Business Perspective on Energy and Sustainability Issues

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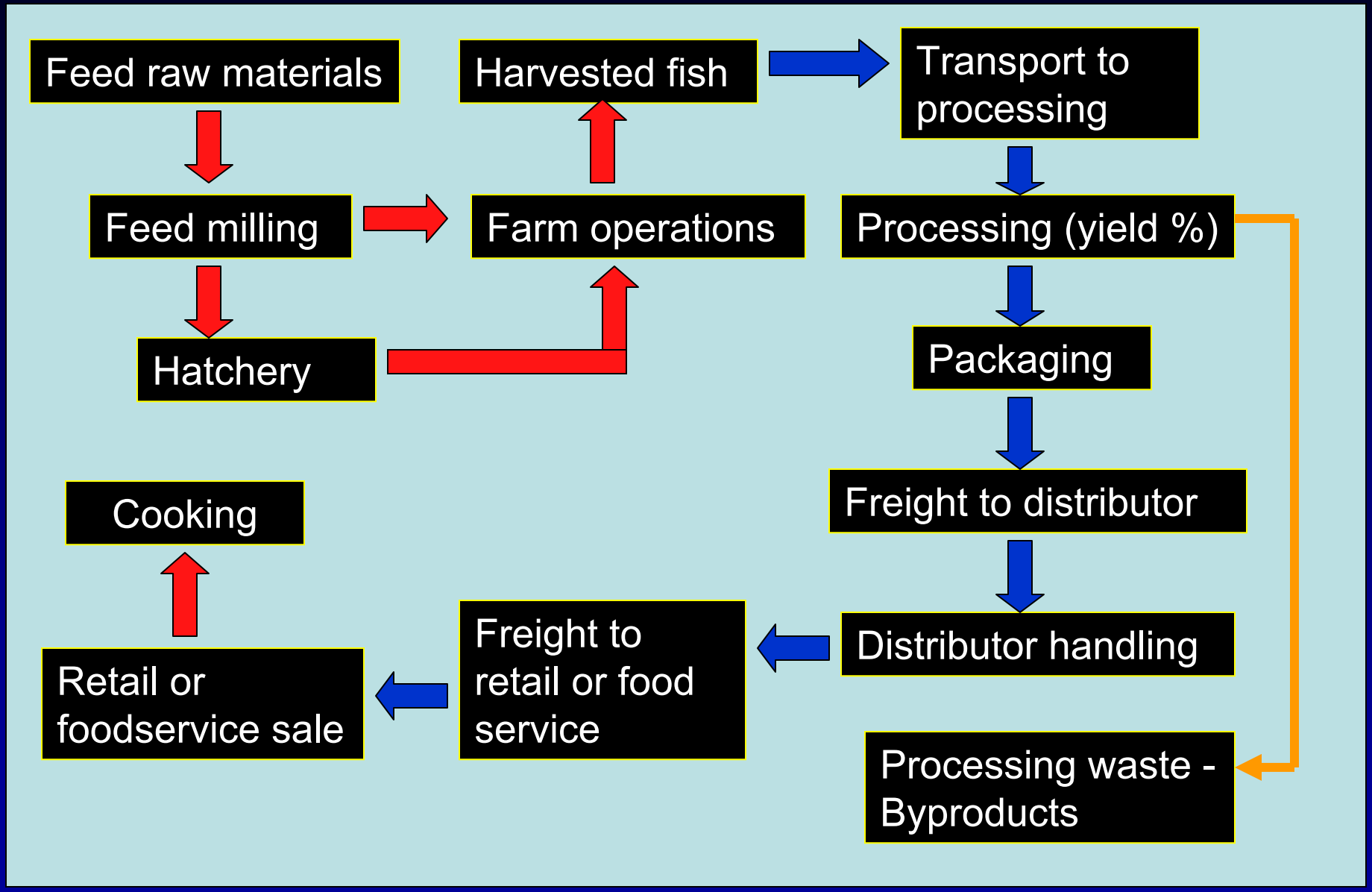
Aquaculture America ‘09

The Aquaculture Value Chain



Measures of Efficiency

1. Money
2. Energy
3. GHG Emissions
4. Ecological Footprint
5. Life Cycle Assessment

Decide which parts of the Value Chain to measure (boundaries) and what within them is material.

