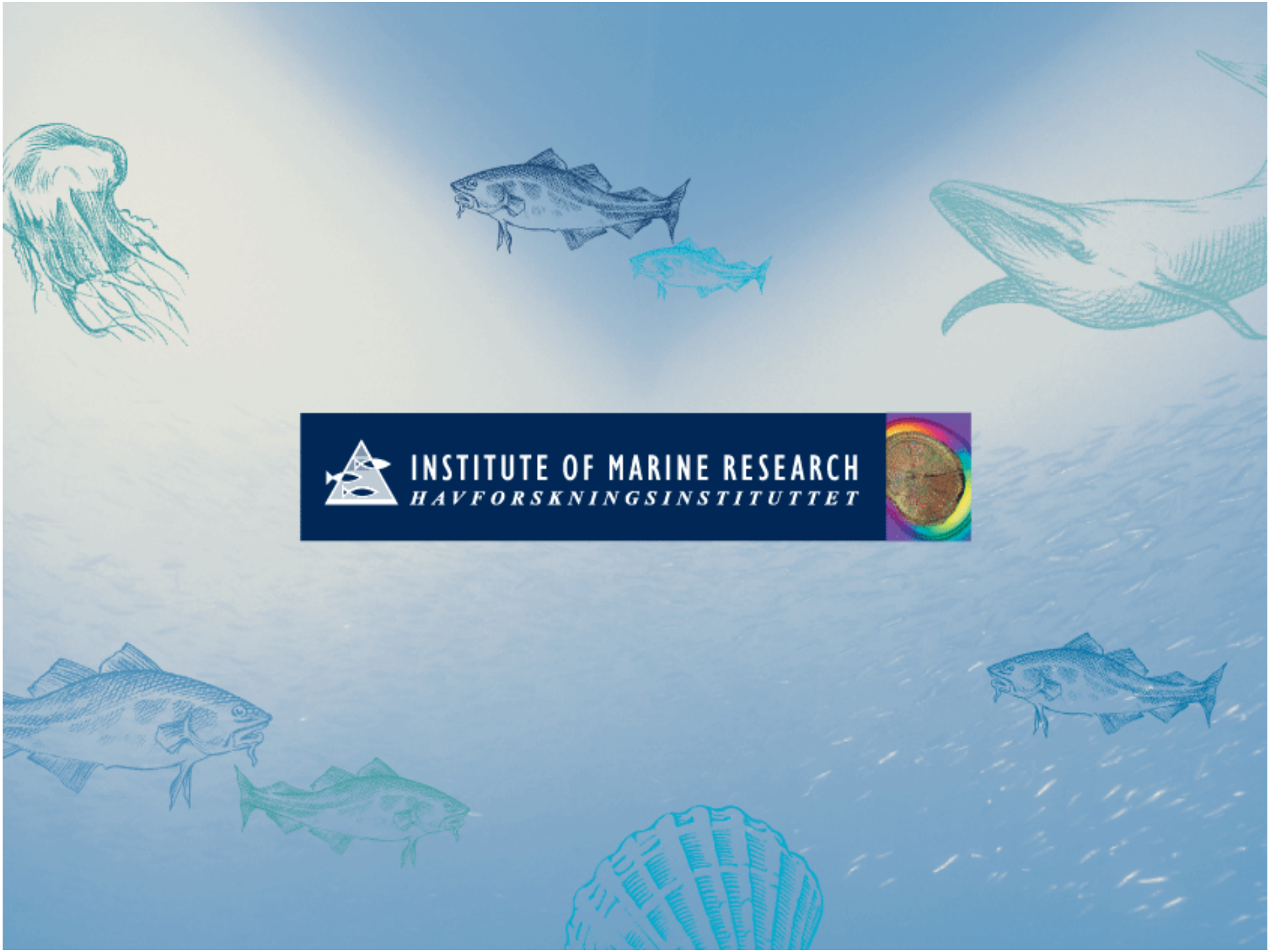
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Marine finfish – ”Super-Chickens” of the Sea

Ole Torrissen

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I guess you find the reason for the inviting me is here:

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Atlantic Salmon (*Salmo salar*): The "Super-Chicken" of the Sea?

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A surprising title?
You have heard the opposite earlier!

