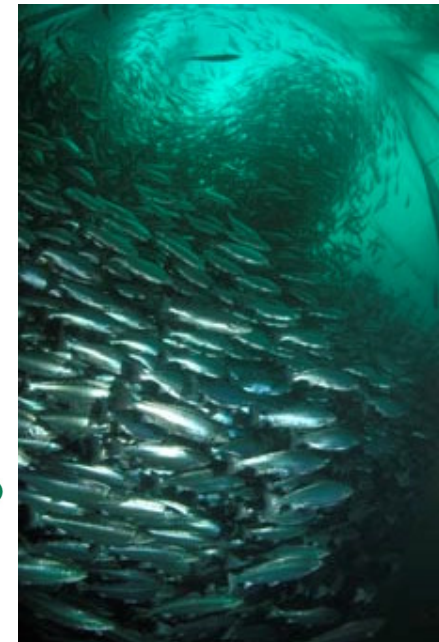


Recent trends in use of marine ingredients in aquaculture diets, especially for salmonids

“Can a growing aquaculture industry continue to use fishmeal and fish oil in feeds and remain sustainable?”



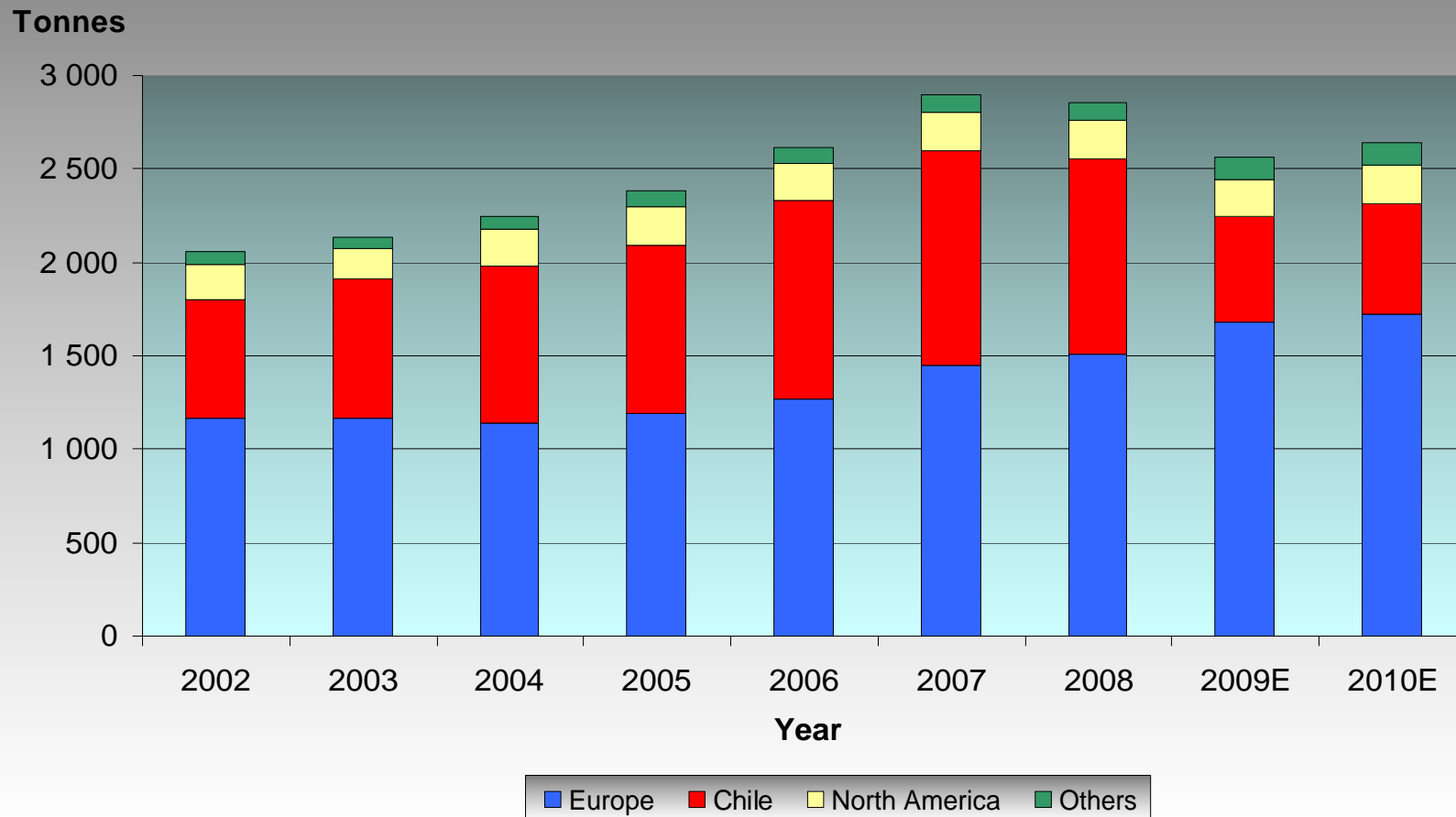
Einar Wathne, (dr.sci. MBA) Deputy COO EWOS Group

- Trends in salmon feed production
- What is salmon feed made of
- Cost trends
- Trends in use of raw materials
- Sustainable or not, the omega 3 paradox
- Main issues seen from the industry