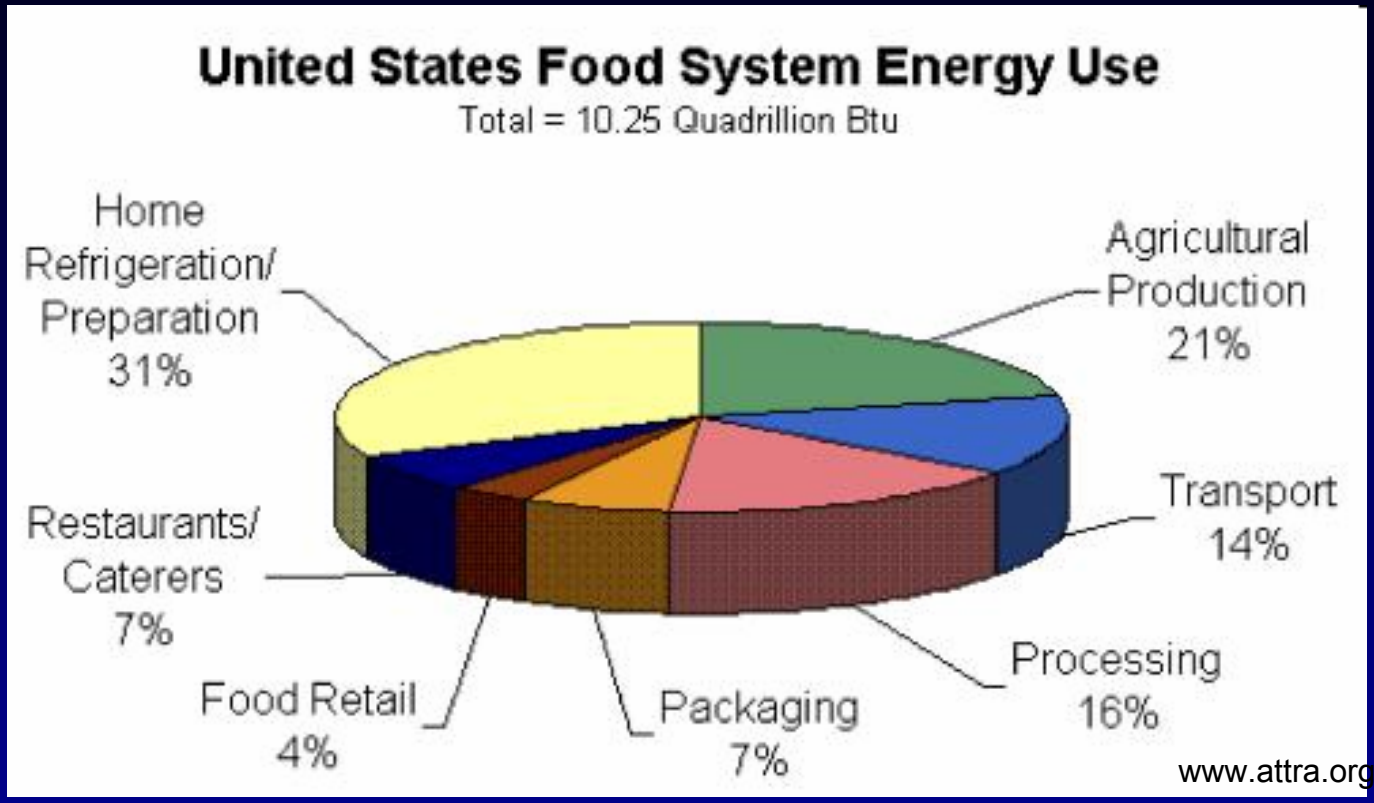
1. Money

FARM	$/lb
Juveniles	0.15
Feed	0.50
Other op costs	0.17
Labor	0.11
Overhead	0.12
Depreciation	0.15
Farming cost	1.20

Sales	$/lb
Yield 50%	2.40
Processing	0.25
Packaging	0.12
Freight	0.25
Sales / overhead	0.15
Cost of goods	3.17
Selling price	4.00 ☺

