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CHAPTER 5

Meat and Seafood: The Global Diet's Most Costly Ingredients

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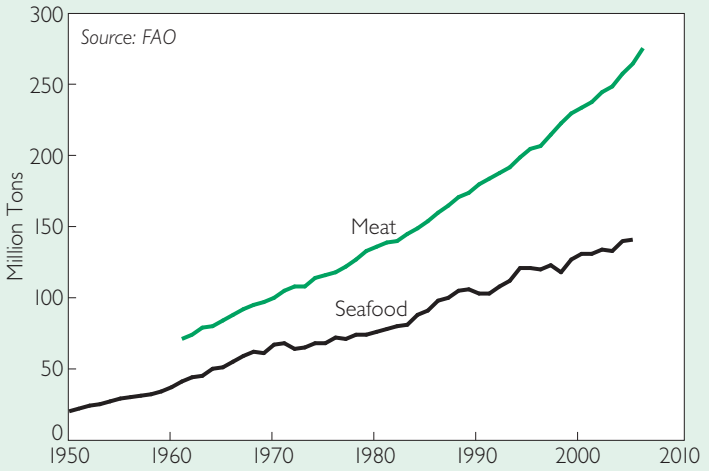
Walk into any kitchen around the world and there's a good chance that meat or seafood sit neatly at the center of the meal. This is especially true at any top restaurant in New York, Rio, or Beijing. But billions of people all over the world have hamburgers or pork chops or fish fingers with their families at home every night. Even the poorest people often spend their extra income on some odd cuts of meat or fish bones for soup. In fact, meat and seafood are the two most rapidly growing ingredients in the global diet. Yet in terms of resource use, these are also two of the most costly.

In 2006 farmers produced an estimated 276 million tons of chicken, pork, beef, and other meat—four times as much as in 1961. On average, each person eats twice as much meat as back then, about 43 kilograms. And the fishing industry harvested about 141 million tons of seafood globally in 2005, the last year for which data are available. That was eight times as much as in 1950, with each person on average eating four times as much seafood as before. (See Figure 5–1 and Table 5–1.)[1]

For people living in wealthy nations, seafood is an increasingly popular health food option; with its high levels of fatty acids and trace minerals, nutritionists recognize seafood as essential to the development and maintenance of good neurological function, not to mention a reduced risk of cancer, heart disease, and other debilitating conditions. In poorer nations in Asia, Africa, and Latin America, people are also eating more fish if they can afford it. And Chinese consumers now eat roughly five times as much seafood per person as they did in 1961, while total fish consumption in China has increased more than 10-fold. For more than a billion people, mostly in Asia, fish now supply 30 percent of their protein, versus just 6 percent worldwide.[2]

The good news is that there are methods of raising beef, pork, and chicken that do not create mountains of toxic manure and consume huge amounts of grain and water, as well as techniques for catching fish that do not end up destroying coral reefs and ensnaring

Figure 5–1. World Meat Production and Seafood Harvest, 1950–2006



seabirds and turtles. These innovations will be much cheaper in terms of energy and resource use as well as health impacts. But the price that consumers pay at the store or market will likely rise. Rethinking how fish and meat are produced will mean that consumers in industrial countries will have to eat fewer of these products—surf-and-turf dinners for executives may become a thing of the past, as will cheap fast-food meals of fried fish and hamburgers that have become a dinnertime staple for busy families. Eating less of these foods now, however, is a sort of investment in the future, since it will mean saving family farms, improving rangeland, reducing water pollution, and—in the case of wild fish—preserving a catch that is increasingly scarce.

Changing Production Methods

How did the meat and seafood that people eat change so dramatically? Industrial meat production took off in the early twentieth century with a series of changes in animal breeding and farm structure and with the rise of corporate agribusiness. Before World War II, cattle were raised on the open range, eating a grass-based diet. Chickens—raised mostly for their eggs, not meat—were allowed to forage outdoors for grass and insects. Pigs, while usually enclosed in open air pens, were given sufficient space to nest and root, as well as access to fresh air and sunlight. And the manure these animals produced was used efficiently to fertilize crops.[3]

But starting in the 1930s farmers began raising chickens for meat as well as eggs. Researchers developed new, higher-efficiency feed for these meat chickens, now called broilers. Then scientists discovered that adding antibiotics to feed caused these birds—and other farm animals—to gain weight quicker. Since the 1950s, the time it takes to raise broiler chickens decreased by half, from 84 to 45 days. Today broilers eat less than half as much feed and reach a weight of 2 kilograms in about one third as much time. By the 1960s, pigs and cows were also being raised in feedlots and confined animal feeding operations—indoor enclosures that can hold thousands of animals.[4]

In the case of fishing, the technologies were different but the broad changes in the industry were largely the same. Fishing fleets became larger, more powerful, and better at extracting fish from ever more remote corners of the ocean. Boats now depend on devices such as sonar technology, satellite navigation