Global salmon feed production

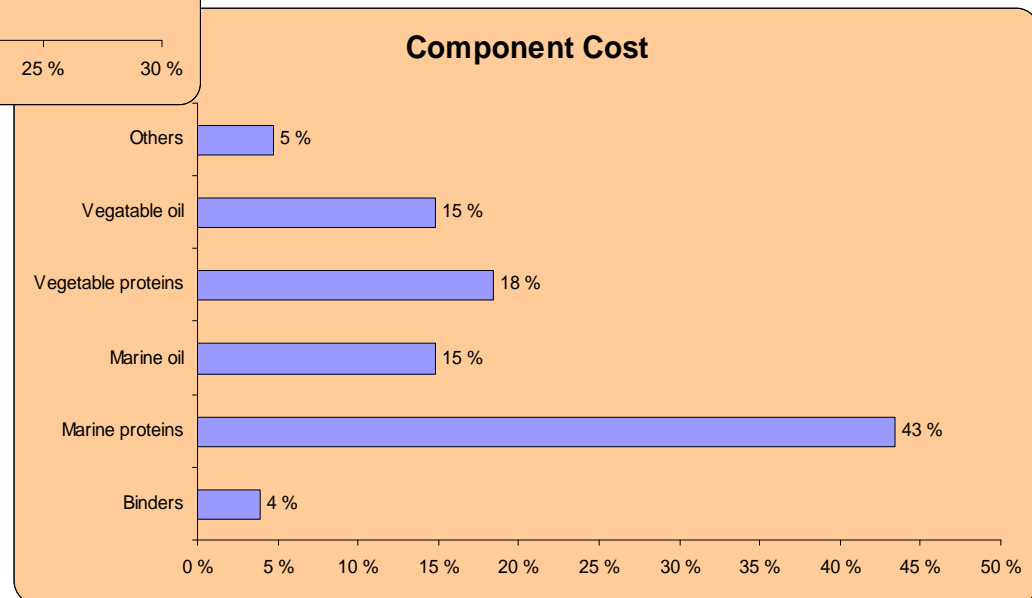
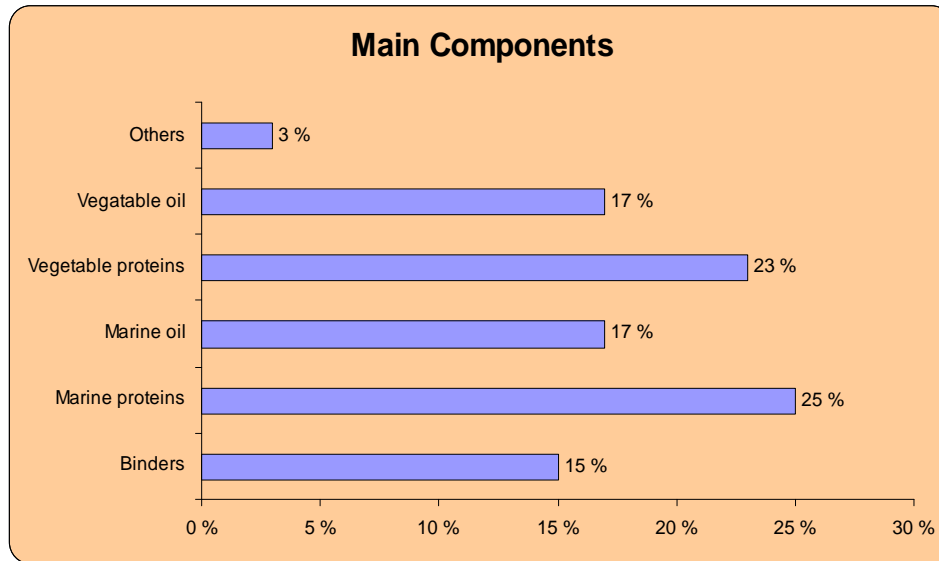


Feed sales consumption/Atlantic & Pacific salmon, Ocean farmed trout and smolt feed in 1000 tonnes