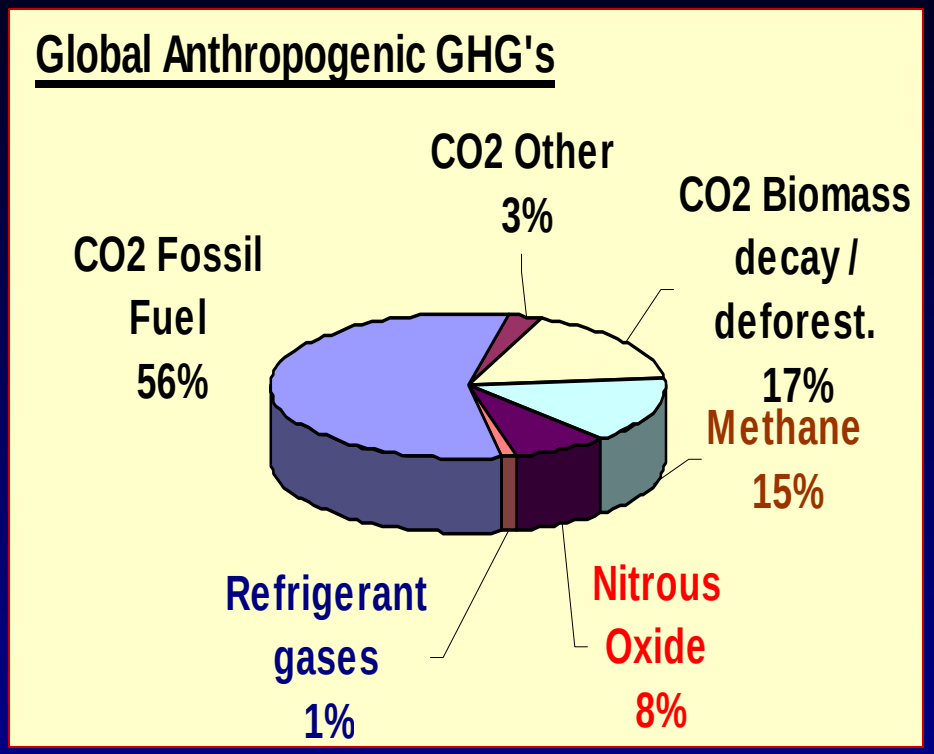
- Though money is a completely objective measure
- Ecological costs are not always accurately monetized.