Table 5–1. Meat and Seafood Consumption in Top Five Countries or Regions, 2005, and Increase since 1961

Country	Meat		Seafood	
	(kilograms per person)	(percent increase since 1961)	(kilograms per person)	(percent increase since 1961)
China	55.5	14.6	25.8	5.4
Japan	91.0	1.7	66.5	1.4
European Union	44.3	5.9	26.5	1.5
United States	123.5	1.4	23.2	1.8
India	6.0	1.6	4.9	2.6
World	42	1.8	23.5	1.8

Source: See endnote 1.

systems, depth sensors, and detailed maps of the ocean floor. Enormous nets made out of synthetic fibers and huge winches give boats access to previously unreachable deep-sea areas where fish gather and spawn. Some fishing boats in the Atlantic Ocean use spotter planes, while in the Pacific fishers use helicopters to seek out schools of prized fish and scoop them up in huge quantities. These technologies are part of the reason that the wild fish catch holds steady at about 70 million tons even though scientists estimate that the fishing industry has eliminated 90 percent of the large fish in the ocean.[5]

When these practices first emerged in fishing ports and rural farming areas, they might have seemed like a good idea—more seafood harvested by bigger boats and fewer fishers; more meat on a more reliable schedule at a lower price. Agribusiness executives saw profits jump. Politicians supported the shift in the interest of competing better with other nations, having more abundant food supplies, and in some cases lowering food prices.

But these lower prices were an illusion. By raising meat in factory farms and grabbing fish and other seafood from the ocean with huge trawlers and other industrial fishing techniques, current production methods are endangering people's health while also threatening the long-term stability of the land, oceans, and genetic diversity that sustain production itself.

In one particularly ironic case, producing meat in midwestern factory farms may actually be reducing the fish harvest from one of the most productive U.S. fisheries. The fertilizers used to grow corn for animal feed run off into surface water and eventually make their way down into the Gulf of Mexico, where they have created a "dead zone" the size of New Jersey. The nitrogen-based fertilizers encourage algae blooms that rob other ocean life of oxygen. This area produces some $662 million worth of seafood each year, nearly one fifth of the entire fishing yield from the United States. And although there is only anecdotal evidence of a decline in fisheries harvests in the Gulf, experience from other less severe dead zones around the world shows that catches can drop precipitously.[6]

Emerging concerns about these two food sources—including avian flu and other new diseases in the case of meat and outright depletion and contamination in the case of seafood—are prompting consumers, fishers, farmers, and agribusiness to search for better alternatives.

Going Back to Nature

Part of the reason that livestock and fish farms have become ecological disasters is that they have moved away from mimicking the environment in which animals exist naturally. Decades ago, before the big jump in production, livestock played a symbiotic role on

most farms—grazing on cropland before or after production and providing essential fertilizer in the form of manure. Fish ponds occupied a similar place on most farms, feeding off of agricultural waste and helping to enrich soil. But once farmers removed livestock and fish production from the land, the need for inputs jumped and the manure began to pile up.[7]

In places as diverse as the Philippines and Iowa, some farmers are going back to more traditional methods of farm animal production. Outside Manila, for example, innovative farmers have learned from the centuries-long practice of raising livestock and fish together. By rearing hogs, chickens, and tilapia and by growing rice, these farmers have created a self-sustaining system: the manure from the hogs and chickens fertilizes the algae in ponds needed for both tilapia and rice to grow. And in central Iowa, pig farmers are remodeling "conventional" concrete sheds for raising pigs into open areas with deep bedding and outdoor access and raising heritage pig breeds, like Berkshires and Tamworths. These breeds are more used to living outdoors, and because they are allowed to forage, their meat is tastier and healthier than factory-farmed pork.[8]

Outside Manila, innovative farmers have learned from the centuries-long practice of raising livestock and fish together.

These farms produce very little waste, provide a diversity of food, and give farmers a much needed sense of both food and economic security if prices for meat or fish fluctuate. The farms also cut down on veterinary costs: Animals that are raised outdoors rarely suffer from the respiratory ailments and other illnesses common in factory farms. And because farmers raising grass-fed animals have fewer of them than factory farms do, they are much better at spotting and treating sick and injured animals and at preventing potential pandemics like avian flu.[9]

Of course, going back to a more traditional way of raising meat and fish is not completely practical. Many people who used to farm have moved away from the countryside, and farms are bigger and more concentrated than they once were, all of which makes it hard to return to a more integrated form of production. But meat and seafood farmers around the world are mixing a dose of old-time practices with certain lessons from modern ecology and showing that they can raise just as much food, while greatly reducing the harm caused by their farms.

