution*, http://www.earthisland.org/map/blrvl.htm (last modified Feb. 26, 2005).

69. *Id.*

70. Bardach, *supra* n. 44, at 92.

71. *Id.* at 92-93.

72. M. Richard DeVoe & Catherine E. Hodges, *Management of Marine Aquaculture: the Sustainability Challenge*, in *Responsible Marine Aquaculture* 21, 28 (Robert R. Stickney & James P. McVey eds. 2002).

73. *Id.*

74. Goldburg & Triplett, *supra* n. 16, at 45.

and there are concerns that humans could ultimately consume these pathogens.[75] Fish farmers also often use algaecides, herbicides, and fungicides, all having the potential to cause harm to fish and humans.[76] For example, copper based algaecides can be toxic to aquatic life such as scallops.[77] Studies on one aquaculture herbicide, known as 2,4-D, show that it may cause non-Hodgkin's lymphoma in humans and a like form of cancer in dogs.[78] Another recent example comes from the UK, where malachite green, a dye widely used as a fungicide for disinfection of fish eggs, was banned by the British government for its suspected toxicity.[79] However, tests on farmed salmon and trout in the UK reveal large quantities of the dye, leading to doubts as to whether fish farmers have actually stopped using it.[80] Aquaculture also involves the use of pesticides, although few are allowed in the US.[81] Finally, salmon farmers often use dyes to meet the color expectations of consumers.[82] A recent study showed that high levels of one of the dyes, Canthaxanthin, could be damaging to human eyesight.[83]

Related to this use of chemicals is the issue of polychlorinated biphenyls ("PCBs") in farmed salmon. In January 2004, the journal *Science* published an article declaring that PCBs in Scottish-raised salmon was so high people could safely eat no more than one serving per month.[84] The aquaculture industry has disputed these findings.[85] This dispute will no doubt continue, but even the hint of something as dangerous as PCBs in farmed fish raises concern over the safety of large-scale aquaculture as a whole.

Large-scale, export-oriented aquaculture operations can also be harmful socially and economically. While intensive fish farms have the potential to create jobs in the developing world, the conversion of arable land and mangroves into large-scale aquaculture facilities can displace peasants and la-

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75. *Id.* at 45.

76. *See id.*

77. *Id.* at 46

78. *Id.*

79. Severin Carrell, *Toxic Salmon Faces EU-Wide Sales Ban*, The Independent (January 11, 2004), http://www.eurocbc.org/ttoxic_farmed_salmon_eu_plan_sales_ban_11jan2004page1405.html (last accessed April 3, 2005).

80. *Id.*

81. Goldburg & Triplett, *supra* n. 16, at 46.

82. Sheila Keating, *Food Detective*, The Times (London) 83 (Jan. 3, 2004). Wild salmon are pinkish in color because they eat shrimp, while farmed salmon are a dull grey. *Id.*

83. *Id.*

84. Ronald A. Hites et al., *Global Assessment of Organic Contaminants in Farmed Salmon*, 303 Science 226, 228 (Jan. 9, 2004). This article was preceded by a July 2003, report by the Environmental Working Group claiming farmed raised salmon contain a significantly higher level of polychlorinated biphenyl ("PCBs") than wild salmon. Environmental Working Group, *PCBs in Farmed Salmon: Factory Methods, Unnatural Results*, http://www.ewg.org/reports/farmedPCBs/es.php (accessed Jan. 22, 2004). This study has been attacked by the aquaculture industry and some independent scientists as inconclusive. *Study of PCBs in Farmed Salmon Dismissed* 1, *Seafood Business* (Sept. 2003).

85. *See* e-mail newsletter from Global Aquaculture Alliance, *Global Aquaculture Alliance* (Feb. 12, 2004) (arguing that the study incorrectly used the EPA standards for PCBs rather than that of the Food and Drug Administration which is the correct standard to be applied for US consumers), http://www.gaalliance.org/issu5.html (accessed Apr. 1, 2005).

borers without the skills to work on more sophisticated fish farms.[86] Furthermore, shrimp aquaculture situated in mangroves can directly lead to destruction of arable land, such as in Thailand, where its 25,000 shrimp farms are responsible for raising the salinity of nearby soil, leaving adjacent farmlands unusable.[87] The foreign investment gained from export aquaculture can be outweighed by loss of land and displacement of the rural poor.

C. *Sustainable Aquaculture*

Methods for sustainable aquaculture include a mixture of prior planning, application of traditional knowledge, and utilization of current technology. Proper siting of aquaculture operations can lessen environmental impacts.[88] When possible, freshwater fish farms should be situated inland to prevent waste and chemicals from spreading. Where this is not feasible, farms should be located in areas of strong water flow and high benthic erosion to prevent both waste buildup and the spread of parasites. Siting facilities where it is difficult for predators to reach can cut down on the need for lethal predator removal.[89] In addition, the depth at which aquaculture facilities are located affects environmental impact. Instead of facilities located directly on the sea floor, aquatic organisms can be raised in baskets or on platforms hanging from floating rafts or structures extending into the water. Harvesting the organisms from these platforms does not require bottom dredging, lessening the impacts on these vital ecosystems.[90]

Use of advances in technology such as better feed, improved monitoring of stocks, and water saving devices, can help reduce ecological damage. The negative impacts of fish waste can be mitigated through better technology in both the feed itself and the method of feeding. Vegetable forms of protein, replacing fishmeal, are being studied as a means to reduce waste pollution.[91] Using cameras, fish farmers can monitor the amount of uneaten feed going directly to waste and adjust amounts accordingly.[92] Other technological advances that are being implemented are re-circulating systems and "raceways," which use less water, prevent waste buildup, and contain

86. Yung C. Shang & Clem A. Tisdell, *Economic Decision Making in Sustainable Aquacultural Development*, in *Sustainable Aquaculture* 127, 137 (John E. Bardach ed., 1997).