- ”Long distance experts” have concluded that aquaculture production of ”carnivorous” fish are unsustainable:
  - Consume more fish than they produce.
  - The support area needed for food provision is 50,000 times larger than the cage area.
  - They consume non-renewable energy and create waste.
  - The social costs exceed the benefits
  - It is farming the ”tigger og the sea”…..

Naylor, Folke & ...

Karoline Andaur: "Salmon farming is not sustainable. What other food sectors are, is irrelevant!

No food production system, now in use, is truly sustainable from an energy or biodiversity perspective as they generate waste, require fossil energy, use water, and change land cover.(Diana, 2009).

But still we need our daily food

FAO (1996) defines food security to exist "*. . . when all people, at all times, have* physical and economic access to sufficient, safe and nutritious food to meet their dietary needs

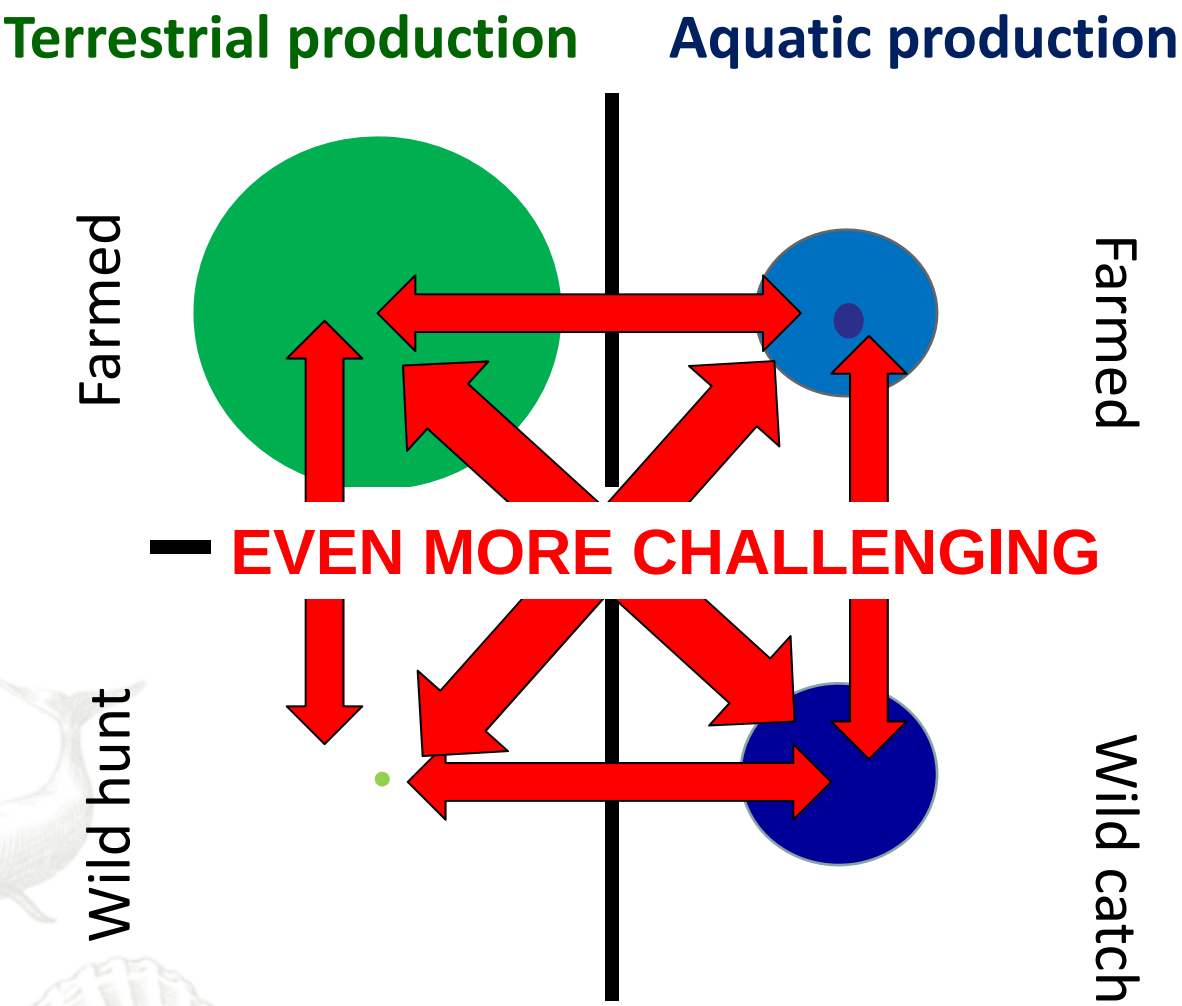
food preferences

active and healthy life".