For years, for example, the pig industry has said that gestation crates—concrete stalls that do not allow pigs to move much, turn around, or act in other natural ways—are the most economical way of meeting demand for pork products. But recent Iowa State University research that compared the costs of raising sows (female pigs) in gestation crates and alternative structures found otherwise. Instead of confining pigs in crowded factory farms, the researchers reared sows in group hoop houses—pens that allow the animals to nest in straw and walk around freely. A two-year study found that sows in hoop houses had more live births than those in confinement facilities. Researchers also found that group housing could reduce production costs by as much as 11 percent compared with gestation crates. Pigs are not only very social creatures, but when allowed to nest together they can better control their own temperatures, which can improve overall health and performance, the researchers claimed.[10]

This type of mangement-intensive farming will also create more jobs. According to agricultural economist William Weida, one reason factory farms claim that they are profitable is that they need fewer people to take care of the

animals. But recent evidence indicates that when animals are well cared for they perform better. Smithfield, for example, the world's largest pork producer, found at one of its hog farms in Mexico that productivity increased when they had more people tending the pigs. These practices are part of a much wider movement toward humanely raised and environmentally sustainable products from animals that were raised on grass.[11]

Raising cattle, cows, pigs, and chickens—and raising fewer of them—in more natural environments also has some significant benefits for what is likely the most pressing environmental issue today: climate change. Researchers at the University of Wales are looking at how introducing different grasses—which are what ruminants are meant to eat—into cattle diets can help reduce the methane emissions from belching, flatulent cows. While the diet fed to cattle and dairy cows on factory farms encourages them to gain weight quickly, it also leads to a variety of digestive problems. Scientists believe that more-digestible feed will reduce these problems and thus help curb methane emissions. Not surprisingly, some of the grasses found commonly in U.K. pastures and meadows—including white clover, rye, and a flower called bird's foot trefoil—are highly digestible. And a Swedish study in 2003 found that beef cattle raised organically on grass emit 40 percent less greenhouse gases and use 85 percent less energy making beef than cattle raised on grain.[12]

While improving meat farming largely means moving animals out of grain-focused feedlots and back onto the land, the simplest way to reform fish farming is by moving back down the food chain toward species that do not require as much fish feed. As seafood producers have begun farming fish to compensate for the depletion of wild fish stocks, farmed fish have grown to account for 40 percent of all seafood eaten around the world. Industry analysts suspect this share will be well above half in the next few years. But much like the move to concentrated factory farms for meat, fish farming has been transformed from its ancient roots of efficiently reusing vegetable scrapes, weeds, and manure to raise a few carp or catfish.[13]

The closely confined fish on industrial farms require massive inputs of feed, energy, and biocides to control disease, while also generating large amounts of manure. Today, fish farmers raising tuna, salmon, striped bass, shrimp, and other carnivores consume considerably more fish—anchovy, herring, capelin, and whiting—in the form of feed than they produce. In 1948, only 7.7 percent of total marine catch was reduced to fishmeal and fish oil. Now about 37 percent of global landings are reduced to feed, eliminating an important historical and future source of human sustenance.[14]

Understandably, farmers raise carnivorous fish like salmon, tuna, and cod in large open-ocean pens because of the high prices these fish command. Only a shift in taste by consumers will help push farmers toward raising more-efficient species like carp and catfish as well as shellfish. In the short term, however, fish farmers are at least starting to move—in line with the urgings of various concerned citizens' groups—in a better direction.[15]

Consider salmon, the first species to be raised in fish farms on a large scale. Several decades of production in nations like Chile, Norway, and the United States have shown that such farms also lead to large amounts of coastal pollution from waste and excess feed, the use of antibiotics and other chemicals to control disease, and the occasional escape of millions of salmon into nearby waters, where they often spread disease to remaining wild salmon.[16]

In response, the National Environmental

Trust and other conservation groups, fishing organizations, and marine scientists launched the Pure Salmon Campaign. The group has eight primary areas—such as waste, disease, and escapes—that they encourage salmon farms to address. In particular, the campaign has been lobbying for a move toward closed-container farms, so that water can be reused and any pollution from the fish can be treated and kept out of the surrounding waters. And they have started lobbying the world's largest salmon farming companies—including Marine Harvest, which controls more than 20 percent of global production—with a combination of shareholder resolutions and direct negotiations with corporate boards. Most recently, they helped convince Marine Harvest's largest shareholder (an avid angler for wild salmon) of the importance of closed-container farms.[17]

In many densely populated Asian nations, where demand for seafood is growing fastest, fish farming is a natural addition to existing rice farming operations.