87. Terry McCarthy et al., *Fishy Business; Seafood Farms Are Growing Fast, But Only a Few Take Pains to Keep Environment Clean*, TIME A8 (Nov. 25, 2002). While there are numerous other unsustainable land uses degrading the coasts of Southeast Asian nations, shrimp farming is a major cause. *See* Timothy O'Riordan, *Sustaining Fish Farming*, Environment, http://www.findarticles.com/p/articles/mi_m1076/is_8_45/ai_110357295 (last accessed April 3, 2005).

88. Goldburg & Triplett, *supra* n. 16, at 79.

89. *Id.* at 78-79.

90. *Id.*

91. Hardy & Tacon, *supra* n. 54, at 319-21.

92. Kenneth M. Brooks, Conrad Mahnken & Colin Nash, *Environmental Effects Associated with Marine Netpen Waste with Emphasis on Salmon Farming in the Pacific Northwest*, in *Responsible Marine Aquaculture* 159, 161 (Robert R. Stickney & James P. McVey eds., 2002).

the environmental impacts in a small area.[93] Most importantly, advances in enclosure technology must be implemented to prevent stock from escaping and predators from entering.

Use of traditional aquaculture methods is another means of achieving sustainability. Aquaculture has been practiced for thousands of years in China with minimal environmental impact.[94] Many Chinese fish farmers practice polyculture (i.e., integrated agriculture and aquaculture)[95] leading to a more efficient use of resources, increased food supply, and less environmental damage.[96] While these aquaculture operations are practiced on a small-scale, many of the traditional methods can be utilized for industrial size facilities.[97]

Aquaculture's promise can be obtained if its potential problems are addressed through the practice of sustainable aquaculture, which promotes clean oceans, abundant wild stocks, biodiversity, and human safety. Although much has been written on sustainable aquaculture, there has been little comparison of the costs between conventional and more sustainable methods. This paper proceeds on the assumption that sustainable methods cost more; the following eco-labeling plan seeks to address these higher costs.

III. ECO-LABELING FOR AQUACULTURE

This part begins by discussing eco-labeling then explains the categories (or types) of eco-labeling and discusses which is best for the US plan. Next, this part provides an analysis of the role of the federal government in the US Plan. Finally, this part provides an explanation of the goals of the proposed eco-labeling program: (1) raising environmental awareness; (2) setting relevant criteria agreed upon by all stakeholders; and (3) ensuring compliance.

A. *Eco-Labeling*

1. *Background*

An eco-label, or environmental label, is a label placed on a product to inform consumers that the product is less environmentally harmful than simi-

93. Goldburg & Triplett, *supra* n. 16, at 80-83.

94. Malcolm C.M. Beveridge & David C. Little, *The History of Aquaculture in Traditional Societies*, in *Ecological Aquaculture* 3, 9-13 (Barry A. Costa Pierce ed., Blackwell Publishers 2003).

95. *See id.* at 12.

96. *See* Goldburg & Triplett, *supra* n. 16, at 67.

97. Polyculture has enormous potential. One method already used in traditional aquaculture is integrating of fish with aquatic plants to mitigate pollution. *Id.* at 67-68. Another way of integrating traditional knowledge is to reduce high rates of density in stocks, a common practice in large-scale industrial aquaculture. Reducing density helps prevent the spread of disease and contributes to overall fish health as dense stocking, poor water quality, and stress cause the majority of health problems. *Id.* at 72-73.

lar products, either based on the actual product characteristics, the production and process method ("PPM") used in its manufacture, or both.[98] The main goals of an eco-label are to provide more information to consumers about the environmental impact of the product being consumed and to lessen the environmental impact resulting from manufacture of that product.[99] In theory, eco-labeling utilizes market-based incentives to persuade consumers and producers to buy products that conform to criteria designed to minimize environmental harm.[100] The concept is to inform consumers which products are more environmentally friendly, and eventually force producers to undertake more environmentally friendly productions and processes.[101] In this manner, manufacturers will internalize harmful environmental externalities in a more cost-effective way than could be accomplished through traditional command and control regulation.[102]

Eco-labeling, like any other strategy, is not without problems. One problem is the two assumptions upon which an eco-labeling plan must proceed. The first assumption is that consumers will pay a premium for labeled products. Studies show that consumers are actually willing to pay a premium for eco-labeled products.[103] One particular survey conducted in the US revealed that consumers would pay between two and five dollars more per pound for seafood certified to have been caught in a manner that ensured no over-fishing.[104] However, other studies have produced evidence that price considerations will always trump environmental benefits in consumer decision-making.[105] This is an inherent drawback of eco-labeling. A way of overcoming this limitation is by increasing environmental awareness. A successful program must convince consumers of the need for environmentally conscious purchasing, with this newfound awareness trumping the desire to buy the cheaper product.

The second assumption behind eco-labeling is that increased market share and/or sales revenue from obtaining the eco-label will offset the producer's compliance costs. The fact that increasing numbers of producers seek eco-labels every year on a voluntary basis supports this assumption.

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98. U.S. Envtl. Protec. Agency, *Determinants of Effectiveness for Environmental Certification and Labeling Programs* 1, (Apr. 1994), http://www.epa.gov/clariton/clhtml/pubtitle.html; *select* 742R94001 [hereinafter EPA, *Determinants*].

99. Anil Markandya, *Eco-Labelling: An Introduction and Review*, in *Eco-Labelling and International Trade* 1, 4 (Simonetta Zarrilli et al. eds., Palgrave Macmillan 1997).

100. *See* Teresa Hock, *The Role of Eco-Labels in International Trade: Can Timber Certification Be Implemented as a Means To Slowing Deforestation?*, 12 Colo. J. Intl. Envtl. L. & Policy 347, 350 (2001).

101. Surya P. Subedi, *Balancing International Trade With Environmental Protection: International Legal Aspects of Eco-Labels*, 25 Brook. J. Intl. L. 373, 375 (1999).

102. *See* Peter S. Menell, *Environmental Federalism: Structuring a Market-Oriented Federal Eco-Information Policy*, 54 Md. L. Rev. 1435, 1442-44 (1995).

103. Catherine R. Wessells et. al., *Product Certification and Ecolabelling for Fisheries Sustainability* 20-21, FAO Fisheries Technical Paper No. 422 (2001), http://www.fao.org; search Wessells.