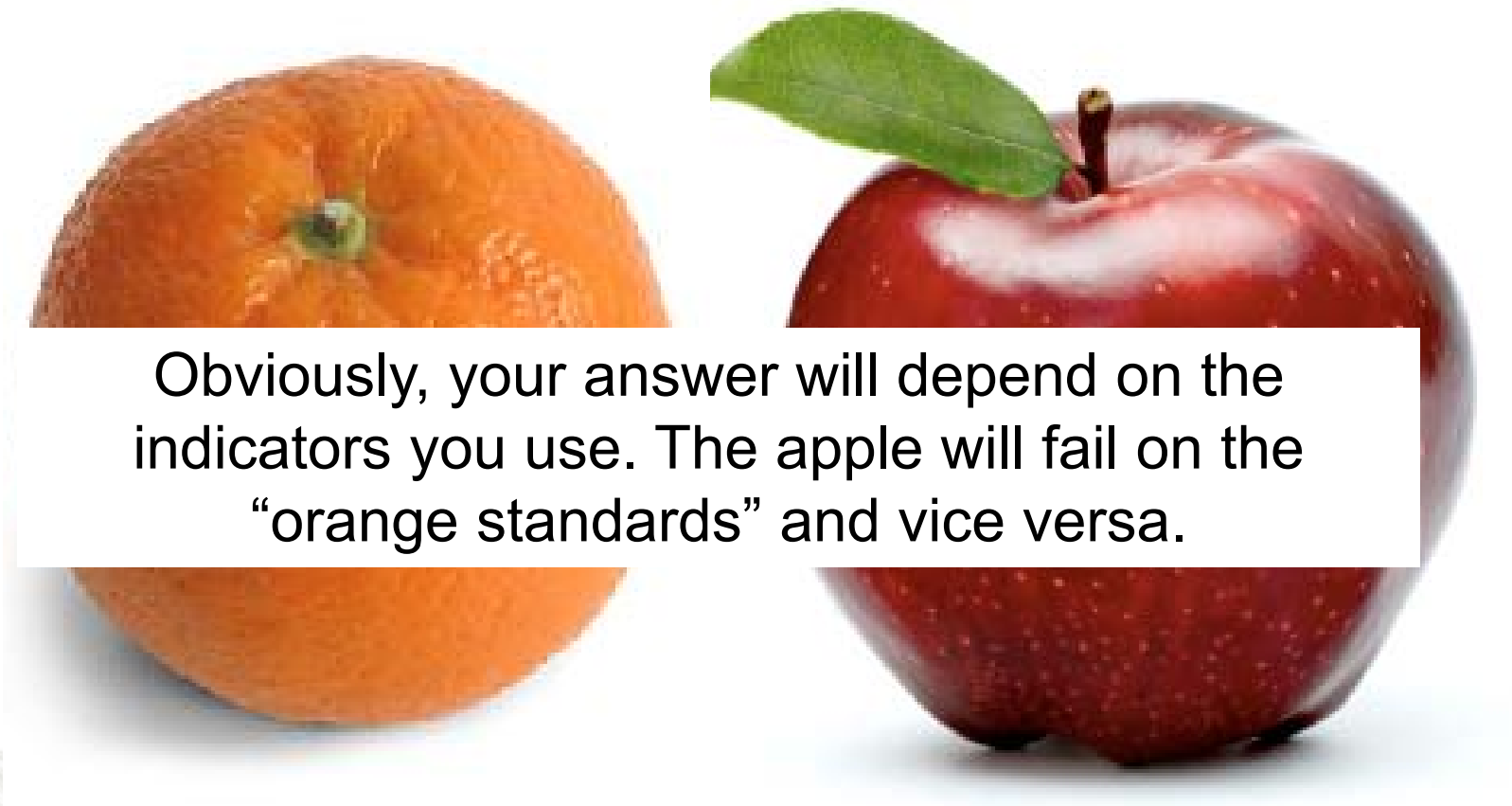
Origin of our daily food

- 72 % of earths surface is covered by sea water
- Approximately 55 % of the primary production on earth occurs in the sea.
- We consume in average 11.7 MJ/day (2831 Kcal/day)
- Only 1,1 % come from seafood (0,13 MJ/day (31 Kcal/day))

Worlds “muscle food” production



Comparing apples and oranges?