But what about the high feed requirements in salmon, shrimp, and other carnivorous fish farms? Borrowing principles from ancient fish farms that raised several species of carp that each fed on a different plant or that combined ducks, fish, snails, and other organisms that fed off each other, integrated farms can reduce feed requirements and waste while generating more edible seafood than a fish monoculture does. While large-scale applications are still relatively few and far between, raising salmon with bottom-feeding fish, mussels, sea urchins, or algae can help eliminate most nitrogen "leakage" from the salmon, while also producing other harvestable crops. (Mussels actually grow 50 percent faster near salmon pens.)[18]

In Norway, several large farms have found that introducing cleaner fish—a species that cleans parasites and leftover food off other fish—into salmon pens dramatically reduces lice (the major disease of farmed salmon, which also has been spreading to and decimating wild salmon throughout the world) and feed wastage (as the cleaner fish scavenge what the salmon miss) and that the cleaner fish can later be harvested to turn into fishmeal. Salmon production remains the same while waste drops by more than half, the incidence of disease drops, and the farm harvests two or three additional crops.[19]

Because oysters, clams, scallops, mussels, and other shellfish eat algae and can help filter and reduce excess nutrients that run into the water and promote algae blooms, coastal communities around the world are using shellfish farms to remove nutrients from bays, rivers, and coastal waterways. Studies have shown that enhancing shellfish beds is a cheaper way to remove nitrogen from the water than sewage treatment plants. This allows sunlight to reach the bay bottom so that grasses and the other bases of the food chain thrive. "By providing these three services—filtration, stabilization and habitation—oysters engineered the ecosystem," wrote shellfish expert Rowan Jacobsen in *A Geography of Oysters* when describing the historic role of oysters in places like the Chesapeake Bay on the east coast or Puget Sound in the west.[20]

A return to oyster farming could not only result in lots of new jobs and shellfish to eat. It might actually be the best way to restore inland estuaries, coral reefs, and coastal ecosystems damaged by pollution, including the more than 200 large dead zones that have been caused by excess nutrient runoff. Moreover, the metal cages that hold the shellfish in these operations function as artificial reefs. Fishers have learned that striped bass, shad,

and other species congregate around them.[21]

In many densely populated Asian nations, where demand for seafood is growing fastest, fish farming is a natural addition to existing rice farming operations. This isn't new. Archeological evidence shows that Chinese farmers have been raising fish in rice paddies for nearly 3,000 years. Vegetable scraps and crop residues are fed to fish, which in turn produce waste that is used to fertilize the fields. Farmers can also use fewer pesticides and herbicides, since fish help control pests by consuming the larvae and eating weeds and algae that compete with rice for nutrients. (Fish farming also helps to control malaria, since fish eat mosquito larvae.)

Farmers practicing rice-field culture in Bangladesh have managed to reduce production costs by 10 percent, and the average farm income has increased by 16 percent in just three years, buoyed by sales of fish fry and fingerlings as well as of fish that farmers do not eat. One hectare of rice field typically produces between 250 and 1,500 kilograms of fish. Thousands of rural Bangladeshis have already adopted this form of affordable aquaculture. And researchers suggest that farmers could quickly adapt this integrated system on about 40,000 hectares, generating 10,000–60,000 tons of fish, worth roughly $40 million a year.[22]

Such benefits are not restricted to Asia. A recent project that focused on increasing production at several hundred small-scale fish farms in Cameroon found that basic technical assistance—including regularity of feeding, proper stocking densities, and a harvest schedule—boosted production from 498 kilograms to 2,525 kilograms of fish per hectare and increased cash returns 16-fold. The researchers estimated that in areas with good market access, similar investments could add 5,300 tons of fresh fish to the food supply, put an additional $50 million into the local economy, and produce profits for each farm in the range of $2,000 a year—twice the average income per person.[23]

A Change in Incentives

For governments interested in being ahead of the pack in promoting ecological meat and seafood farms, the biggest priority is changing the major financial incentives they give to farmers and fishers. Right now, most subsidies keep farming and fishing mired in the status quo of destructive production. For instance, governments give farmers nearly $300 billion each year to grow a handful of commodities like corn and soybeans, which not only encourages chemical use and discourages diversity on the farm—since farms get paid based on how much of these crops they harvest—it also brings down the prices of these crops and turns corn and soybeans into a very cheap way to fatten animals.[24]

The Washington-based Environmental Working Group reports that direct subsidies for livestock between 1995 and 2005 totaled $2.9 billion in the United States alone. During the same time, corn and soybean producers—who provide, in effect, the fuel for confined animal feeding operations—received approximately $50 billion and $13 billion respectively.[25]

The estimated $30–40 billion in fisheries subsidies each year goes mainly to low-interest loans to replace old boats with more powerful, newer ones, to fishing port development, and to payoffs from wealthy nations that wish to gain access to the fishing grounds of poorer countries. As one historic analysis of fisheries subsidies noted, "in the 1950s and 1960s, the more boat-building subsidies you gave, the more fish you got." But since more than two thirds of ocean fisheries are now fully exploited, continued subsidies mean that too many fishers are going after too few fish.[26]

As Daniel Pauly of the Sea Around Us Project at the University of British Columbia notes, the public pays for these subsidies with tax dollars and is rewarded with cheaper fish only in the short term. As in agriculture, the wealthiest nations and the largest boats reap most of the benefits: the United States, the European Union, and Japan account for 75–85 percent of fisheries subsidies.[27]

In both farming and fishing, subsidy reform does not have to mean fewer jobs and less food.