104. *Id.*

105. *Id.*

Arguably, if producers did not feel that eco-labeling would aid their bottom line they would not implement it. However, this may only mean that producers think they will increase revenue from eco-labeling. If revenues do not increase, other producers will not to submit to the costs of eco-labeling. Raising environmental awareness among consumers can also mitigate this limitation. If more consumers are willing to pay a greater premium, producers utilizing eco-labels will see their profits increase. Thus, environmentally informed consumers can overcome the two main limitations of eco-labeling.

Another criticism of eco-labeling is its ability to send the wrong message to consumers. By themselves, eco-labels do not compel consumers to reduce their consumption, reuse what they already have, or recycle.[106] Eco-labels could send the message that consumers need not make any changes in their consumption behavior other than purchasing eco-labeled products to have a positive environmental impact.[107] Eco-labeling could even increase consumption in this manner. However, encouraging consumers to reduce, reuse and recycle is not mutually exclusive of eco-labeling.[108] Both strategies have the same goal of reducing environmental harm from consumption.[109] The strategies are actually complementary -- in that both get consumers to consider the environmental implications of consumption.

2. Advantage Over Other Forms of Regulation

Eco-labeling is preferable to domestic regulation because of the global scope of the problem. Environmentalists and industry alike complain that the US's piecemeal approach of regulating aquaculture through a myriad of state and federal law is both burdensome and ineffective because it is applied inconsistently.[110] However, even more effective domestic aquaculture regulation would have only a small impact on global aquaculture because the US is a net importer.[111] While much of the imports come from developed nations with their own regulatory schemes in place, the majority comes from developing nations where regulation is weak or nonexistent.[112] No changes in US regulation of domestic fish farms, be they command and control regulation, taxes, or subsidies, will affect the unsustainable practices

106. Roger D. Wynne, *The Emperor's New Eco-Logos? A Critical Review of the Scientific Certification Systems Environmental Report Card and the Green Seal Certification Mark Programs*, 14 Va. Envtl. L.J. 51, 143 (1994).

107. *Id.*

108. George Richards, *Environmental Labeling of Consumer Products: The Need for International Harmonization of Standards Governing Third-Party Certification Programs*, 7 Geo. Intl. Envtl. L. Rev. 235, 252 (1994).

109. *Id.*

110. *See, e.g.* Erin R. Englebrecht, *Can Aquaculture Continue to Circumvent the Regulatory Net of the Magnuson-Stevens Fishery Conservation and Management Act?* 51 Emory L.J. 1187, 1201-1207 (2002).

111. Vannuccini, *supra* n. 4, at 2.

112. *Id.*

of Thai shrimp farmers or Chilean salmon farmers. Developing nations have a disincentive to regulate aquaculture because it would hurt their competitive advantage over developed nations.[113] Eco-labeling avoids the limitation of traditional domestic regulation (command and control regulation, taxes, subsidies, etc.) by providing an incentive to all producers, regardless of location, to lessen environmental harm from their operations.

Because aquaculture is a global issue, in theory, a multilateral environmental agreement ("MEA") is desirable. This would give all nations involved an effective voice. However, reaching such an agreement would be extremely difficult. Coming to an agreement on whose standards should apply, how they will be monitored, and how infractions are to be punished could take years. Furthermore, developing nations will not want to sign such agreements if they must ultimately surrender their competitive advantage. On the other hand, developed nations will not want to sign agreements unless developing nations are willing to make environmental concessions. Furthermore, setting standards for the US plan in particular will not involve the agreement of governments of all nations with aquaculture, thus making the process that much more streamlined than formation of an MEA.

3. *Impact*

Empirical evidence suggests that eco-labeling programs can be successful in specific product areas. Under Germany's Blue Angel eco-labeling program, emissions of sulphur dioxide, carbon monoxide, and nitrogen oxides fell by over 30% in the years after eco-labels for oil and gas heating appliances were introduced.[114] Also under Blue Angel, after the introduction of a paint eco-label, market share for low-solvent paint and varnishes increased from one to 50 percent.[115] This change was estimated to have resulted in a yearly reduction of 40,000 tons of solvents released into the environment.[116] The Swedish Environmental Choice program has led to an increased demand for unbleached and environmentally bleached paper, resulting in a reduction in discharges of chlorinated organic compounds of 165,000 metric tons annually.[117]

Overall, however, it is difficult to show how effective an eco-labeling scheme would be due to the relative infancy of the practice and the consequent lack of empirical data. The limited available evidence suggests that substantial impacts by eco-labeling programs have only taken place in na-

113. Although low wages are the main factor giving a competitive advantage to developing nations, lack of environmental regulation is another part of the equation.

114. *Trade, Environment and Development Aspects of Establishing and Operating Eco-Labeling* Programmes, U.N. TDBOR, 2nd Sess., ¶ 18, U.N. Doc. TD/B/WG.6/5 (1995) [hereinafter UNCTAD Report].

115. *Id.*

116. *Id.*

117. Org. For Econ. Cooperation and Dev., *Joint Session of Trade and Environment Experts, Eco-Labelling: Actual Effects of Selected Programmes* 45 (1997) [hereinafter OECD].

tions where there is already a high level of environmental awareness such as Germany and Sweden.[118] Thus, an eco-labeling scheme's success tends to be directly proportionate to consumer environmental awareness.

B. *Categories*

Although the literature is inconsistent on classification of labeling programs, existing plans can be broken down into four categories: mandatory-- negative content labeling; mandatory -- content neutral labeling; voluntary -- single attribute labeling; and voluntary -- multi-criteria labeling.[119]

1. *Mandatory -- Negative Content and Mandatory -- Content Neutral Labeling*

Mandatory -- negative content labeling plans are government programs where products containing (or produced using) environmentally harmful substances are labeled informing consumers of that fact.[120] An example is the Clean Air Act's requirement that products containing or manufactured with the use of ozone depleting CFCs and HCFCs have labels attesting these facts.[121] Mandatory -- content neutral plans are also government-administered programs. However, they require labels on products that do not necessarily provide negative information, but rather just information the government has deemed important for consumers to know.[122] An example is the corporate average fuel economy ("CAFÉ") standards, which are required to be labeled on new cars sold in the US. At first glance these mandatory plans might seem well suited for aquaculture eco-labeling, however, the government must administer any mandatory scheme, and this begins to look a lot like domestic command and control regulation. For this reason, mandatory schemes are not suitable for the US plan.