Obviously, your answer will depend on the indicators you use. The apple will fail on the “orange standards” and vice versa.

Abuse of “sustainability” indicators

- Two examples
  - Salmon production requires a support area for feed supply of 40 000 to 50 000 times the area of the cages themselves (Folke and Kautsky, 1989)
  - “Fish in – Fish out” calculations (Tacon and Metian, 2008; Kautsky and Troell, 2010)

The extreme example: Who have the “deepest footprint”

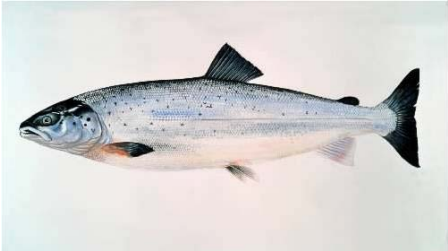
The Queen to be?

Or the hunter?

ArEA for an “average” Swede: 0.4 ha per year
ArEA for an traditional Inuit: ≈ 4 ha per year

“When map and terrain don’t fit – trust the terrain”

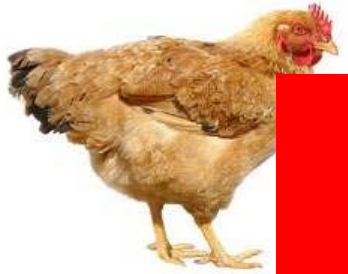
ArEA of 40-50 000 times “housing” area



Production of all in the range of 200-400 kg/m^2/year

The difference

Terrestrial production | **Aquatic production**



Farm

Wild hunt

This is a typical example of
