

Sustainable Marine Resources for Organic Aquafeed

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PREFACE

- With wild fish capture facing a number of severe constraints, aquaculture appears to be the only viable option to meet this growing demand. According to the FAO, global aquaculture production will have to double by 2030 to keep pace with the demand. This represents, in absolute terms, an increase of almost 40 million tons.
- Analysis of food conversion efficiency suggests a closely regulated combination of industrial and human consumption fisheries may provide the only solution to the long term demands for fish protein.”
ICES Advice 2005
- In an ideal world fish would be fed directly to humans, but where this is not currently feasible, farmed fish are the best converters to high quality food for human consumption



Key Points

- SUSTAINABILITY – feed fisheries a finite, but sustainable, resource
- ECOEFFICIENCY – improving wild fish:farmed fish ratio
- HUMAN HEALTH – the massive positive impact on human health overwhelms minor contaminant risk
- FISH HEALTH and WELFARE – fish have an essential fatty acid requirement

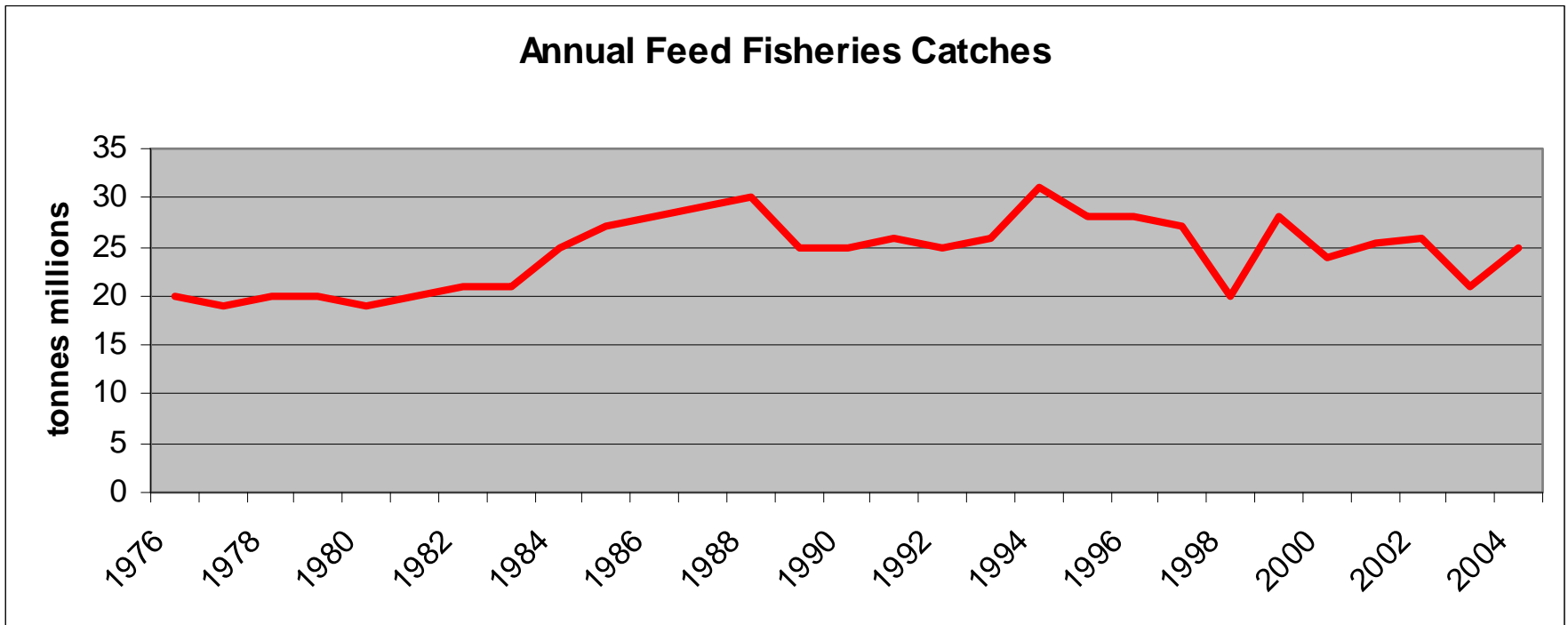


Increasing demand for fishmeal and fish oil from aquaculture is NOT leading to an imminent supply crisis