2. *Voluntary -- Single Attribute Labeling*

Voluntary -- single attribute labeling programs, provide labels attesting to one positive characteristic of the product.[123] The best-known example is "dolphin-safe" tuna. The main problem with this category is the proliferation of self-declaration, which refers to labels applied by producers or industry associations. Self-declaration asks consumers to trust industry to conduct its operations in an environmentally responsible way in the same way as if there was no label. The 1990s saw a rash of advertising based on

118. *Id.* at 67.

119. U.S. Envtl. Protec. Agency, *Status Report on the Use of Environmental Labels Worldwide* 9-10, (Sept. 8, 1993), http://www.epa.gov/ clariton/clhtml/pubtitle.html; *select* 742R93001 [hereinafter EPA, *Status Report*].

120. *Id.* at 25.

121. *Id.* at 172.

122. *Id.* at 24.

123. *Id.* at 21-22.

unverifiable or false environmental claims attempting to capitalize on "green consumerism."[124] This type of marketing, derisively known as "greenwash" or "ecopornography," led to consumer confusion and mistrust of environmental labeling in general.[125] The FTC took action in the mid 1990s to regulate this misleading advertising,[126] nonetheless these problems persist. The Consumers Union Guide to Environmental Labeling ("CUGEL") reports an abundance of labels with no standards or verification.[127] For example, "environmentally friendly," "cruelty free" and "no animal testing" are meaningless labels, in that they are general claims with no organization behind them other than the industry itself.[128] This completely undermines the eco-labeling approach. Self-declaration represents business as usual for industry, with a change in marketing strategy. Consequently, it is an environmentally counterproductive practice.

There are examples, however, of voluntary -- single attribute programs administered by independent, third party certifiers, that solve the problem of self-declaration. For example, Scientific Certification Systems ("SCS") performs assessments of manufacturers' operations.[129] If the manufacturer meets the standard, SCS will allow its seal (a green cross) to appear next to the single attribute claim.[130] Examples of single attributes used are "biodegradable," "recycled content," and "salvaged wood."[131] The problem with this method, however, is their limitation to one characteristic. Any environmental assessment of aquaculture would have to take account of numerous factors incuding feed, water quality, siting, and integrity of enclosures. Verification of one attribute would not sufficiently inform consumers whether a particular fish farm practices sustainable aquaculture. For this reason, a voluntary -- single attribute program is inadequate.

3. *Voluntary -- Multi-Criteria Labeling*

The best eco-labeling category for the plan advocated for in this paper is the voluntary -- multi-criteria plan. This category relies on independent,

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124. David Hoch & Robert Franz, *Legal Developments: Eco-Porn Versus the Constitution: Commercial Speech and the Regulation of Environmental Advertising*, 58 Alb. L. Rev. 441, 441 (citing terms coined for the questionable advertising such as "eco-pornography," "greenwash" and "greensleeze").

125. *Id.*

126. *See generally* Kimberly C. Cavanagh, *It's a Lorax Kind of Market! But Is It a Sneetches Kind of Solution? A Critical Review of Current Laissez-Faire Environmental Marketing Regulation*, 9 Vill. Envtl. L.J. 133 (1998).

127. *See* Consumers Union Guide to Envtl. Labeling, *Labels*, http://www.eco-labels.org/labelIndex.cfm (accessed March 15, 2004) [hereinafter CUGEL].

128. CUGEL, *Product Area*, http://www.eco-labels.org; search individual labels in "label search" (accessed April 17, 2004).

129. Sci. Certification Systems, *Services for Manufacturers*, http://www.scscertified.com/manufacturing (accessed March 15, 2004) [hereinafter SCS].

130. SCS, *Sci. Certification Systems*, http://www.scscertified.com/aboutSCS (accessed March 15, 2004).

131. *Id.*

third party certifiers from government or private institutions.[132] What differentiates voluntary – multi-criteria labeling from other categories is its reliance on a life cycle analysis ("LCA"), also known as a "cradle to grave" analysis.[133] In a LCA, the environmental effects of a product's inputs, manufacture, use, and disposal are tested.[134] Thus, the environmental impact of an aquaculture product could be traced back to where it was raised and properly assessed. Under this method, the eco-label does not give specific results of LCA,[135] but rather assures consumers that the product has met the standards -- a kind of environmental seal of approval.[136] Assuming the eco-label enjoys the public's confidence, providing a laundry list of how the product meets every detail of the LCA is probably counterproductive.[137] Reviewing such a list is time consuming, and for any type of environmental labeling to affect consumer decisions, it must be possible for the recommendation to be acted on immediately, without additional cost or time.[138] Furthermore, the average consumer may not understand a laundry list of environmental criteria.[139] A label that has the public's confidence is a convenient way for consumers to make a decision between products without confusion or a significant expenditure of time. For this reason, this method is the best fit for aquaculture.

C. *The US Aquaculture Eco-Labeling Plan*

The US Aquaculture Eco-Labeling Plan ("AEP") plan proposed in this paper is a voluntary -- multi-criteria, federally coordinated eco-labeling plan. AEP is a combination of approaches from the best of existing government and private plans, along with recommendations from scholarly literature.

1. *Role of the Federal Government*

Under the AEP, the federal government coordinates the overall program, but a private company is responsible for its actual operation. This model is based on Canada's "Environmental Choice Program" ("ECP"). ECP is administered jointly by the Canadian government (known as Environment

132. EPA, *Status Report*, *supra* n. 119, at 10-11.

133. Candice Stevens, *Synthesis Report: Life-Cycle Management and Trade*, in Life-Cycle Management and Trade 7, 7 (OECD ed., 1994).

134. U.S. Envtl. Protec. Agency, *The Use of Life Cycle Assessment in Environmental Labeling* 2, (Sept. 1993), http://www.epa.gov/ clariton/clhtml/pubtitle.html; *select* 742R93003.