“apples” and “orang
stan

Or trapped in the mind that’s nothing has changed since 1980

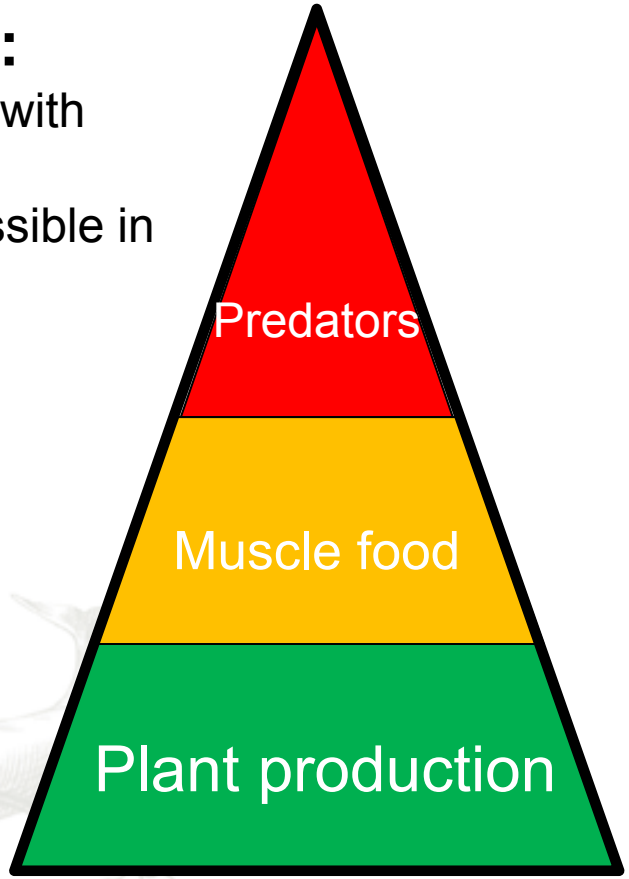
Wild catch

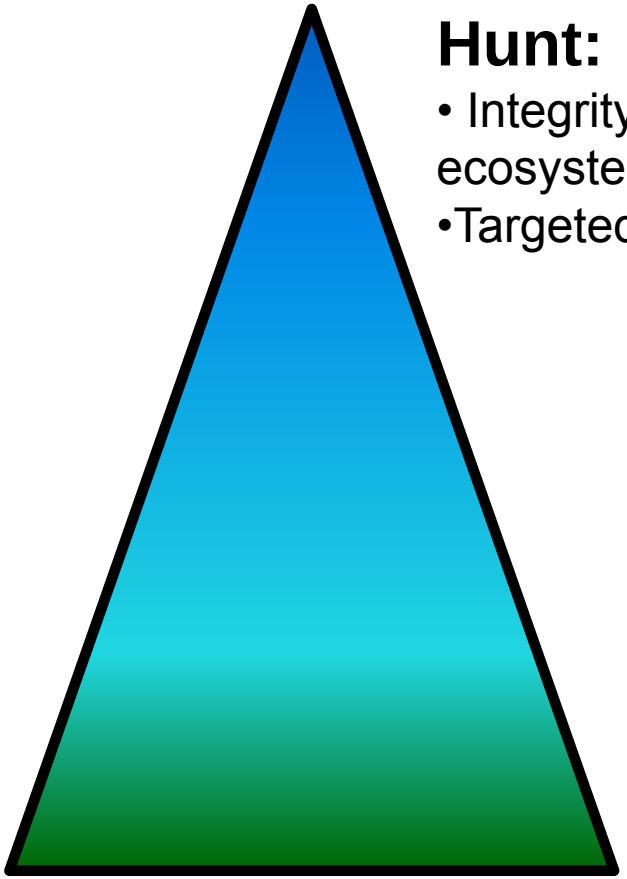
“Farming” and “Hunt”

Farming:

• High yield with low input!

•Lowest possible in food web.



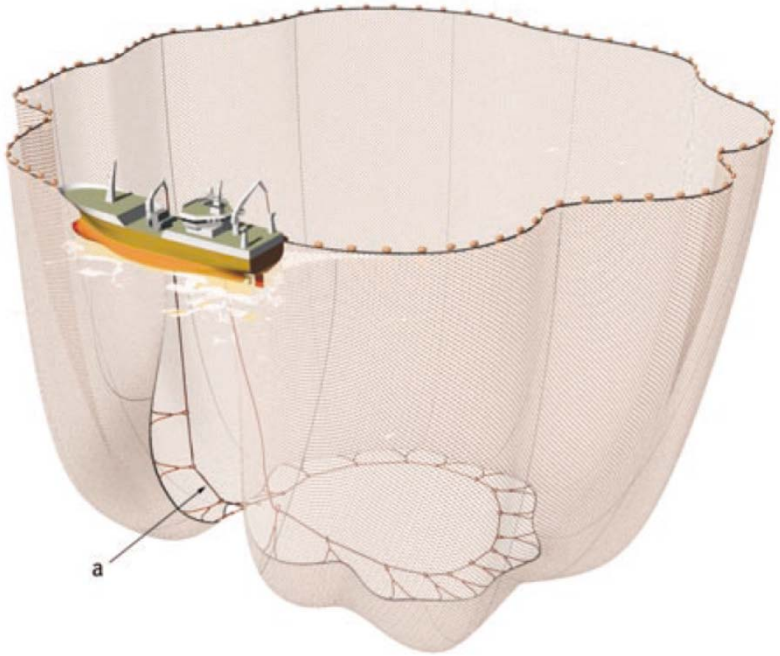


Hunt:

• Integrity of ecosystem

•Targeted catch

Both have challenges – but different



I have never seen data showing that one sector is better or worse than the other. But quite often undocumented claims!

FIFO or FI = FO
FI (Fish in), FO (Fish Out)

- The calculation “overlook” important factors:
  - 70 % of fish meal is made of “by-products”:
    - ¼ of all fish meal and oil is produced of waste.
    - 1 kg of forage fishes give a maximum of 400 g food.
  - 50 % of fat and protein in salmon feed originate from plants
  - 20-30% of salmon is rendered back to fish meal and oil used in feed for other animals