- Tacon (2005) has been much quoted as saying that demand will outstrip supply within the next decade, and this position was reinforced by a period of strong prices
- But IFFO has shown that - with the ongoing pattern of substitution with complementary ingredients, reallocation from pig & poultry to aquaculture and more strategic use of fishmeal and fish oil – there is no crisis



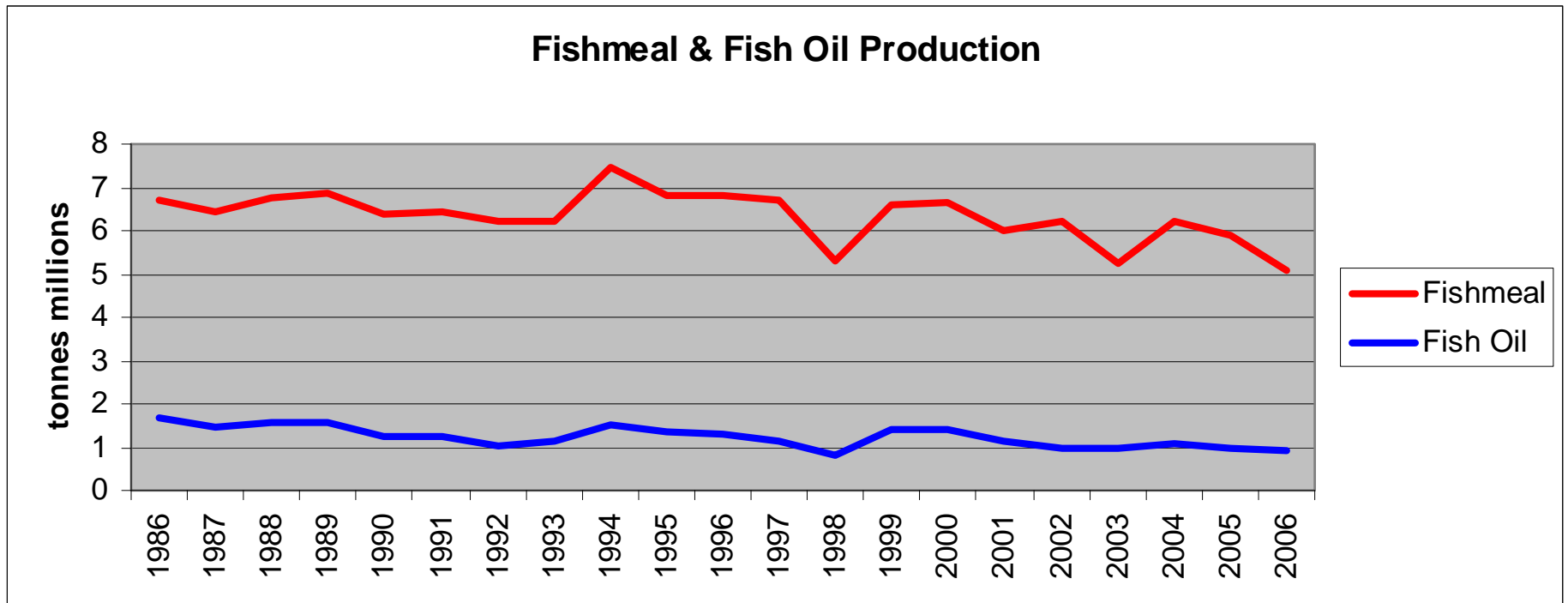
SUPPLY – feed fish, natural variation



FAO 2007



SUPPLY - global fishmeal & fish oil production



IFFO



SUPPLY of fishmeal and fish oil

Looking ahead there is no evidence of extraordinary alteration to raw material supplies

e.g.