135. Some scholars also place a "report card" scheme under the voluntary, "multi-criteria" category, in which the label lists a number of content neutral environmental criteria (similar in principle to nutritional labels on processed food) and leaves it up to consumers to decide.

136. Wessells, *supra* n. 103, at 10.

137. *See* EPA, *Determinants*, *supra* n. 98, at 63-64 (asserting that nutritional information can become so complicated that it defeats its own purpose).

138. *Id.* at 63-64.

139. *Id.* at 64.

Canada), and TerraChoice Environmental Services, a private company.[140] TerraChoice is licensed by the national government to award eco-labels.[141] The Canadian government is ultimately responsible for ECP, but TerraChoice operates largely independent of Environment Canada. The US Environmental Protection Agency ("EPA") could take on the same role as Environment Canada, and designate a private company similar to TerraChoice to award the eco-labels in AEP. In addition, the US plan could have an interdepartmental committee composed of representatives from EPA and other federal departments to provide on-going policy advice and serve as an information clearinghouse for the private company, much like ECP's interdepartmental committee does for TerraChoice.[142] This plan would allow the federal government to take the lead in formation and management of the program.

This hybrid eco-labeling scheme is specifically more desirable than a purely private or purely governmentally administered plan. In a purely governmentally administered plan, companies may use political influence to set favorable standards for their product or even to obtain a label for a product failing to meet the standards.[143] While a private party can also be "captured" by industry, the hybrid AEP takes steps to avoid this, see *infra* section C2. Private eco-labeling plans also suffer from a confusing proliferation of labels, often meaning different things. Eco-labeling can also suffer from having a number of certifiers whose criteria for sustainable aquaculture do not match and are in fact incompatible.[144] The number of eco-labels combined with differing standards can lead to consumer confusion and distrust of environmental labeling in general, as was the case in the US in the 1990s.[145]

An impediment to consumer acceptance of eco-labeling in general is the lack of one recognized and accepted label.[146] A government certified eco-label has the ability to be the most recognized and trusted label due tot exposure, credibility, and relative objectivity associated with the federal gov-

140. Envtl. Choice Program, *Envtl. Choice Program*, http://www.environmentalchoice.com (accessed March 27 2005).

141. *Id.*

142. OECD, *supra* n. 117, at 22. Relevant federal departments would be represented such as the State Dept., Dept. of the Interior, NOAA, and the Dept. of Ag.

143. *See* Avi Gesser, *Canada's Environmental Choice Program: A Model for a "Trade-Friendly" Eco-Labeling Scheme*, 39 Harv. Intl. L.J. 501, 513 (1998).

144. *See* Hock, *supra* n. 100, at 359. There are often problems with reaching agreement on just what the criteria should be in awarding an eco-label. *See, e.g.* Frederick A. Veitch III, *Brewing up a Storm: The Potentially Cataclysmic Effects of Industrially Grown Coffee*, 13 Colo. J. Intl. Envtl. L. & Policy 211, 233 (2002) (citing how "shade grown" coffee is currently certified as either Fair Trade, sustainable, organic, or bird-friendly, with each designation emphasizing different criteria).

145. *See generally* Cavanagh, *supra* n. 126.

146. Commn. for Envtl. Cooperation, *Supporting Green Markets: Environmental Labeling, Certification and Procurement Schemes in Canada, Mexico and the United States* 53 (1999), http://www.cec.org/files/pdf/ ECONOMY/labels-e_EN.pdf (accessed Mar. 26, 2005).

ernment. This would prevent the creation of diffuse labeling schemes that undermine public trust.

Purely private certification schemes also have the potential for conflict of interest problems. A government coordinated plan gives greater credibility than a private certifier because it is ultimately elected officials making sure the system is run properly, assuring a level of accountability that would not exist in the private sector. An example of a private scheme where conflict of interest arises is the Forest Stewardship Council ("FSC"), whose mission is to ensure proper forest management.[147] FSC is an accrediting organization, which develops standards and accredits certifiers who can then award the FSC eco-label.[148] FSC is composed of representatives from industry, wholesalers, retailers, consumer groups, indigenous peoples, and environmental NGOs.[149] While stakeholder involvement is a key to a successful eco-labeling plan, FSC allows *too much* involvement. CUGEL reports that FSC is not free from conflict of interest because industry representatives have voting rights for standard setting decisions.[150] FSC has been criticized for inconsistent standards, and for blurring the distinction between natural forests and plantations, which can lead to natural forests being cleared for plantations.[151] Such a high level of industry involvement in decision-making could be the cause of such failures and provides a warning for aquaculture eco-labeling.

Concededly, industry is also highly involved in decision-making under the proposed program. Nevertheless, there is a difference between allowing industry some input in deliberations and allowing industry voting rights on standard-making decisions. The former is necessary to involve industry in a dialogue with other interested parties so that effective and realistic standards can be set. The latter involves allowing industry an undue influence in decision-making, and a resulting conflict of interest.

This all begs the question: Could a purely private eco-labeling program be as effective as the hybrid plan if it did not allow as much industry influence as FSC? The answer is yes, but only in theory. As discussed above, producers have an incentive to obtain an eco-label, but this incentive is not without reservation. The disadvantages of obtaining an eco-label are the costs of certification and the maintenance of rigorous standards.[152] Industry must be confident that the eco-label is one that will lead to greater profits.[153] A government affiliated eco-labeling plan receives greater credibility

147. CUGEL, *Label Report Card: Forest Stewardship Council,* http://www.eco-labels.org/home.cfm; *search* Forest Stewardship Council (accessed Feb. 10, 2004).

148. *Id.*

149. Forest Stewardship Council, *The History of FSC-US,* http://www.fscus.org/about_us (accessed Feb. 10, 2004).

150. *See generally* CUGEL, *supra* n. 147.

151. *Id.*

152. *See* Wessells, *supra* n. 103, at 10-22.