First conclusion

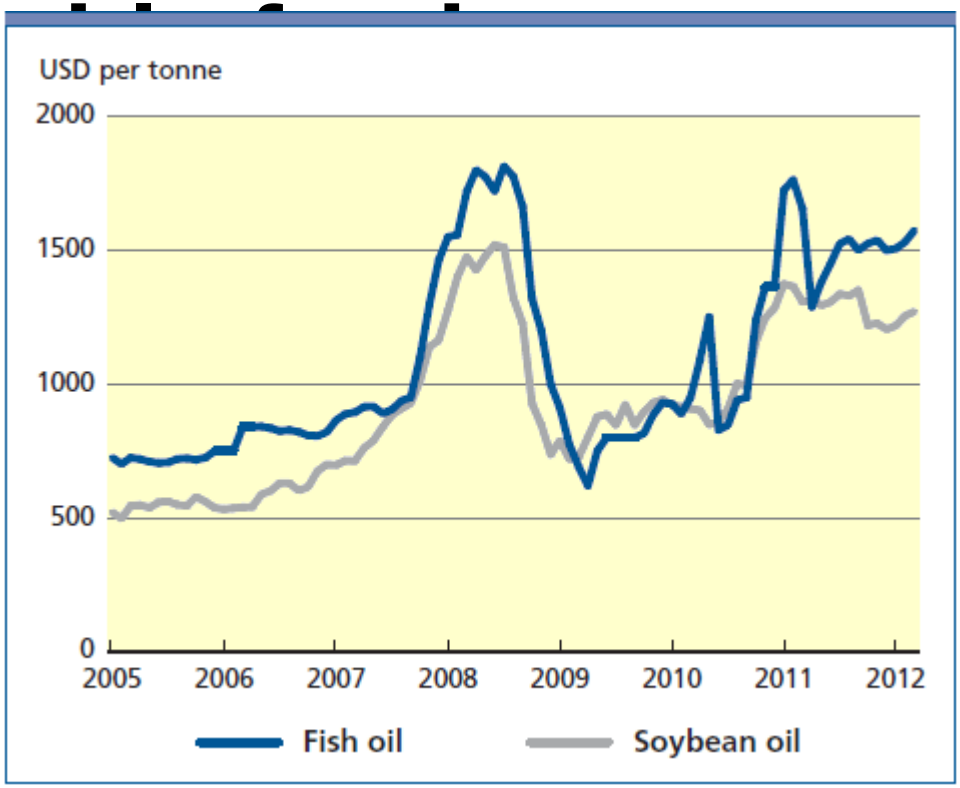
Farmed fin-fish produce more fish meat than it consume!