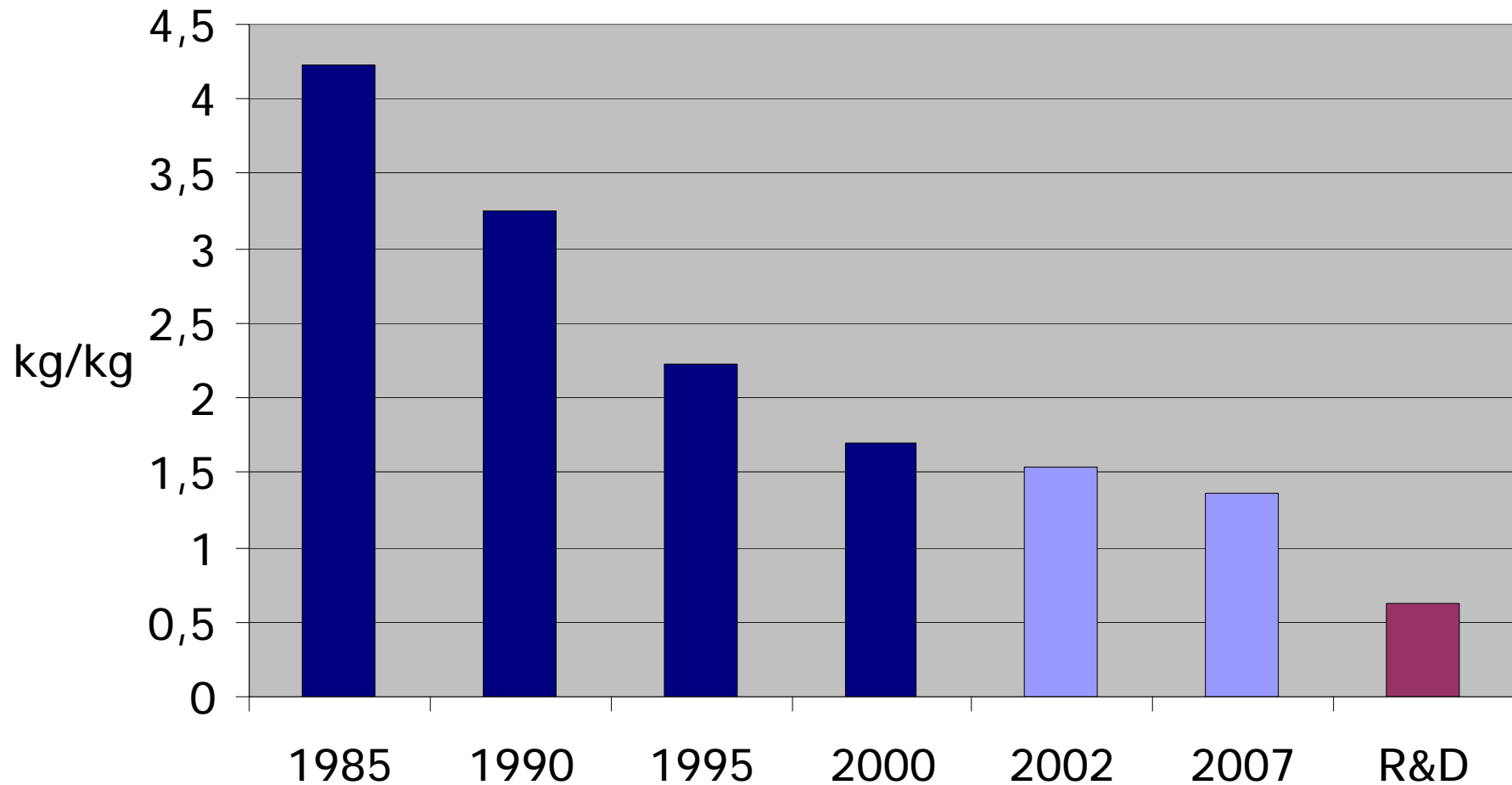


Source: Kontali 2010
www.ewos.com

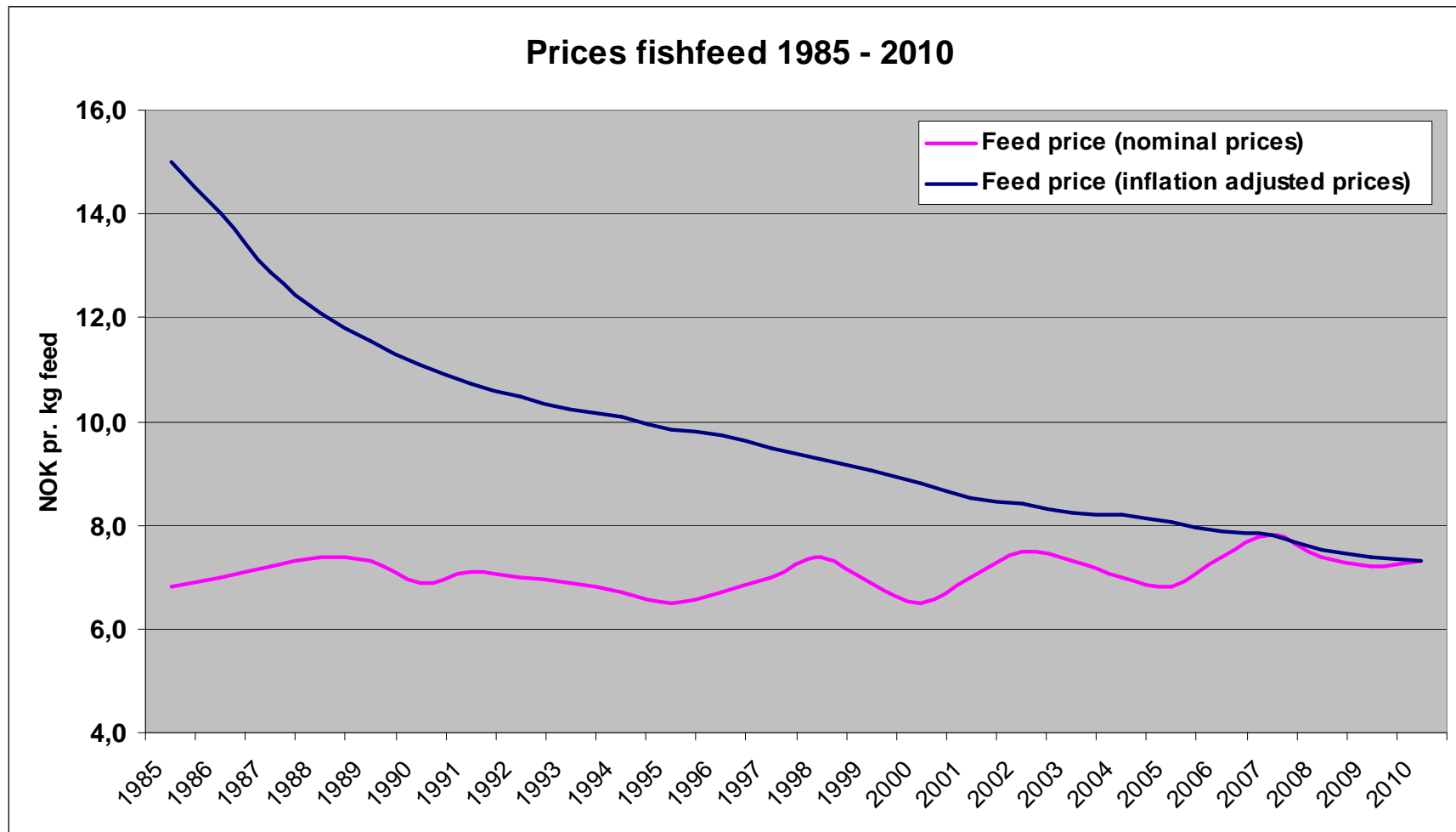
Typical salmon feed composition



Marine protein efficiency in the history of farmed salmon



Prices fish feed from 1985 to 2010



Base year 2009

Feed ingredients; we used to look for:



Energy

Protein

Amino
acids

Vitamins

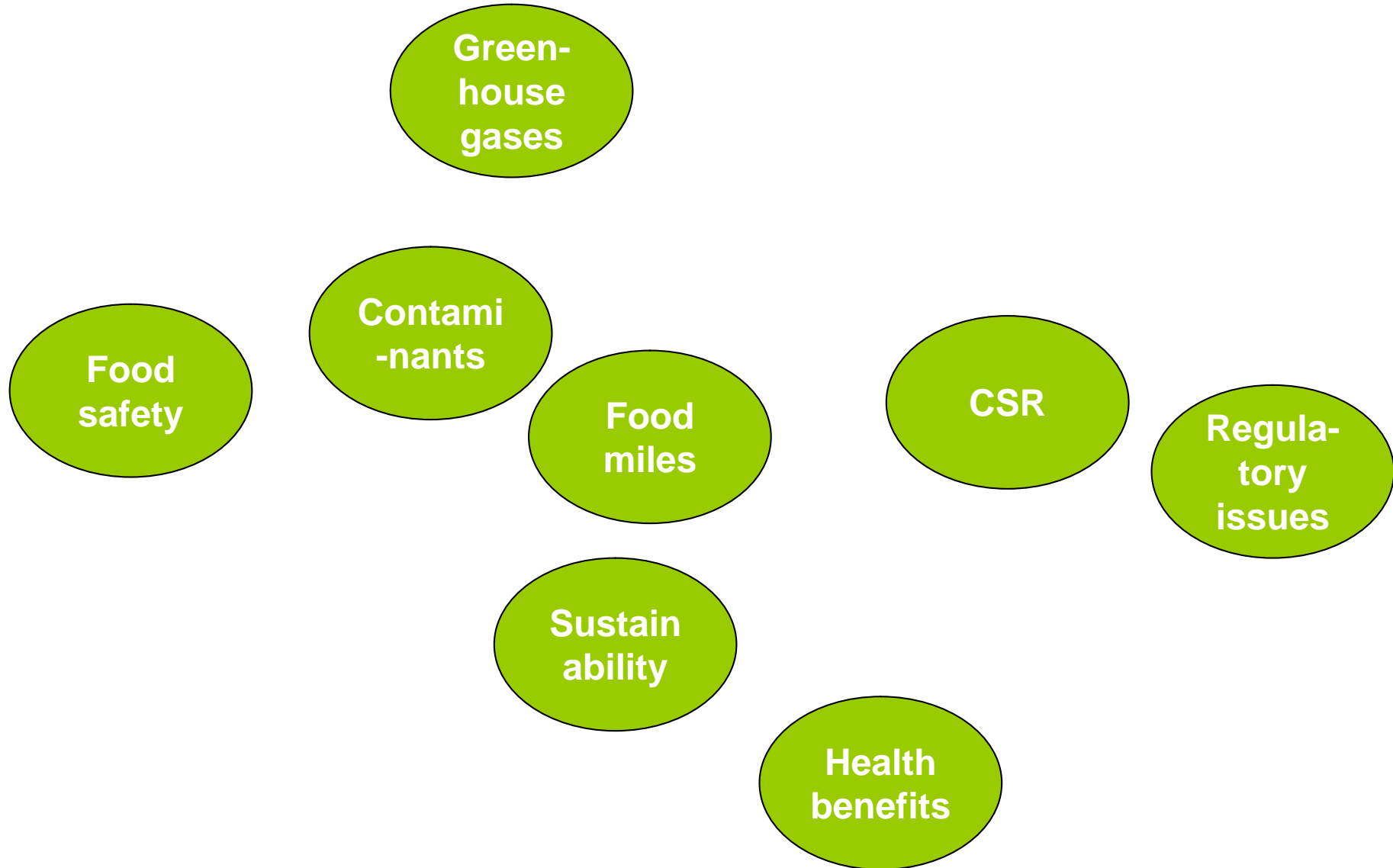
Fatty
acids

Digesti-
bility