153. *See id.*

than a purely private plan.[154] Thus, corporations signing on with a government-affiliated plan have a better chance of earning greater profits. In this way, producers may be more motivated to participate in government eco-labeling plans than private plans. One way for private certifiers like FSC to get industry to participate is to allow them greater decision-making power than a government plan would. Unfortunately, this may also result in watered down eco-labeling without meaningful standards. If a private certifier does not allow industry a large amount of decision-making power, no producers will sign up. This "catch- 22" illustrates why a private eco-labeling scheme, while effective in theory, cannot be as effective as a properly administered government coordinated plan.

2. *Goals of the Plan*

The US plan has three specific targets which further the goals of creating better-informed consumers and minimizing environmental harm from aquaculture. The three targets are: (1) a direct campaign to raise consumer awareness of environmental issues; (2) relevant criteria (i.e. make the eco-label a fair indication of environmental worth); and (3) enforcement of compliance by participating producers. Each goal must build on the success of the previous one to ensure an overall successful program. Attainment of these goals is the only way an eco-labeling plan can gain public recognition and trust, change consumer behavior, get industry to seek the label, and eventually result in less environmentally harmful aquaculture.

a. *Raising Environmental Awareness*

An eco-labeling plan's ability to lessen environmental harm depends on consumer perception, recognition, and willingness to act on the information obtained from the label.[155] To meet these three factors consumers must have environmental awareness,[156] meaning they must have an understanding of the environmental consequences of consumption, and a willingness to undertake behavior that will mitigate these consequences.[157] Consequently, a major part of the US plan would be the raising of consumer awareness of aquaculture's environmental impact.

Raising environmental awareness must go far beyond just providing eco-labels for products. Successful programs have engaged in major campaigns for raising general environmental awareness as well as exposing the program to the public. For example, in Canada, ECP has sponsored and taken

154. The US public has grown weary of so many labels, many with questionable validity. *See* Hoch & Franz, *supra* n. 124, at 442. Although many citizens may not view the federal government as infallible, it is at least free from an agenda of trying to sell products. This alone gives it greater credibility than a private corporation.

155. OECD, *supra* n. 117, at 37.

156. *Id.*

157. *Id.*

part in numerous marketing projects to increase its exposure, including advertising, trade shows, speaking engagements, direct mailings, and joint promotional activities with participating industries.[158] Under AEP, EPA could engage in a similar campaign to promote the plan.

Another method that could prove productive for AEP is endorsement from environmental NGOs. The highly successful Swedish Environmental Choice program has benefited from its affiliation with the Swedish Society for Nature Conservation ("SSNC"), the country's largest environmental NGO.[159] SSNC has carried out a large publicity campaign for the eco-label, helping it to achieve substantial market recognition.[160] Powerful environmental NGOs such as the Environmental Working Group and the World Wildlife Fund have put sustainable aquaculture on their respective agendas.[161] Campaigns by these powerful groups to promote AEP could greatly raise awareness of unsustainable aquaculture practices and the plan itself. NGO endorsements are advantageous because environmentalists often have greater trust for environmental NGOs than the federal government.[162]

Another resource for publicity is consumer organizations. Germany's Blue Angel program gained enormous exposure from such groups.[163] In Germany, consumer groups encouraged the Blue Angel program as a means of discouraging consumers from purchasing products with self-declaration labels.[164] In the US, self-declaration labels are also widespread.[165] Endorsement by US consumer organizations would give AEP the exposure and credibility necessary for success.

Raising public awareness could even lead to consumers themselves proposing product categories. In this situation, consumers would recommend to the appropriate office of AEP products they feel should be assigned criteria for eco-labeling. This could be accomplished in several different ways. Consumer organizations could coordinate individual consumers and lead efforts to establish new product categories. A less direct method could come from supermarkets, wholesalers, restaurants and other service industries. Recognizing a demand from individual consumers, these entities

158. *Id.* at 22.

159. *Id.* at 17.

160. *Id.* at 43.

161. Environmental Working Group, *Summary – PCBs in Farmed Salmon*, http://www.ewg.org/reports/farmedPCBs/es.php (accessed Feb. 24, 2004) [hereinafter EWG]; World Wildlife Fund, *Protecting Wild Salmon from Impacts of Salmon Aquaculture: A Country-by-Country Progress Report*, http://www.panda.org/downloads/marine/osloresprogfinal3.pdf (accessed Feb. 24, 2004).

162. A 1990 survey found that among environmentally conscious consumers 48% said environmental NGOs were a very good source of information, while only 6% said the federal government was trustworthy. George Richards, *Environmental Labeling of Consumer Products: The Need for International Harmonization of Standards Governing Third-Party Certification Programs*, 7 Geo. Intl. Envtl. L. Rev. 235, 253-54 n. 126 (1994).

163. OECD, *supra* n. 117, at 53.

164. *Id.*

165. CUGEL, *supra* n. 147.

could propose new categories individually, or more effectively, through trade associations representing many supermarkets and wholesalers. Finally, such a program could even lead to grassroots efforts by individual consumers, coming together as *ad hoc* organizations to lobby for a new product category. This scenario would lead to better-informed and more empowered consumers, which would, ideally, spill over into other aspects of environmental sustainability.

The advantage of consumers suggesting product categories is the directness of the message it would send to industry. Where producers must make the proposal, consumers have to take the first step and pressure the producer, who then must take the next step in proposing a new product category. Allowing consumers to propose categories removes a step, eliminating the middleman between consumers and the eco-labeling program. Consumers with the ability to propose product categories helps to streamline the process of eco-labeling.

b. *Relevant Criteria*

Making a label a credible indicator is the most important factor in gaining public confidence and producer participation in an eco-labeling scheme – but this requires adequate and meaningful criteria. The lack of adequate criteria is the eco-labeling aspect most criticized as unworkable. A policy of inclusion and transparency at all stages will go a long way in addressing these criticisms. Under AEP, all stakeholders are brought into the process of setting criteria at all levels. First, when setting the overarching AEP criteria, all relevant parties would be included. Next, when applying this standard in an individualized manner to a specific aquaculture facility, the relevant parties would be included again. Both these processes would be transparent to the public at all times.