Because this support structure favors larger, less diverse, more capital-intensive operations, the prevailing policy actually discourages more diverse and humane livestock farms and less destructive fishing operations.

Subsidies have proved particularly resistant to reform as the recipients have amassed political clout on a par with the payouts they receive. But a first approach would be to go after the most egregious subsidies, including fuel subsidies for fishing fleets. Ships that have to travel farther to find fish gobble up tremendous amounts of energy keeping the fish cool on the long trips back to shore. In 2000, fisheries around the world burned about 13 billion gallons of fuel to catch 80 million tons of fish. In other words, the world's fleets use about 12.5 times as much energy to catch fish as the fish provide to those who eat them.[28]

Consider bottom trawling. Dragging a net across the ocean bottom has been likened to clearcutting a forest in search of squirrels and chipmunks. Such fishing is energy-intensive and destroys habitat, including sensitive deep-sea areas that can harbor future populations of fish. Governments still give bottom trawlers about $152 million in subsidies. That is about 25 percent of the total value of the boats' catch, even though this fleet only yields about 10 percent of the catch in profits. In other words, the subsidies are the only reason fishers are still using the technique.[29]

Or consider subsidies in many developing nations that either directly or indirectly favor raising exotic breeds of animals. The Farm Animal Genetic Resources Division of the U.N. Food and Agriculture Organization reports that subsidies for veterinary drugs can encourage raising animals that are not suited to particular climates or that have resistance to certain pests. But if these subsidies were removed and replaced with compensation for farmers who raised their animals outdoors on grass or who worked to conserve rare breeds, the environmental and public health benefits could be wide-ranging.[30]

In both farming and fishing, subsidy reform does not have to mean fewer jobs and less food. Redirecting subsidies that go to the largest operations can actually create more jobs, since small livestock farms and fishing vessels both employ more people per unit of food harvested. A study in Norway found that small-scale fisheries generate five times as many jobs per unit of landed value as large-scale ones. Small-scale fishers are also likely to use more selective and less destructive fishing practices—catching tuna with handlines, for instance, instead of long lines that snag sharks and seabirds or using passive traps to only catch certain fish instead of dragging, which kills everything in the net.[31]

And despite the fears of farmers and governments that eliminating subsidies would destroy agriculture, farmers and agribusiness can actually thrive with zero subsidies. In New Zealand, in 1984 a newly elected government stopped paying farmers for growing crops and raising animals. It was a shock to rural communities. But instead of destroying them, production of milk quadrupled.[32]

Without subsidies for fuel and grain, New Zealand dairy farms have turned to nurturing

the nation's abundant pasture. Farmers shifted away from Jersey cows, with milk rich in butterfat, to larger Friesians, which provide more protein-rich milk. A "Kiwi cross" of the two breeds resulted in a higher-protein milk in a more compact, hardier animal. Today, cows in New Zealand cost less to feed and yield more milk solids, making them more profitable. Sheep farmers also responded, reducing their huge herds of mostly small and fatty lambs, importing breeds from Finland and Denmark to improve the fertility of their ewes, and producing larger, leaner lambs that were both less expensive to raise and more appealing to health-conscious consumers.[33]

In other cases, subsidies can help jumpstart a completely different regulation of the oceans. Some maritime nations, including Belgium, Canada, China, Germany, New Zealand, and the United Kingdom, are beginning to shift their fisheries subsidies toward establishing marine reserves in which a swath of ocean is made off-limits to any fishing.[34]

In contrast to the current system, which regulates fish species by species and which sets sometimes controversial limits on how much of each can be caught in a given time, marine reserves do not require expensive data collection programs in order to gain a detailed understanding of the fish stock. Nature manages itself; the entire ecosystem gets protection rather than just one species, and fish have a safe place to get big, spawn, and produce young fish that migrate out of the preserve. Evidence shows that fish populations recover rapidly in such reserves and that nearby fish catches and sizes increase dramatically after a reserve is set up.[35]

A recent study estimated that establishing reserves for all the world's major fisheries would cost $5–19 billion each year and create about 1 million jobs. Beyond increasing the fish catch, these reserves make ideal centers for tourism and help restore coral reefs, mangroves, and other ocean ecosystems, yielding other benefits to society. Delegates at the 2002 World Summit on Sustainable Development and the 2003 World Parks Congress called for the establishment of a global system of marine protected areas, and scientists estimate that making just 20 percent of the oceans off-limits to fishing would be sufficient. Today only 1 percent of the world's ocean area is currently protected.[36]

Embracing the Ethical

Governments and policymakers can shift policy and enact regulations on food, but it is consumers and big buyers who can rapidly reshape the market and make the most impact by voting with their food dollars. From farm-friendly companies like Niman Ranch and Heritage Foods U.S.A. to major corporations like Whole Foods, and even Smithfield Foods, business is starting to meet consumer demand for safe, humane, and sustainable meat production. The same is happening in the seafood supply chain—from fishing cooperatives whose members are returning to less destructive artisanal methods to large supermarket chains that are marketing sustainable seafood as the healthier choice.