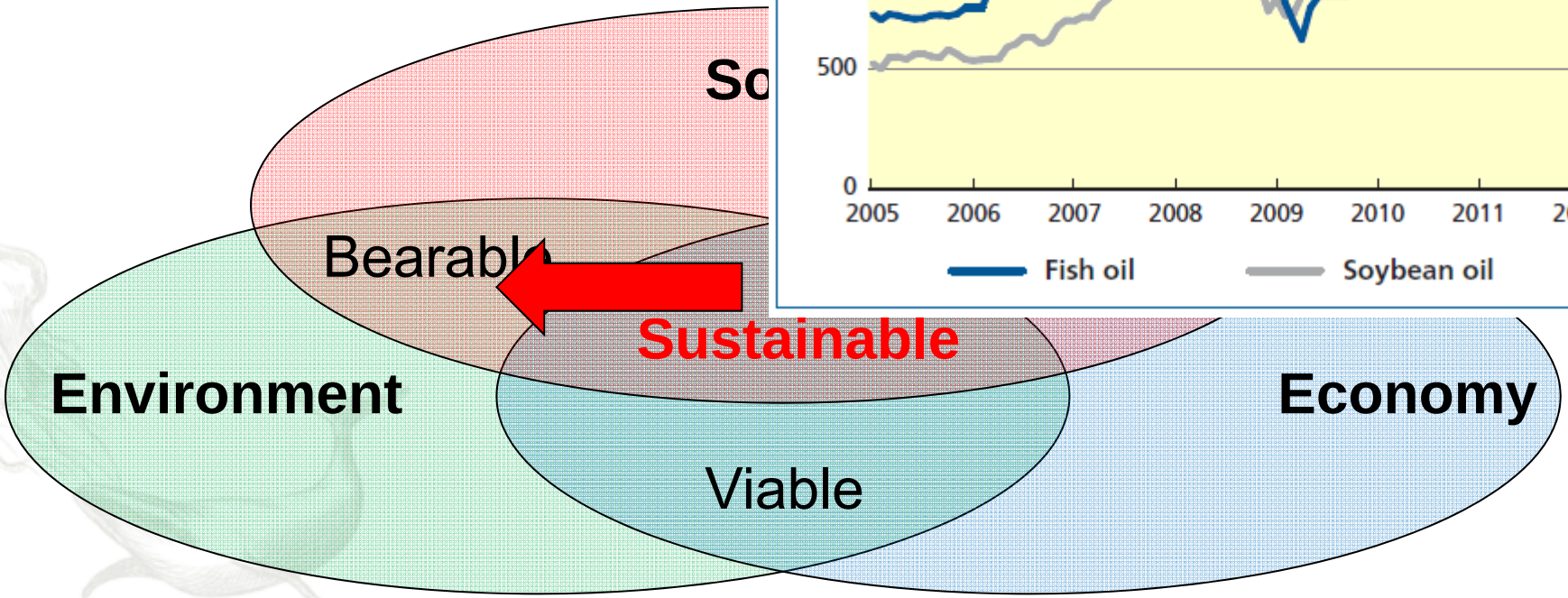
Second question

- Does it really improve sustainability to replace fish (which no one would like to eat) with highly appreciated plant products?
  - Wheat
  - Soy beans
  - Rape seeds
- Feeding all farmed salmon on only plant products would require 1.1 mill. ha farmland

Sustain

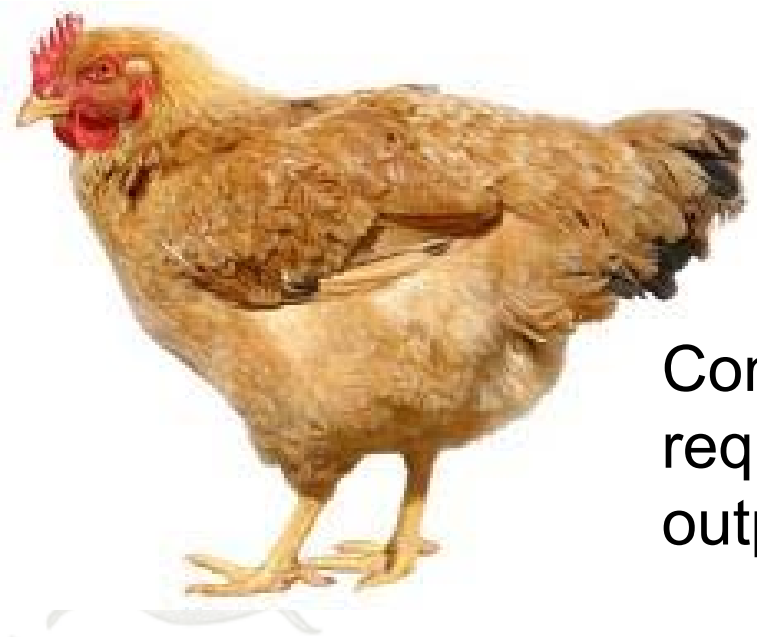
Is it acceptable to feed fish
to feed fish fish?





Choices are important!