La Niña	+ve
El Niño	-ve
Krill coming on stream	+ve
More precautionary approach to fishing	-ve
More large fish to human consumption	-ve
More processing waste to fish meal & fish oil	+ve

There will be good years and bad years - but overall effect on fishmeal and fish oil volumes will be neutral



DEMAND - changing role of fishmeal & fish oil

	2002	2007	2012
Fish	High use in most diets	Moderate use in most diets	Starter, finisher, broodstock & recovery diets
Pigs	All diets	Reduced in grower diets	Starter and special feeds
Poultry	All diets	Starter diets	Breeder diets & recovery diets

Commodity



Strategic Ingredient

Increasing animal prod.



Decreasing FM inclusion



Constant FM prod.



Looking ahead

Assuming a constant annual production of approximately:

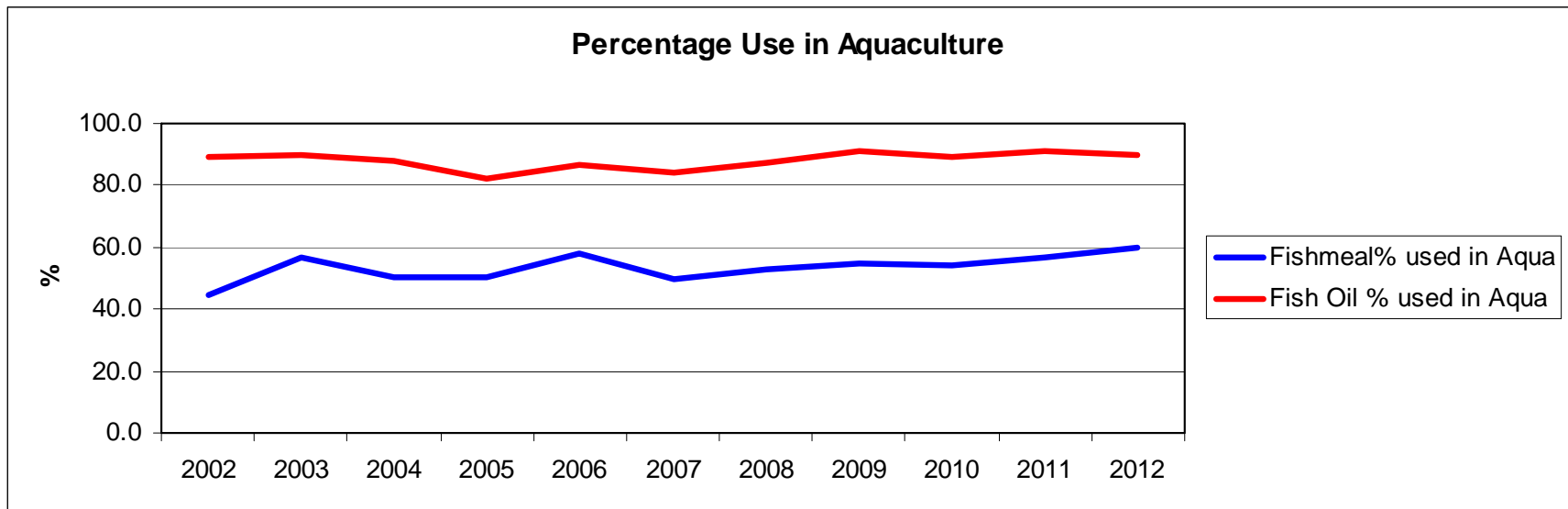
- 6 million tonnes of fishmeal
- 950,000 tonnes of fish oil.

We reach a point in 2012 where 60% of world fishmeal production goes to aquaculture compared to 52% in 2005 and 88% of fish oil will be used by aquaculture compared to 84% in 2005.