There are two sides to this innovation—a move by the food industry to embrace ecologically sustainable food and label it as such and a reciprocal response from shoppers who seek out this choice. In some cases consumers help set the relationship in motion. Heritage and rare breeds of livestock are coming back in vogue because of their unique qualities: healthier meat, milk, and eggs and better flavor. More sustainable fish also are often the ones that have a lower risk of mercury contamination, because they tend to be lower on the marine food chain.

These markets for ethical meat and seafood cannot grow without clear labels and certifi-

cation programs that ensure that one farmer or fisher is different from another—and that consumers are really getting what they pay for. In the case of seafood, the impetus for such certification actually came from Unilever, the Dutch food and consumer products giant. In the 1990s, Unilever—then the world's largest seafood buyer—faced considerable pressure from its customers and from environmental groups to rethink its seafood purchases. But the company needed some guidance on which species to avoid and which to favor.[37]

Working with WWF, Unilever helped create the Marine Stewardship Council (MSC) in 1997 to certify fish populations as sustainable and to provide direction for the nascent sustainable seafood market. The MSC is now supported by at least 100 corporate, environmental, and consumer organizations in more than 20 nations, all of whom have a stake in the future of the global seafood supply. Certified fisheries can use the group's "Fish Forever" ecolabel, signifying that their product was caught using environmentally sound, economical, and socially responsible management practices. More than 300 seafood products bearing the MSC blue ecolabel are available in supermarkets in nearly 30 nations.[38]

Certain seafood companies are beginning to base their entire business on "the story behind the fish"—how it was raised, caught, and processed—just as many supermarkets and agribusinesses now capitalize on rising global interest in organic produce, grass-fed beef, and other "environmentally friendly" food choices. Consider EcoFish, a distributor based in the state of New Hampshire. Founded in 1999 as the only company in the world whose sole mission was to identify and market seafood originating from environmentally sustainable fisheries, EcoFish's products are now found in more than 1,000 stores and 150 restaurants throughout the United States. Another U.S. firm, CleanFish, specializes in finding a market for seafood caught by smaller-scale fishers around the world, whose artisanal techniques are less likely than large-scale fishing fleets to harm the marine environment (and the quality of the fish flesh).[39]

In contrast to certification through the MSC, an expensive process that can take some time and begins in response to requests from fisheries, EcoFish and CleanFish seek out seafood supplies from around the world and then assess whether they meet certain standards. This has allowed the two firms to offer a wider range of seafood—including farmed seafood—and to offer products years before they receive MSC certification. EcoFish recently received an investment grant that it hopes will allow its sales to grow fivefold in the next three years, to $15–20 million. EcoFish products are now available in 243 branches of Loblaws, Canada's largest seafood retailer.[40]

These innovations in sales pitch have a way of being contagious, particularly when they involve big players in the market. In June 2007 Tyson Foods—one of the largest meat processors in the world—decided to quit doing something that has been a hallmark of industrial animal agriculture since the 1950s. The company announced that the birds it sells to grocery stores and restaurants all over the country would no longer be treated with antibiotics. This move was not altogether altruistic or even based on health concerns about antibiotics resistance. Instead, Tyson was reacting to consumer demand for antibiotic-free meat products.[41]

Once one major industry player makes the shift, its competitors often must do the same or risk losing business. In early 2006, Darden Restaurants—parent company of Red Lobster, the top seafood restaurant chain in the United States, with 1,300 locations—

announced plans to certify all its farm-raised shrimp "to ensure it is grown in a sustainable way, with minimal impacts on the environment." And Wal-Mart, the world's largest retail store and the largest food seller in the United States, announced that within three to five years it would be certifying that all its seafood for the North American market was raised sustainably. Critics suggest the standards could be stiffer, and implementation is far from assured.[42]

Other big companies are also jumping on the natural, organic, or humanely raised bandwagon, partly for economic reasons. Smithfield announced in 2005 that it would only buy from suppliers who did not use antibiotics on their animals. Burger King—the second largest fast-food company—has said that it will try to buy animals that are given more living space. Natural foods giant Whole Foods will introduce labeling criteria in 2008 that give consumers detailed information about how the meat on their plates was raised, treated, and slaughtered.[43]

Consumers are also looking to connect directly with livestock producers. A few years ago it was hard for consumers to find farms where they could buy grass-fed and pasture-raised eggs, meat, and milk. Today there are more than 800 U.S. and Canadian farms listed on the Web site Eatwild.com, an organization that promotes grass-raised animal products.[44]