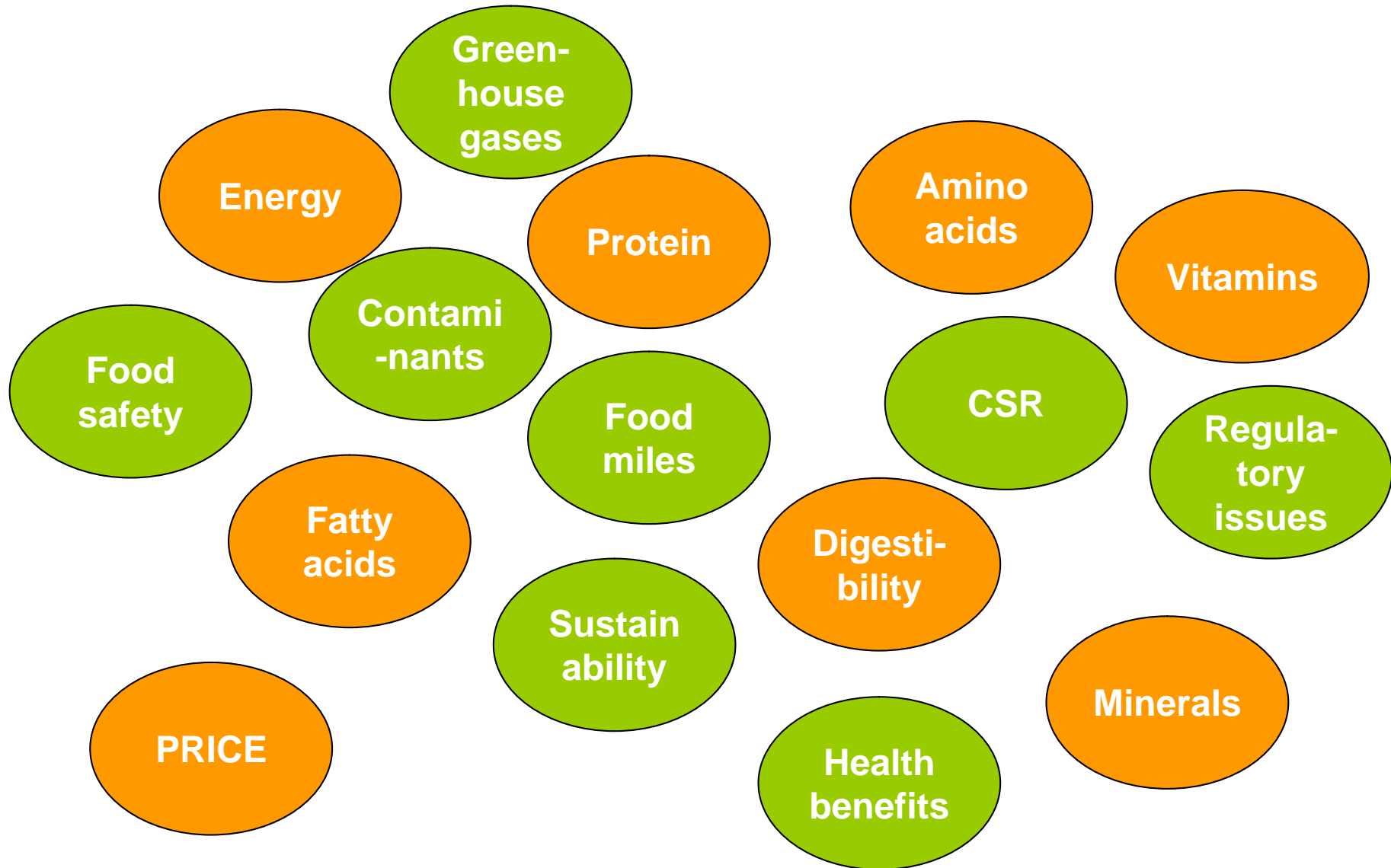
PRICE

Minerals

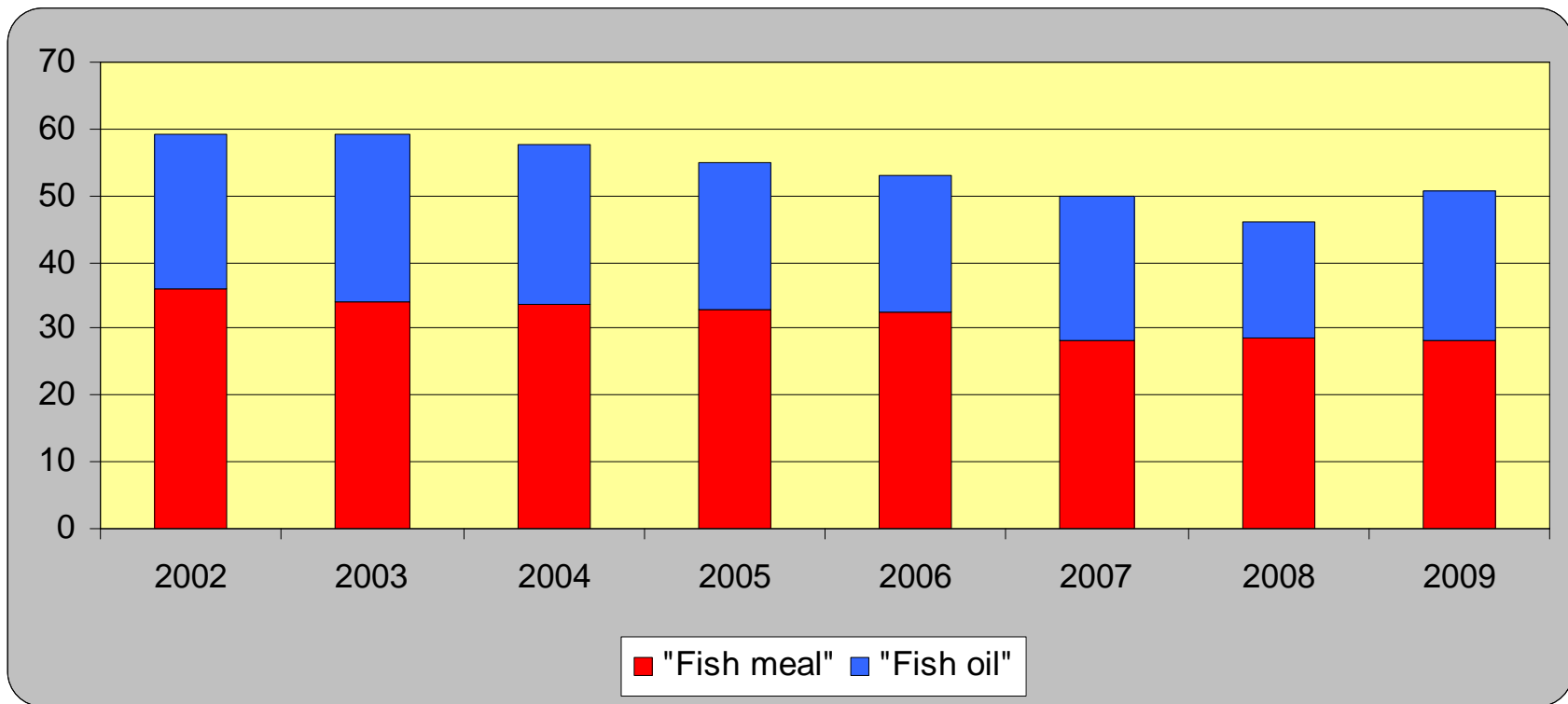
Feed ingredients; new terms:



Feed ingredients; now we look for:



Recent development; marine ingredients in salmon feeds

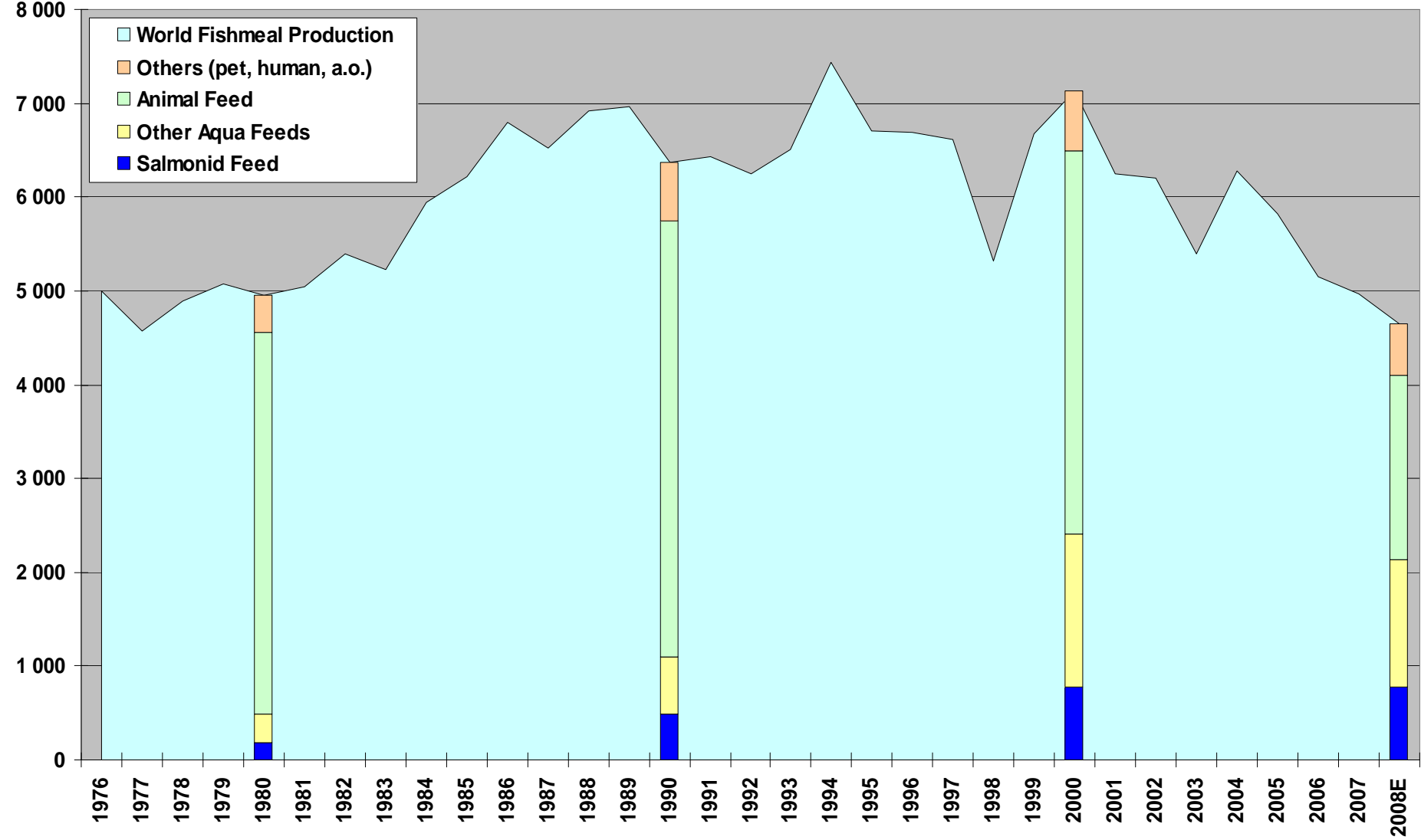


Source: EWOS
www.ewos.com

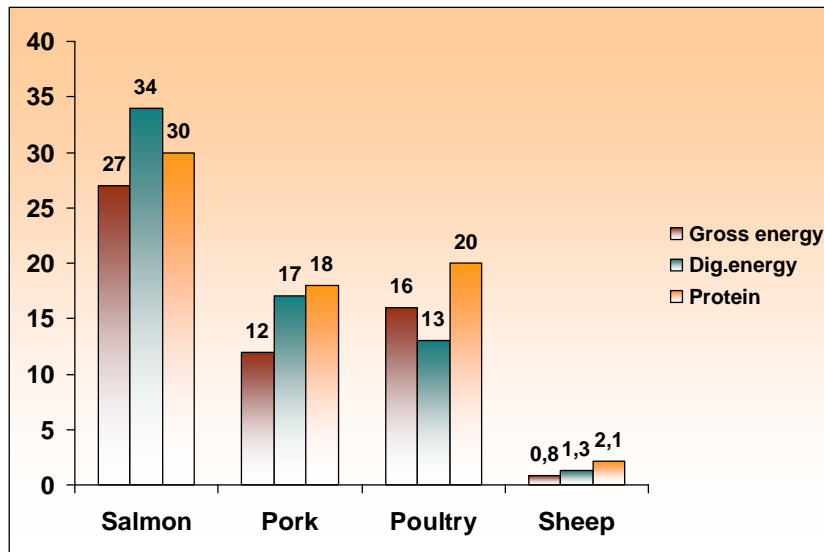
World Fish Meal Production & Use

Sources:
 Production: FAO
 Usage: IFFO

1000 tons