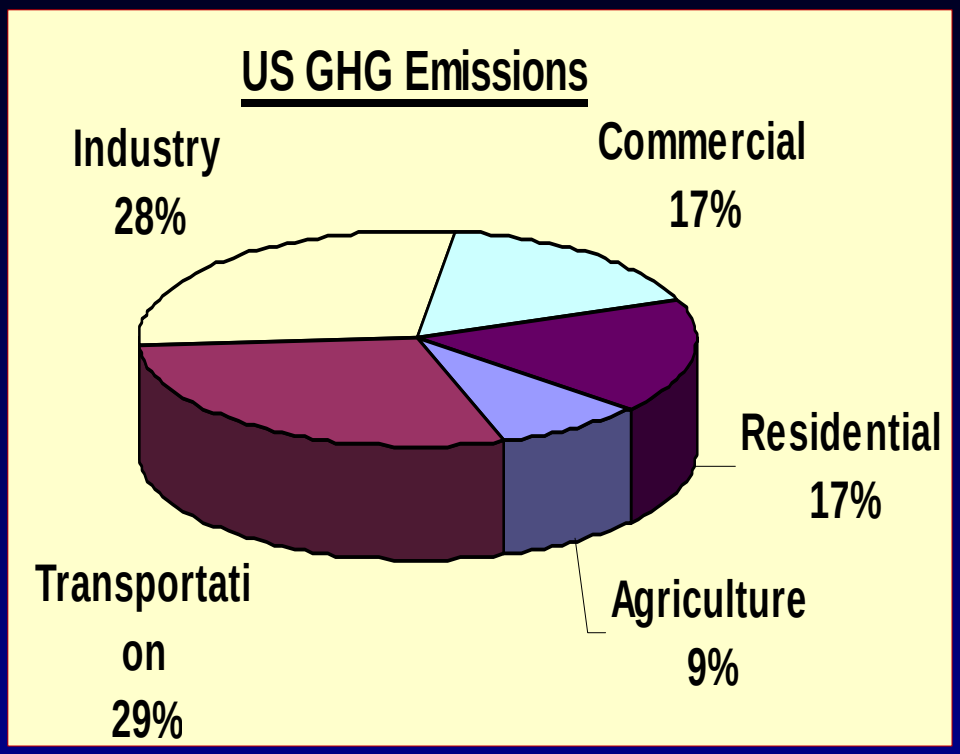
2. Life Cycle Energy Assessment - LCEA



Does not measure: -All greenhouse gases, -Protein efficiency, -Ecological services, -Opportunity Costs

3. Life Cycle GHG Emissions Assessment

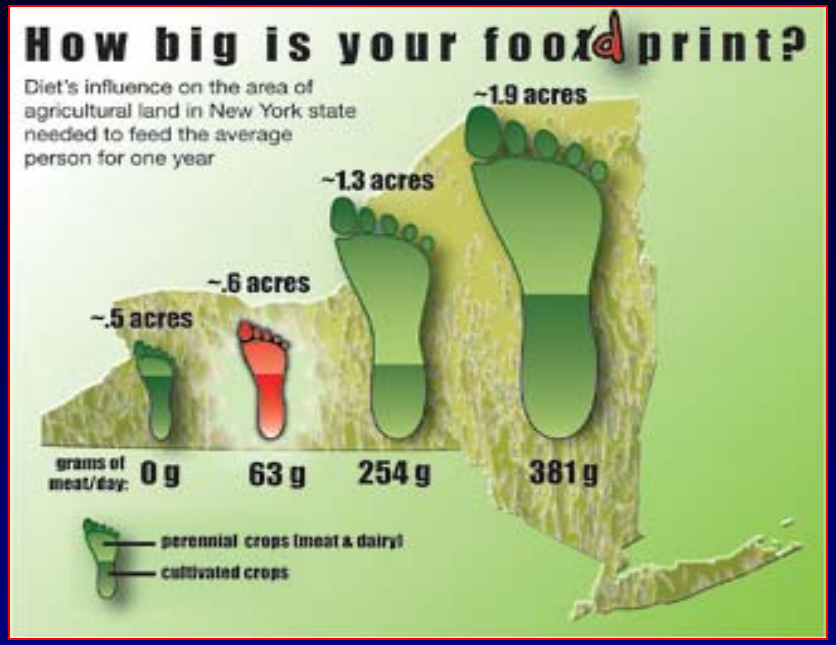




Measures Global Warming Potential (GWP)

- Methane - Livestock, manure & rice farming.
- Nitrous oxide- Fertilizer and manure breakdown in soil.