The next graph clearly shows that aquaculture can continue to grow without fishmeal or fish oil becoming limiting factors



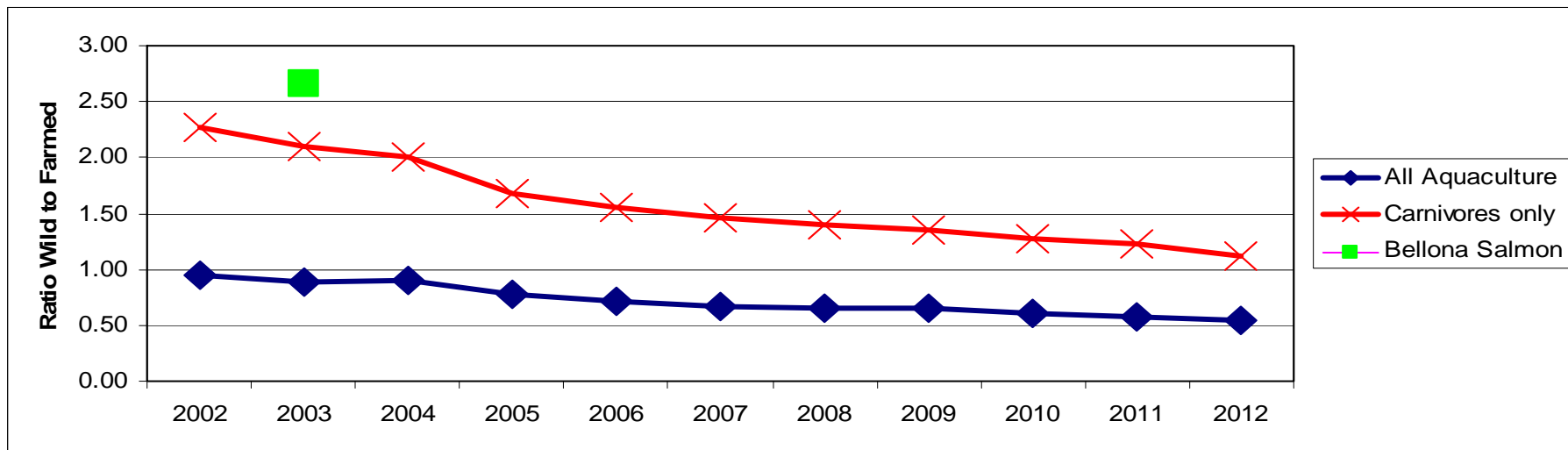
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Conversion efficiency from wild feed fish to farmed fish

is not 8:1 or 4:1, **but approx 1:1**

Eco-efficiency **wild fish:farmed fish** (global ratio)



Jackson 2007, based on FAO data 2006



CONVERSION EFFICIENCY

- In the early 90s roughly 2.5-3.0 kg of wild fish was spent in the production of 1 kg farmed salmon. This is now down to close to 1:1 on the protein side but the high oil requirement of salmon makes it a special case.
- Conversion efficiency based on the edible protein and energy recovery basis in fish is about twice that of poultry and many more times efficient than cattle.
- At 12% fish meal and 12% fish oil inclusion in salmon the ratio would be around 1:1, while with other carnivores fed less fish oil it would be better



SUSTAINABILITY

Feed fisheries are a finite, but sustainable, resource

Peruvian anchovy – highly precautionary approach in the world's largest feed grade fishery.

US Gulf Menhaden – fishing effort is below Maximum Sustainable Yield (MSY).

Trimmings from MSC-certified Alaskan pollock fishery – usage as fishmeal and fish oil instead of current wasted resource.

International organic standards – European authorities permit the use of trimmings.