Fishing communities are a growing ally in this movement. Fishers are often the first to know that a given fish supply is endangered. So it is not surprising that fishers are using the newfound consumer awareness about the state of the world's fisheries to redefine their own role. In some cases this means returning to older fishing techniques that are less destructive and that help preserve the quality of the seafood. The Cape Cod Commercial Hook Fishermen's Association, faced with depletion of the cod stock that historically sustained its members, decided to promote "old fashioned" hook lines that mean considerably less bycatch and fish that are less likely to get damaged, so that their texture and taste are usually superior.[45]

In other cases, like Alaska's wild salmon fishery or wild shrimp harvesters off Viet Nam's coast, fishers are forming cooperatives to manage a given fishery collectively and perhaps even to cut down on the total catch. When it is their own survival at stake, they are proving to be quite innovative. And just as seafood companies are beginning to see fish as a form of wildlife rather than just a commodity, fishers are making a similar shift in mindset, adopting a marketing strategy that treats the fish as a higher-value product rather than a low-cost raw material for processing.[46]

Moving Down the Industrial Food Chain

For the poor, whose diets might be confined to starchy staple crops, meat and seafood bring both increased status and added nutrition. For the wealthy, a meal is not complete unless it includes chicken, pork, or beef, while health-conscious consumers often replace the traditional meat serving with tuna, swordfish, or some other seafood. But consumers need to rethink their relationship with all these foods in order to keep them on the menus in fine restaurants as well as on the plates of people in the developing world.

Under this new food paradigm, people will need to reconsider the place of meat in their diets. Raising animals outdoors on grass will necessarily mean that there are fewer of them to eat, and higher prices for sustainably and humanely raised meat will mean shifting this from the center of each meal. The same is true for seafood. Fish, especially the big, carnivorous species, will not be as readily available, and consumers will have to eat

fewer of them and more of certain other fish. Chefs, large food buyers, and consumers will need to explore less well known fish species and choose seafood that is lower on the marine food chain.

Many consumers are giving up meat altogether as the health and environmental benefits of doing so become clearer. And it is becoming easier to obtain meat alternatives. Researchers at the Vrije University of Amsterdam, for example, are developing alternative meats based on peas and other legumes that are highly nutritious, extremely economical, easy to prepare, and—perhaps most important—tasty. And consumer perception of these products has been positive, especially when people learn more about how their meat is raised and the ecological impact of raising animals in a densely populated nation like the Netherlands.[47]

Slow Food offers an alternative to fast-food culture by celebrating regional cuisines, distinct crop varieties, and forgotten food traditions.

While the growth of industrial meat and seafood production is likely inevitable in the developing world, livestock producers and fishers everywhere have an opportunity to improve meat and seafood. When it comes to producing meat, eggs, milk, and seafood, bigger does not necessarily mean better—or even more profitable.

For both meat and seafood, eating lower on the food chain generally reduces the harm done by these products. In the case of fish, the smaller, herbivorous species (shellfish, anchovies, catfish, and tilapia) are less endangered and fished in a less destructive way than the larger, carnivorous species (tuna, swordfish, and shark). For meat, eating fewer animal products in general and eating eggs, beef, pork, and chicken from animals raised on a natural diet of grass is healthier for people, for the animals, and for the environment.

Many of the innovations that will reduce the ecological burden of meat and seafood can also help make these foods more available to poorer communities. Adding fish ponds to rice paddies and coastal agriculture is an easy way to boost a farmer's income and dietary options. Setting up no-fish zones around coral reefs and spawning grounds boosts the fish catch for both rich and poor fishers. And while cows or pigs bred for industrial-scale production may not thrive in poor areas where farmers cannot provide feed and veterinary inputs, hardier, indigenous breeds may be the best hope for adding milk and eggs to the local diet.

Rather than burden consumers with lengthy lists of "good" and "bad" food, a group called Slow Food International has tried to give seafood lovers, as a start, some basic rules of thumb that depend on a more holistic understanding of what is happening in the oceans. With a membership that includes 100,000 people in more than 80 nations, Slow Food offers an alternative to fast-food culture by celebrating regional cuisines, distinct crop varieties, and forgotten food traditions.[48]

The organization held a meeting in 2007 called Slow Fish that brought together small-scale fishers, chefs, and seafood companies to suggest how people could continue enjoying seafood without compromising responsibility. Participants called for support of "small-scale inshore fishing and ancient methods of fishing, processing and preserving which are sustainable and produce outstanding products that form part of our cultural identity." They urged people to eat fish lower on the food chain—such as the smaller, spinier fish that have long been part of Mediterranean cuisine—and to support traditional, low-impact

types of fish farming, such as oyster farming and low-density freshwater pool systems.[49]

In Peru, several marine scientists have taken this message to heart and have launched a campaign to change the image of the *anchoveta* from something that only poor people eat to a fish that could be turned into a gourmet item consumed by connoisseurs. The Peruvian anchovy accounts for about one tenth of the wild fish netted around the globe each year. And yet nearly all of these small fish—chock full of the same beneficial fatty acids found in tuna, salmon and other big fish—get ground into fish meal and fish oil that will be used to fatten pigs and chickens in factory farms in North America, Europe, Japan, and other areas.[50]