Farmed salmon, the most effective farmed animal



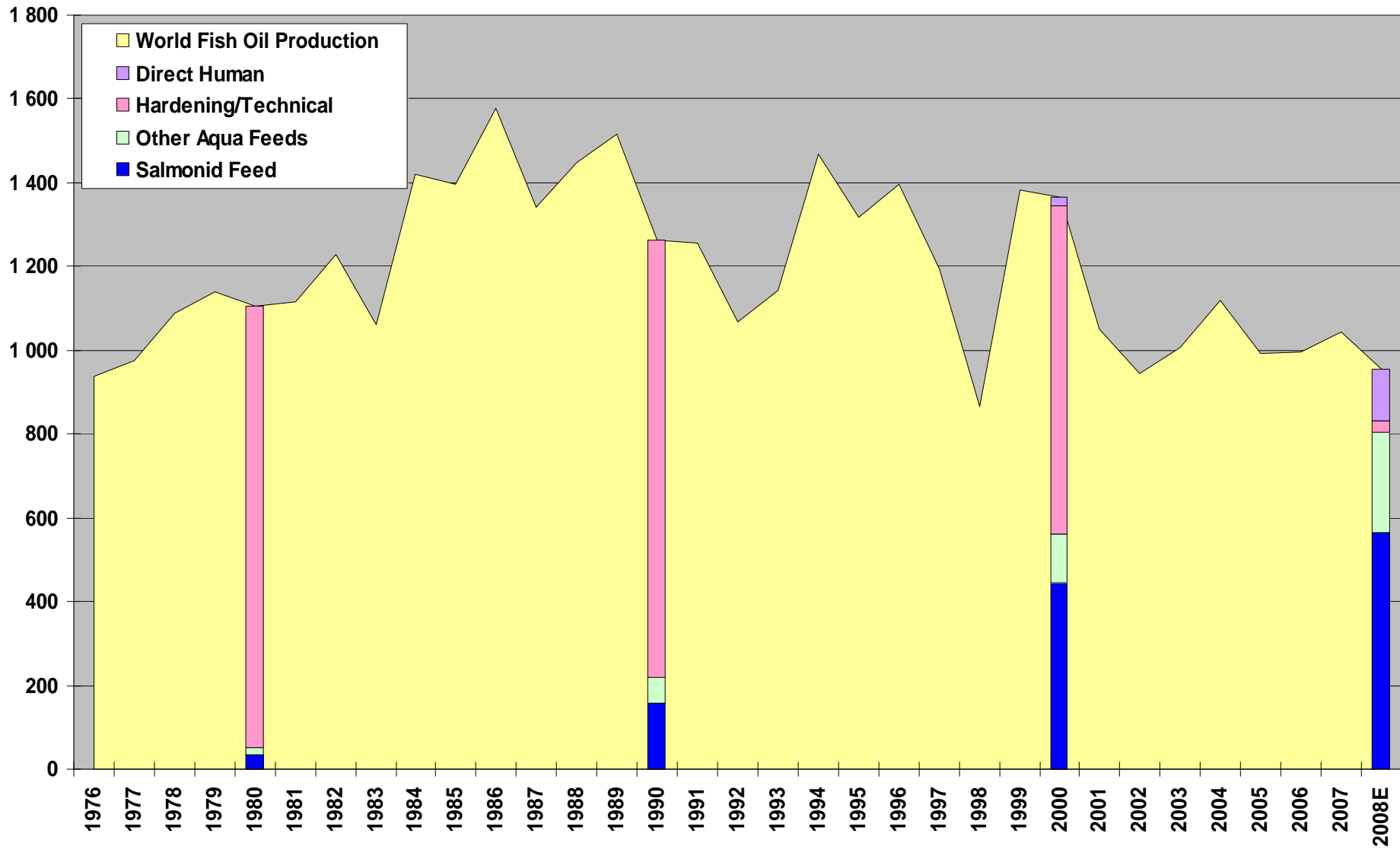
- We have by far the most effective food conversion in farmed salmon
- Why should we not use fish where it is best utilized?
- We could turn around and state that not using fish meal for farmed salmon is unsustainable?