HUMAN HEALTH

POP's and long chain omega- 3's (DPA and EHA)

- The benefits to human and animal health from long-chain omega-3 fatty acids are overwhelming

(compared with the minor, diminishing and manageable risks from POP's)

- What is missing is rigorous risk analysis



HUMAN HEALTH

POP's IN PERSPECTIVE

- The short-lived fish used in fishmeal and fish oil production have much lower levels of POPs than long-lived species like marlin, shark and tuna
- Many years of controls and bans on release of POPs are reducing background levels and contamination. EU maximum permitted levels are applied for methyl mercury, PCBs, dioxins and more.
- Levels found in pelagic fish from Alaskan and South Pacific waters are very low
- Less than 12% fish oil runs the risk that there are not enough omega-3's in the final product



FISH HEALTH AND WELFARE

- Fish **cannot** convert the omega-3 fatty acids found in plant oils such as linseed into EPA & DHA at a rate essential for normal growth and health including reproduction
- Also virtually all species are carnivorous during at least some part of the life cycle, as fry for example.
- The reality is that that if fishmeal were eliminated from all aquafeeds, production of nearly all fish species would be difficult if not impossible.



CONCLUDING POINTS

- Most international organic standards have recognised the inherent differences between terrestrial and aquatic ecosystems and allow the use of meal and oil produced from fish processing by products in organic aquafeeds
- If NOSB, or any similar organisation, rejects organic diets for aquaculture, then they remove the incentive for aquaculture to move further towards the responsible and eco-efficient approach to production which you advocate
- If you do not encourage its use, the alternative could be to waste it!





ANOTHER RBEP SUCCESS: Demonstrating the value of a fishy biodiesel blend in Alaska's Aleutian Islands

The Regional Biomass Energy Program (RBEP) promotes increased production and use of bioenergy resources, and helps advance the use of renewable biomass feedstocks and technologies. Historically, the RBEP leverages two nonfederal dollars for every federal dollar it administers.

Benefits of Fish Oil Biodiesel Blend Fuel

- Saves money
- Reduces reliance on petroleum-based fuels
- Develops a sustainable local fuel source
- Burns cleaner than traditional diesel fuel
- Requires minimal processing, all of which can be performed locally
- Creates new markets for low-value fish processing byproducts

"The economics of this demonstration are really impressive when you consider that UniSea is replacing \$1.19/gallon diesel with 25 cent/gallon fish oil. Using a local natural resource to displace imported oil and improve the environment can only help the sustainability of our fishing communities."

Bob Poe, Executive Director
Alaska Energy Authority



U.S. Department
of Energy
Regional Biomass
Energy Program

www.ott.doe.gov/rbep

CHALLENGE

Some 3.5 million gallons of fish oil are produced annually from processing pollock in the Alaskan Aleutian Islands community of Unalaska/Dutch Harbor, even more when other parts of coastal Alaska are included in the list of producers.

This oil has minimal commercial value, especially considering the cost of transporting it to markets in the Pacific Rim and continental U.S. Because fish oil contains approximately 90% of the energy content of #2 diesel fuel and is easy to process into usable biodiesel blend fuels, this clean-burning bio-oil could be used to reduce dependence on imported fuel and improve air quality in the region.

RBEP SOLUTION

With funding from the U.S. Department of Energy's Regional Biomass Energy program (RBEP), the Alaska Energy Authority, and the Alaska Science & Technology Foundation, seafood producer UniSea, Inc., has undertaken a demonstration project to test the practical use of blended fish oil and diesel fuel as generator engine fuel. Much of rural Alaska depends on such generators for power — the 200 or so rural Alaskan village utility companies consume approximately 28 million gallons of diesel fuel each year just for power production. Additional diesel fuel is used throughout the state for space heating and powering fishing vessels.

Using one of the company's six 2.3-megawatt generator engines at its seafood processing facility in Unalaska/Dutch Harbor, Alaska, UniSea had Colorado environmental consulting firm Steigers Corporation test several fish oil biodiesel blends over a five-day period, followed by several months of regular operation using one of the blends.



The community of Unalaska/Dutch Harbor is located in the Aleutian Islands southwest of mainland Alaska. UniSea, Inc. operates a seafood processing facility in the community, where a pollock oil-diesel fuel blend is being tested in generator engines.

Surely feeding it to fish & retaining the EPA & DHA has got to be better!!