As part of Discover the Anchovy Week in 2006, some 18,000 people tasted anchovies at 30 restaurants in Lima. Fresh anchovies are now available in many of the nation's markets, and the government is supplying the fish as part of its hunger programs. Researchers estimate that Peru could employ many more people and generate 10 times the revenues if the high-volume, low-value fishmeal industry were retooled to carefully package the anchovy as a fresh fish for local consumption and export.[51]

Part of the global impact of this gastronomic shift is that it would make much better use of beleaguered fish populations. "We can still savor seared ahi and grilled swordfish steaks—they have the best meat and few bones, after all—but we must reserve them as a luxury product," notes Martin Hall, chief scientist of the Dolphin Tuna Program at the Inter-American Tropical Tuna Commission. He explains that "it takes close to 60 million metric tons of potentially edible fish per year to feed the three million metric tons of the three major tropical tuna species we harvest annually. If we could replace some of our tuna sandwiches with the anchovies, sardines, squids, and other species the tuna eat, we would open up a substantial supply of protein that could feed millions more."[52]

In Japan, recent reductions in tuna catch quotas and soaring prices have prompted sushi chefs and home cooks in this fish-loving nation to search for substitutes. The Japanese consume about three quarters of the world's annual tuna catch. As the *New York Times* reported in the summer of 2007, Tadashi Yamagata, vice chairman of Japan's national union of sushi chefs, has been experimenting with tuna alternatives at Miyakozushi, his family's busy lunchtime restaurant in Tokyo. His most successful substitutes were ideas he "reverse imported" from American sushi bars, like "smoked duck with mayonnaise and crushed daikon with sea urchin."[53]

Other groups, like Heritage Foods USA, encourage customers to eat antique or heritage breeds of cows, pigs, chickens, and other foods in order to save them from extinction. The most well-known example is the turkey variety known as Bourbon Reds. These birds were almost extinct because of industrial farming practices that favor fast-growing but flavorless, big-breasted birds. Such birds are raised on factory farms, are never allowed to mate (they reproduce by artificial insemination), and are pumped full of antibiotics. But thanks to a consumer awareness campaign promoting the hearty, distinctive flavor of Bourbon Reds, these birds are in high demand—last year Heritage Foods sold 3,000 Bourbon Reds in the United States for Thanksgiving—and more and more farmers are raising them.[54]

In the developing world, groups such as GRAIN and the League for Pastoral Peoples are working hard to ensure that livestock genetic diversity is on the agenda of policymakers worldwide. Corporate agribusinesses, says GRAIN, have "dramatically increased

their control over the livestock industry in recent years," and this makes the food system "dangerously dependent on a few corporations and a vulnerable, narrowing genetic base." The group also warns that the vast knowledge attained by livestock keepers over millennia is quickly disappearing and that there is an urgent need for pastoralists and livestock keepers to "reclaim their rights."[55]

Such a historical view is useful. Meat and seafood have long been a part of the human diet, but the form they take has changed as wild populations of fish have waxed and waned, as hunted game gave way to domesticated livestock, and as human desires and culinary fads shifted and spread. The meat of sharks was not in wide demand until recently, for example, when shark fin soup—an ancient Chinese dish that can cost $200 a bowl and was once reserved for the kitchens of the wealthy—became a more common menu item in economically booming China. The roaring market in these fins, which can fetch $700 a kilogram and entice shark hunters from as far away as Ecuador, is driving the killing of roughly 100 million sharks each year and the extinction of most major shark species.[56]

As part of a recent shark awareness campaign, the conservation group WildAid released several graphic videos of sharks being "finned" that were later aired on television in Taipei, Hong Kong, and Singapore. The group also features Asian celebrities like film director Ang Lee and Taiwan's President Chen Shui-bian in public service announcements asking people not to eat shark fin soup. These efforts seem to be paying off. Both Thai Airways and Singapore Airlines pulled shark fin soup from their first-class services in 2000, for instance. And in late 2005, several high-profile institutions in Hong Kong, including Disneyland and Hong Kong University, stopped serving shark fin soup following protests by animal rights and marine conservation groups.[57]

Following their lead would mean breaking with long-standing tradition, but it is not unprecedented. Stark white veal flesh has become a symbol of cruel caging techniques, while "rosey veal" from calves allowed to walk with their mothers is now showing up on menus. Savvy seafood processors are starting to favor wild harvested shrimp over shrimp raised on patches of deforested mangroves. Shark fins, like so many ecologically taxing food items that the planet can tolerate only on a small scale, are something people will need to give up.[58]

But we know that not all meat and seafood is created equal. And innovative farmers, fishers, and food companies have already shown that providing safe, tasty, and humane food does not have to cost our health and the environment so much.

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