Nutrient and energy retention in salmon, compared with other farmed animals (Austreng 1994)

World Fish Oil Production & Use

Sources:
Production: FAO
Usage: Holtermann

1000 tons

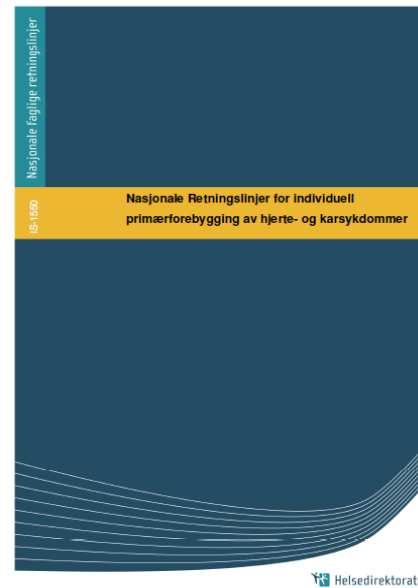


Paradox of fish oil



- Salmon feed industry use 70 % of global fish oil produced
- Resources used for meal and oil production has few other market alternatives
- The use of oils from wild fish has a significant medical and socioeconomic impact
- Farmed salmon has made available almost a million tons of fish oil pr year, formerly used for applications where omega-3 fatty acids where destroyed

The role of fish diets and CHD, Coronary Heart Disease in Humans
– an overview based on two recent Norwegian public reports and recommendations



- 1). National recommendations for individual primary prevention of Coronary Heart Disease Norwegian Health Directorate, issued 04/2009, p 1 – 137
- 2). Fish and seafood consumption in Norway .– Benefits and risks. Norwegian Scientific Committee for Food Safety, issued 03/2006, p 1 – 171.



CHD, Coronary Heart Disease in Norway (population 4,7 mill.) Mortality and morbidity



- **Mortality 2007**
 - Heart infarcts, stroke, others **14 610**

- **Morbidity***
 - Chronically ill/on disability benefit **24 000** (8%)

 - Hospitalizations **123 000** (15 % of hospital days)

 - Clinical consultations in polyclinics/doctors surgeries **1,4 mill.** (10 %)

* Additional sources; Norwegian Institute of Public Health,
Statistics Norway, SSB

Health effects and consumption of fish - Epidemiological studies (1)



Coronary Heart Disease

- He *et al.* (2004b). Persons with a high consumption rate of fish, **> 4 meals a week had a 38% reduction in mortality** compared to persons with few fish meals.

An increase of the daily intake of 20 g fish reduces the risk of **fatal coronary event by 7%** respectively.

- Köning *et al.* (2005). Fish consumption in itself reduces risk of **coronary death by 17%, a fish meal a week gives a 21% risk reduction.**

A 25% reduction in non-fatal coronary events was related to fish consumption compared to non-consumption.

Health effects and consumption of fish - Epidemiological studies (2)



Stroke

- He *et al.* (2004a).. Persons eating a fish meal 2 – 4 times weekly had a **20% risk reduction** compared to persons eating a fish meal less than once a month
- Mozaffarian *et al.* (2005a). **Same risk reduction** recorded for persons having omega-3 containing fish in their regular diet
- Bouzan *et al.* (2005). The sole consumption of fish in the diet **reduces stroke risk by 12%** compared to non-consumption



A reduction in **10 %** of the epidemiological markers on CHD in Norway by a change in diet will represent the following figures;



- Mortality **2007**
 - Heart infarcts, stroke, others 14 610 **(1 460)**

- Morbidity*
 - Chronically ill/on disability benefit 24 000 **(2 400)**

 - Hospitalizations 123 000 **(12 300)**

 - Clinical consultations in polyclinics/doctors surgeries 1,4 mill. **(140 000)**

* Additional sources; Norwegian Institute of Public Health, Statistics Norway, SSB

The consumption of salmon and fat fish in the EU Medical and socio-economical impact



- The epidemiological data on CHD and fish consumption as shown on the example Norway, originates from a country with;
 - Relatively small population, 4, 9 mill.
 - Relatively low and sinking incidences of CHD in its population, data presented
 - Relatively high consumption of fish per capita; 65g/dayly pr. adult – 2 meals weekly

- Extrapolating the Norwegian data onto the EU level means taking into account;
 - A population of > 500 mill. (100x Norway)
 - Higher incidences of CHD in certain countries
 - Lower consumption of fish per capita in certain countries

- A lowered risk towards CHD within the EU population resulting from a higher fish consumption rate should be expected with a significant socio-economic impact



- Total salmon production 2009; 1 mill. tons
- 6 proper meals pro kilo salmon
- 6 billion meals annually
- Recommendation;
 - 2 meals weekly
 - 100 meals pro year
- Preventive potential;
 - 60 million people

- Use of marine resources
 - If fisheries resource management, policy and control had been trusted, we would not had any reason to question the sustainability in using marine resources for food production
- Use of GM materials
 - We need more alternatives, in order to secure further industry growth
- Use of LAPs, land animal proteins
 - This untapped source for high quality proteins, from top standard rendering industry is not sustainably utilized
- Resource efficiency
 - Methodology and information presented are in many cases biased, incomplete or even wrong

Summary



- The aqua feed industry contribute to increased availability of healthy seafood while growing and improving efficiency
- We invest heavily in R&D to broaden the range of ingredients
- Marine feed resources should be allocated to productions utilizing the resource best by ensuring we have a well function market
- Improved EU regulations of fisheries will be important to sound management of the resource and building consumer confidence.
- The industry needs help in food safety assurance of new ingredients to continue making cost effective and health-promoting aqua feeds.