

Global study of salmon shows: 'Sustainable' food isn't so sustainable

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Popular thinking about how to improve food systems for the better often misses the point, according to the results of a three-year global study of salmon production systems. Rather than pushing for organic or land-based production, or worrying about simple metrics such as "food miles," the study finds that the world can achieve greater environmental benefits by focusing on improvements to key aspects of production and distribution.

For example, what farmed [salmon](#) are fed, how wild salmon are caught and the choice to buy frozen over fresh matters more than organic vs. conventional or wild vs. farmed when considering global scale environmental impacts such as [climate change](#), [ozone depletion](#), loss of critical habitat, and [ocean acidification](#).

The study is the world's first comprehensive global-scale look at a major food commodity from a full life cycle perspective, and the researchers examined everything - how salmon are caught in the wild, what they're fed when farmed, how they're transported, how they're consumed, and how all of this contributes to both environmental degradation and socioeconomic benefits.

The researchers behind the study sought to understand how the world can develop truly sustainable food systems through the lens of understanding the complexities associated with wild and farmed salmon production, processing and distribution. They found that decision-making for food must learn to fully account for the life cycle

socioeconomic and environmental costs of food production. How we weight the importance of such impacts is ultimately subjective and in the realm of policy and culture, but using a comprehensive approach provides a more nuanced process for informed decision-making. Even food has a lifecycle, and the world must learn to comprehend the full costs of it in order to design reliable, resilient food systems to feed a world population that's forecast to grow to 9 billion in less than 40 years.

The researchers chose salmon as their focus as it exemplifies important characteristics of modern food systems, yet offers unique opportunities for comparison. It is available around the world at any time and in any location, regardless of season or local ecosystem, it is available in numerous product forms, and it is distributed using a variety of transport modes. Unlike many other food systems, however, it is available from both wild sources and a range of farmed production systems.

While it isn't easy to balance people, profit and planet, the world must do much better. Food production, in aggregate, is the single largest source of environmental degradation globally. Impacts vary dramatically depending on what, where and how food is produced. For example, early results of the study found that growing salmon in land-based farms can increase total greenhouse gas emissions ten-fold over conventional farming depending on how and where the farming is conducted. Similarly, while organic farming of many crops offers benefits over conventional production, organic salmon production gives rise to impacts very similar to conventional farming due to the use of resource intensive fish meals and oils. Beyond the farm, it's important to also consider the total impact of food preparation. Driving to the store alone and then cooking alone at home has a big environmental impact. Going out to dinner more, or just eating more frequently with friends and family at home, has huge benefit.

For concerned consumers, it's important to think about how food was

produced and transported - not just where it was produced - when making food choices.

Initial Findings from the Study (More Due with the Final Report in 2010):

- Fish should swim, not fly. Air-freighting salmon, and any food, results in substantial increases in environmental impacts. If more frozen food were consumed, more container ships would be used to ship food. Container ships are by far the most efficient and carbon-friendly way to transport food. Globally, the majority of salmon fillets are currently consumed fresh and never frozen. In fish-loving Japan, which gets much of its fish by air, switching to 75 percent frozen salmon would have more benefit than all of Europe eating locally farmed salmon.
- The choice to buy frozen matters more than organic vs. conventional or wild vs. farmed.
- A full [life cycle](#) assessment approach to research provides a more nuanced process for informed decision-making. Even food has a lifecycle, and we must comprehend the full impact to make meaningful improvements to food systems. Tradeoffs may be inevitable.
- Contrary to what is widely perceived, the vast majority of broad-scale resource use and environmental impacts (energy inputs, GHG emissions, etc) from conventional salmon farming result from the feeds used to produce them. What happens at or around a farm site may be important for local ecological reasons but contributes very little to global scale concerns such as global warming.

- Across the globe, what is used to feed salmon and the amounts of feeds used vary widely. As a result, impacts are very different. Norwegian salmon farming resulted in generally lower overall impacts while farmed salmon production in the UK resulted in the greatest impacts.
- Reducing the amount of animal-derived inputs to feeds (e.g. fish meals and oils along with livestock derived meals) in favor of plant-based feed inputs can markedly reduce environmental impacts.
- Growing organic salmon using fish meals and oils from very resource intensive fisheries results in impacts very similar to conventional farmed salmon production.
- If not planned carefully, technological fixes aimed at addressing local environmental challenges associated with conventional salmon farming can result in substantial increases in global-scale environmental impacts. In general, salmon fisheries result in relatively low global-scale environmental impacts. However, substantial differences exist between how salmon are caught. Catching salmon in large nets as they school together has one tenth the impact of catching them in small numbers using baited hooks and lures.

Across salmon production systems - and all [food](#) systems - the world is often swimming against the tide. Instead of working with nature, people work against it, chasing fish in the open ocean with big diesel engines or substituting energy demanding pumping and water treatment for free ecosystem services in salmon farming. We can and must do better than this and start to swim with the tide.

More information: The most recent published paper from the study can be seen in the journal *Environmental Science & Technology*: pubs.acs.org/doi/abs/10.1021/es9010114 .

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