4. Ecological Footprint

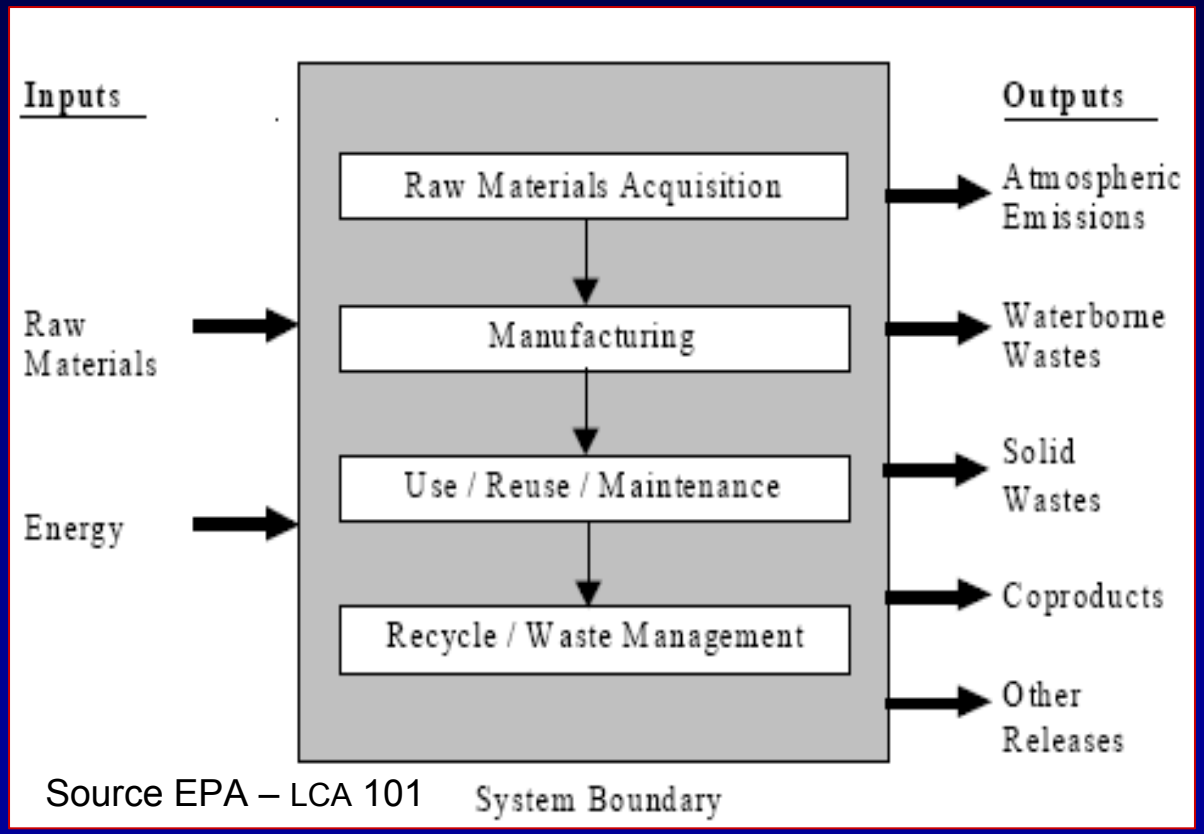


	Primary productivity required per mt
Scallop	10
Anchovy	79
Pollock	282
Sockeye salmon	537
Pink salmon	1,548

- FOOTPRINT – a spatial measure of human use of nature in terms of standardized acres of average terrestrial productivity
- FISHPRINT – the weight of primary productivity required per unit weight of commercially harvested species.

5. Full Life Cycle Assessment

Assesses the relative contributions to a range of global scale environmental problems.



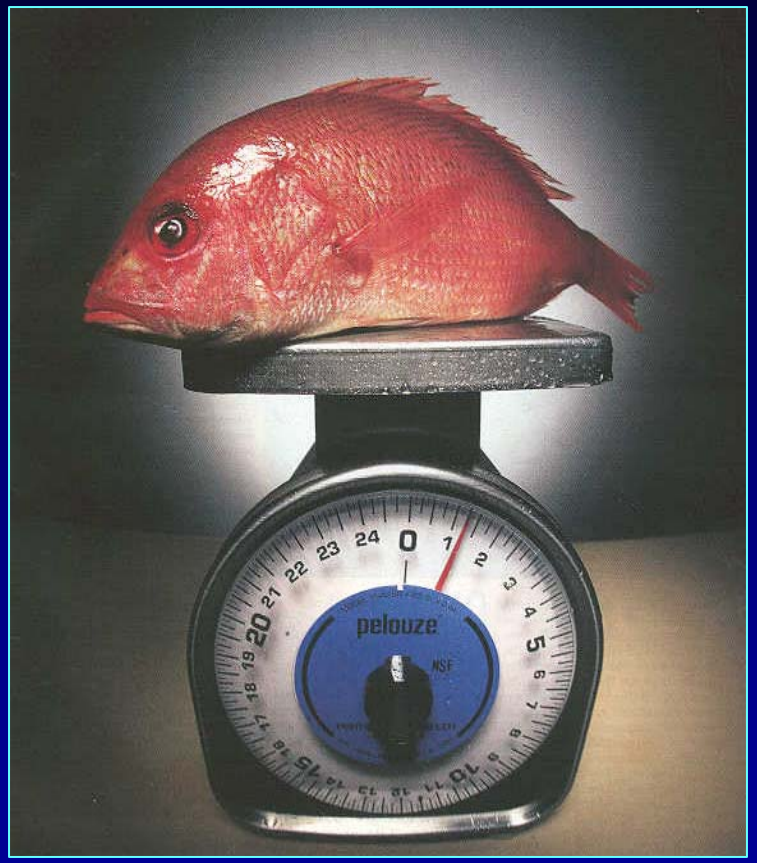
Source EPA – LCA 101

- Global warming
- Eutrophication
- Biotic & abiotic resource use
- Ozone depletion
- Eco-toxicity
- Acidification

Add for a 'Life Cycle Weighted Result'

Perspective 1 – Ignores value of the output

- Especially for food.
- If our goal as a society is to derive the best value we can from the resources we invest in meeting our needs.
- Just measuring the inputs gives no idea of the return on the investment.