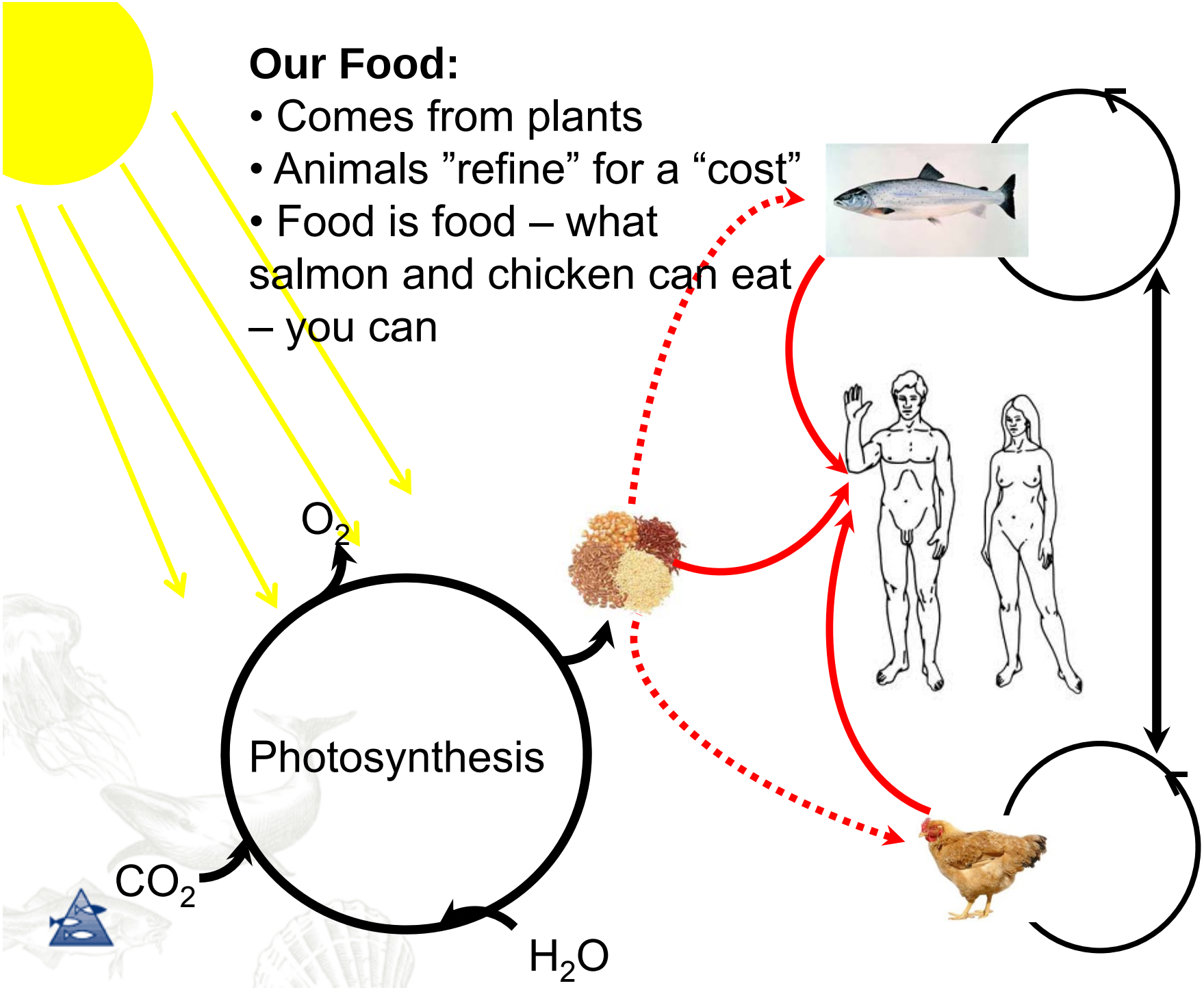
BUT



Comparing “salmon” and “chicken” require neutral indicators. Input & output are in my eyes suitable!

Our Food:

- Comes from plants
- Animals ”refine” for a “cost”
- Food is food – what salmon and chicken can eat – you can



“Muscle food” is refining food through animals for a cost. The costs for finfish is low

	FinFish	Chicken	Pigs
Reproduction	+++	-	--
Poikilothermic	+++	-	-
Body weight	+++	-	--
- skeleton mass	++	-	--
Protein catabolism	+	--	-

“Cost” of production

	A. salmon	Chicken	Pig
FCR (kg feed/kg body gain)	1.2	1.8	2.6
Harvest yield (%)	86	66	73
Edible yield (%)	68	46	52
Energy retention (%)	23	10	14
Protein retention (%)	31	21	18

Bjørkli, 2002)

- Harvest yield = % weight, bled and gutted
- Edible yield = ratio of body weight normally eaten (incl: liver, hart, lung and adipose tissue for pigs)
- Energy retention = energy in edible parts/ gross energy in feed
- Protein retention =kg protein in edible part/ kg protein fed.

“Greenhouse gas” emission

	Kg CO_2/kg (edible)
Beef (Swedish)	30
Pork (Swedish)	5.9
Chicken (Swedish)	2.7
A. Salmon (farmed)	2.9
A. Cod	2.9
Herring	0.6

Cederberg et al. (2009)
Winther et al. (2009)

CONCLUSION

- Farming of fishes give generally higher yield with respect to food for feed than domestic animals like chicken and pigs.
- Emission of greenhouse gasses are low and comparable to chicken.
- All animal farming have environmental costs. Focus on reducing these should have priority.

The NEW Chicken

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