

RURAL ECONOMY AND CONNECTIVITY COMMITTEE

SALMON FARMING IN SCOTLAND

SUBMISSION FROM JOHN MCINTYRE

The energy and hence carbon cost of farmed salmon

Farmed salmon is NOT the lowest energy or carbon food.

There are two parts to the carbon dioxide / carbon / energy cost question

1. The CO₂ released as the result of the industrial manufacture of the fish cages, moorings, boats, feed barges, fish feed and the fuel used to run the boats etc. This is quite high - comparable with industrial beef production.
2. The CO₂ from the respiration of the salmon. I don't think this matters and in any case if the ecosystem was restored to its historic abundance then the biomass of fish would increase and hence the respired CO₂ flux.

The following give data and references that explain:

Tyedmars [1,2], calculates sea cage salmon farming requires about 50 times more fossil fuel energy than is contained in the salmon as edible food energy. This is less energy and carbon efficient than most other food production systems except for some other intensive aquaculture systems and intensive beef production. It is DEFINITELY NOT the most efficient food production system. (I get estimates between 20 and 50 from an economic calculation using the salmon farming production statistics and the energy density of fossil fuel.)

For comparison first world vegetable farming rarely consumes more than 3 times the amount of energy contained in the food and sometimes breaks even.

Third world farmers, who feed 80% of the human population, get 100 times the amount of edible food energy for every calorie of human effort. In other words they are 5000 times more efficient at feeding people than salmon farmers are. And do so without using much/any fossil fuel.

The table below gives the energy costs of some foods (From Tyedmers, [2], table 80 p 182)

Food production system	Amount of energy and carbon used per unit of edible food energy
Third world farmers	0.01
First world vegetable production	1 - 3
Commercially caught coho salmon (B.C.)	13.5
Milk (USA)	14.1
Swine (USA)	17.9
Commercial cod fishery (USA)	20.0

Chicken (USA)	26.3
Eggs (USA)	26.3
Lamb (USA)	50.0
Intensively cultured Atlantic salmon	50.0
Beef (USA)	52.6

References

1. Energy consumed by North Atlantic Fisheries. In "Fisheries Impacts on North Atlantic Ecosystems: Catch, Effort and National/Regional Datasets"., Tyedmers, P., (D. Zeller, R. Watson, and D. and Pauly, Eds.), Fisheries Centre Research Reports 9(3), 12–34.
2. Salmon and Sustainability: The Biophysical Cost of Producing Salmon Through the Commercial Salmon Fishery and the Intensive Salmon Culture Industry., Peter Horst Tyedmers., PhD. Thesis, Faculty of Resource Management and Environmental Studies at The University of British Columbia
., Submitted in 2000. (Available on line if you search with this title.)

The energy contained in fish feed and harvested salmon

The following which is calculated (very simply) from the Scottish salmon farming industries production statistics and the fish feed manufacturer's own feed composition data (extensively cross checked with data from the USDA, FAO and the UK governments food consumption surveys.)

In 2015 the feed used to feed the salmon contains 6.67 times the food energy contained in the harvested salmon

In 2016 the feed used to feed the salmon contains 7.40 times the food energy contained in the harvested salmon

It follows we could feed 6.67 - 7.4 times the number of people at lower energy and carbon cost if we just eat the salmon food. (Not as salmon food of course but processed into something humans would find acceptable or perhaps used in other foods.)

Note: The salmon farming industry talk about feed in fish out or fish in fish out when what actually matters is food energy in to edible energy in the harvested salmon out.

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