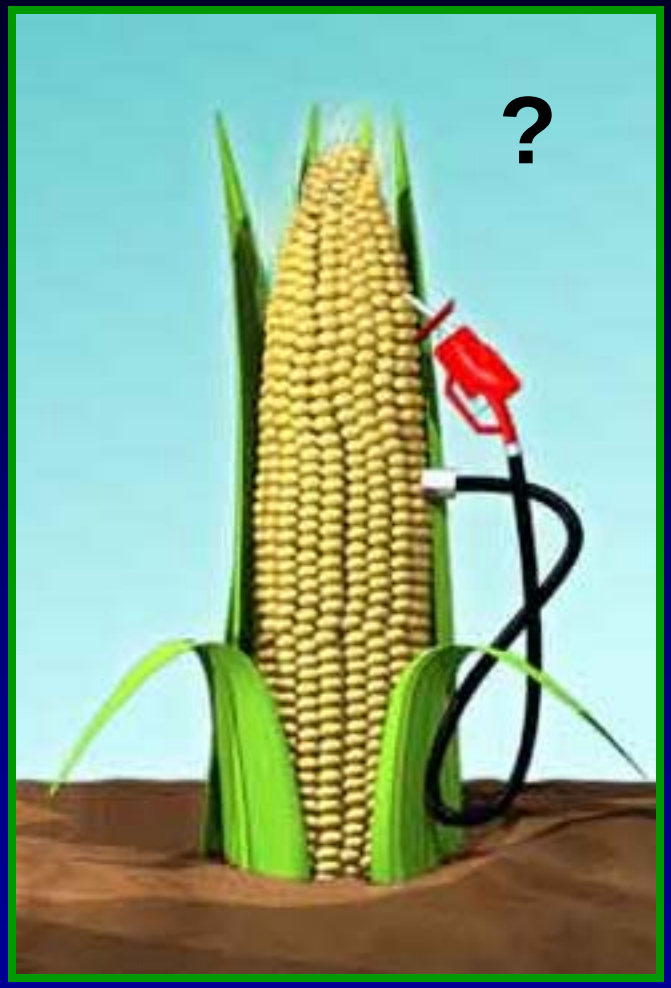


Perspective 2 – Risks of rushing to judgment

- Misrepresentation of data
  - Over-simplification
  - Use of out of date data
  - Incomplete data
  - ‘It’s obvious isn’t it?’
  - Rush to LCA Ecolabel

- Risks inadequate reference to others – ‘Aquacultural Isolation’

- Risks prescriptive remedies.



We still don’t know

For example "*Produce animals lower on the food chain*"

Protein Retention

- Salmon 45%
- Trout 41%
- Catfish 36%
- Sea bream 25%
- Sea bass 22%
- Chicken 33%
- Beef 15%

- Some fish can use fat as an energy source to spare protein.
- Animals turn over protein at different rates.
- Protein quality in feed is a factor.

It's not obvious that herbivores will be more efficient. We don't know enough yet.

Perspective 3- Ignores potential for improvement

- Sustainability is not a status quo concept - especially in a young industry.

- Invention and discovery can transform performance & assumptions.

- Imagine an LCA on computers 25 years ago.

- Or how assumptions would change if we could fully harness solar energy.

"Sustainability is Managed Change" John E. Bardach

Earth receives 7,000 x more energy from the sun than humans use.

Perspective 4 – Develop a hybrid method for food?

- *Focus on food – or even just animal protein.*
- *Define boundaries.*
- *Define metrics that are material.*
- *Capture the most important elements of different methods of measurement, e.g. PPR*
- *Propose a standard for all.*

So that we can compare the nutritional return derived from the natural resources invested.