(i) Setting General Standards for Aquaculture

The Canadian model is a useful model for setting AEP standards. Under ECP, TerraChoice prepares initial guidelines for criteria based on an LCA, an industry profile, economic factors, and the category's market status.[166] It next creates a technical review committiee specific to the product under review.[167] Representatives from the specific industry, government, academia, and environmental NGOs comprise these committees, and analyze the guidelines to ensure that all technical issues are dealt with and the criteria are economically feasible."[168] The results are draft guidelines, which are published in the Canadian government's official publication for announcements, the Canada Gazette. In this manner, stakeholders and interested par-

166. OECD, *supra* n. 117, at 23.
167. *Id.*
168. *Id.*

ties are notified[169] and can submit feedback and suggestions during the review period.[170] TerraChoice and the review committee then prepare the final criteria, which after review by the ECP Interdepartmental Committee, is finally published in the Canada Gazette.[171]

AEP would employ a similar method. The technical committee would be composed of representatives of all aspects of the aquaculture industry (actual aquaculturalists, seafood processors, suppliers, and marketers), NGOs focused on international issues, consumer rights and environmental health, and importantly, scholarly experts on aquaculture, oceanography, marine biology, and other relevant disciplines. A review period would allow for any party not represented on the committee to voice their opinion. The major difference from ECP, is that under AEP, this process would be setting general criteria for the entire aquaculture industry.

Allowing industry input does raise suspicion that standards will be watered down. However, there is evidence that the aquaculture industry would be amenable to an eco-labeling plan with relatively strict standards, so long as those standards were comprehensive and unambiguous. In an unabashedly pro-aquaculture publication, the authors lamented the current regulation of aquaculture, stating that:

> [w]orldwide, the aquaculture industry is calling for transparent and enforceable policies to improve or replace the over-burdensome and largely ineffective policies and legislation that now exists. Many feel that the industry would be able to overcome many of its current institutional limitations with clear policies, empowered lead agencies, and comprehensive and enforceable laws and procedures that encourage sustainable aquaculture and promote trade in aquaculture products.[172]

Furthermore, in 1997, a group of leaders in the aquaculture industry formed the Global Aquaculture Alliance ("GAA"), with a mission to "further environmentally responsible aquaculture to meet world food needs."[173] In 2002, seafood producers, processors, wholesalers, and other industry affiliates, formed the Aquaculture Certification Council ("ACC"),[174] with a similar mission to GAA.[175] These steps, even if purely cosmetic, show either an

169. *Id.*
170. *Id.*
171. *Id.*
172. Devoe & Hodges, *supra* n. 72, at 30.
173. Global Aquacultural Alliance, *Mission*, http://www.gaalliance.org/miss.html (accessed Apr. 13, 2005).
174. Aquaculture Certification Council, *Governance*, http://www.aquaculturecertification.org/accgov.html (accessed Apr. 13, 2005).
175. Aquaculture Certification Council, *Buyer Program*, http://www.aquaculturecertification.org/accbuyer.html (accessed Apr. 13, 2004).

awareness that environmental reputation is important to consumers, or a recognition that sustainable aquaculture practices are necessary to make the industry thrive in the long term. Either way, GAA and ACC's programs show that industry could be agreeable to AEP.[176]

(ii) Applying the Standard

The Marine Stewardship Council ("MSC") is also an instructive model. MSC is a private eco-labeling scheme that sets criteria for wild fisheries. The criteria are based on the principle that management of the fishery should be conducted sustainably through the prevention of over-fishing, respect for the ecosystem, and compliance with local, national, and international law.[177] MSC accredits certifiers who apply MSC's criteria in analyzing fisheries and decides whether a fishery deserves the MSC eco-label. Parties seeking certification are stakeholders in the fishery and are usually the managing national government body or a seafood processor's organization.[178] MSC does not set specific criteria for different fisheries, but rather its certifiers use broad-based criteria to assess each fishery individually, upholding uniform application through its certification guidelines.[179] The formation of a standard by which a fishery is evaluated ends up being an amalgamation.[180] The certifiers apply MSC's criteria, but also a set of guidelines for each individual fishery based on the MSC criteria.[181]

The AEP plan would operate similar to MSC. Specific standards for each aquaculture operation would be untenable as aquaculture is practiced with many different species utilizing various methods in disparate areas of the world.[182] A broad-based standard, calling for minimization of environmental harm, is more workable. The problem is defining the appropriate level of minimization; a solution is the concept of Best Available Technology ("BAT"). Certifiers could assess an individual aquaculture facility in terms of whether it is utilizing BAT in pursuit of the broad-based standard

176. Another indication that industry might be receptive to eco-labeling is the formation of "Salmon of the Americas." The U.S, Canadian, and Chilean salmon farming industries have recently formed this organization as a public relations campaign to battle unfavorable press. Peter Redmayne, *Farmed Salmon: Attacks from Environmentalists and Chaos in the European Market Make Life Hard for Salmon Farmers*, Seafood Business 40 (Sep. 1, 2003).

Its existence shows the salmon farming industry realizes the value of good public image. Eco-labeling is fundamentally based on a corporation's need to cultivate its public image and ultimately increase profits. An eco-labeling plan could get industry to spend money on trying to get awarded the label rather than on a public relations campaign, which may not reach relevant consumers.

177. Brendan May *et al.*, *The Marine Stewardship Council (MSC): Background, Rationale and Challenges*, in *Eco-Labelling in Fisheries: What Is It All About?* 14, 18 (Bruce Phillips *et al.* eds., 2003).

178. *Id.* at 19.

179. *Id.*

180. *Id.* at 21.

181. *Id.*

182. *See generally Ecological Aquaculture* (Barry A. Costa-Pierce ed., 2002).

of environmental harm mitigation. In such a system, certifiers could take an individualized approach to each facility.

A problem with this method is deciding which environmental harms are more egregious than others. For example, a salmon farm may be sited in an area that is out of any marine mammal's territory, thus not disrupting aquatic habitat. However, by locating the facility in an area for this reason, the facility is in a low-flow area where fish waste builds up disproportionately and decimates the benthic layer. How should a certifier value avoiding one harm while causing another? In applying the general AEP criteria, the team would take into account local differences and apply a totality of the circumstances test. The certifying team has to balance all factors in deciding whether the fish farm merits certification. Stated differently, the certifier must judge whether the facility is utilizing BAT, and minimizing environmental harm as much as possible under the circumstances.

This method of broad overall standards with individual teams applying specific standards presents problems. If fairness is to be assured, AEP would have to employ three mechanisms. First, AEP would have a review process in which the certifying teams would also require certification. On a regular basis, an AEP reviewing panel, employing the broad standards worked out among all stakeholders, would evaluate individual certifying teams and the certifications they completed.

Second, EAP would also give aquaculturists a formal appeal mechanism. This appellate panel would allow individual facilities to present their case for certification after the certifying team had denied them. AEP, however, would have to provide a means for a facility to bear the costs. A large multinational corporation-owned facility would be able to hire its own scientists and other professionals to present its case. AEP could provide funding for facilities under a certain revenue level, so such facilities could afford to make an effective appeal.

Third, AEP would send field representatives to facilities to show, rather than just tell, aquaculturists how get certified.[183] These representatives would have to work hand in hand with certifying teams in order to know just what a specific facility would have to do. Aside from helping facilities to get certified, such on-going relationships would foster good relations between industry and AEP. Industry could then receive AEP as a partner helping with compliance, rather than as an adversary.

Another problem with the US plan (and eco-labeling in general) is the cost of certification and licensing. These costs vary by program, but small aquaculture operations would probably always have a more difficult time bearing the burden than large-scale operations. Many aquaculture opera-

183. This process could work much like the process in which the Securities and Exchange Commission provides ongoing advice to a corporation as it goes public, ensuring that the corporation conforms to applicable regulations.

tions are located far from the US, which would raise the cost of certification. Furthermore, the US plan would charge on-going licensing fees (as other plans do) to support administration costs, research costs, etc. This would place a greater burden on small facilities that would struggle to bear the burden of certification and licensing.

The trouble with this critique is that the majority of large-scale export-oriented aquaculture facilities are owned by multinational corporations,[184] making these facilities as able as those in the developed world to bear the costs of certification and licensing. It is worth repeating that subsistence aquaculture operations in the developing world are not responsible for export and are not affected by AEP. As for small producers of aquaculture that actually cannot bear the costs, AEP has a remedy. Certification would cost the same regardless of location and complexity so as not to penalize small facilities. AEP would also charge annual licensing fees based on gross annual sales of the facility with a minimum fee to protect small producers, and a maximum fee to not unduly burden large ones.[185] The maximum fee would be set high enough to offset the cost incurred from setting a flat rate for certification. In this manner, licensing works as a progressive tax on those facilities generating greater revenue.

c. *Compliance*

The two important aspects of compliance are recertification procedures and criteria revision. Under AEP, certifying teams would return to accredited aquaculture facilities for recertification every two years.[186] This would prevent fish farmers from relaxing the standards while still receiving the benefits of the eco-label. Recertification would only take place every two years because of the cost. If producers are over-burdened by the cost of recertification procedures they may opt not to seek the eco-label. While a two-year period may seem to liberal, competitors will have an incentive to inform AEP officials if they suspect a facility has let its environmental standards weaken.[187]

The AEP would also require criteria revision to reflect improved methods and technology in aquaculture. AEP's broad standards need not be updated, as they call for general environmental harm prevention and mitigation, but the specific standards drafted for each facility by the certifying teams would have to be revised. Certifying teams would have to engage in a constant review of individual standards set for specific aquaculture facilities. Consequently, the number of facilities assigned to one certification

184. EWG, *supra* n. 161.

185. This is the method utilized by ECP. OECD, *supra* n. 117, at 24.

186. The German Blue Angel program awards labels for a maximum of four years. OECD, *supra* n. 117, at 27.

187. Gesser, *supra* n. 143, at 510.

team would need to be limited in order to enable the team to adequately address specific sites.

Third, AEP would be configured to allow sixty to seventy-five percent of products to meet the criteria. Other existing programs take a different approach, allowing only twenty to thirty percent of products to meet the standards.[188] Under either approach, once the set percentage of products meets the criteria, the standards are raised.[189] Setting the percentage too low may stifle innovation because mathematically, chances are against a producer receiving the eco-label. Producers have no incentive to bother taking on the cost of trying to obtain it by lessening the environmental impact of their product.[190] While allowing more products in means lower standards, it seems that AEP's method will have a greater impact on mitigating environmental harm, concentrating first on the worst environmental offenders. If a majority of producers qualify for the label, those who are left out will have a greater incentive to qualify due to loss of market share. Once more than the set percentage of products meets the criteria, the standards can be raised just as in existing plans.

3. *Adherence With Principles of Free Trade*

Free trade implications of AEP are beyond the scope of this paper, but a brief explanation of the issues is helpful. Because AEP attempts to reach in to other nations and make producers conform to US standards, it must comport with international free trade law. Although proponents point out that eco-labeling in general does not constitute a tariff or a qualitative ban on products, it could be construed as *de facto* discrimination against foreign suppliers.[191] However, AEP's emphasis on transparency, collaboration with foreign producers, and nondiscrimination could make it able to withstand a World Trade Organization/General Agreement on Tariffs and Trade ("WTO/GATT") challenge. As more national and international eco-labeling schemes are created this WTO/GATT issue will become clearer.

IV. CONCLUSION

Aquaculture has tremendous potential to provide the world with seafood while reducing strain on wild stocks. Unfortunately, it also causes myriad environmental harms. Maximizing the benefits and minimizing the costs is the key to any form of regulation, market-based or otherwise. A government coordinated eco-labeling program could provide such a service. If administered transparently, the plan could survive WTO/GATT scrutiny,

188. For example ECP's goal is to have 20% of products within a category to meet the standards. OECD, *supra* n. 117, at 23.

189. *Id.*

190. *See* Richards, *supra* n. 108, at 250.

191. UNCTAD, supra n. 114, at 5-6.

and if that were to happen, it would open the door for all nations to institute similar plans. Moreover, these plans could address more products, resulting in greater consumer awareness and the minimization of environmental harm on a global scale.