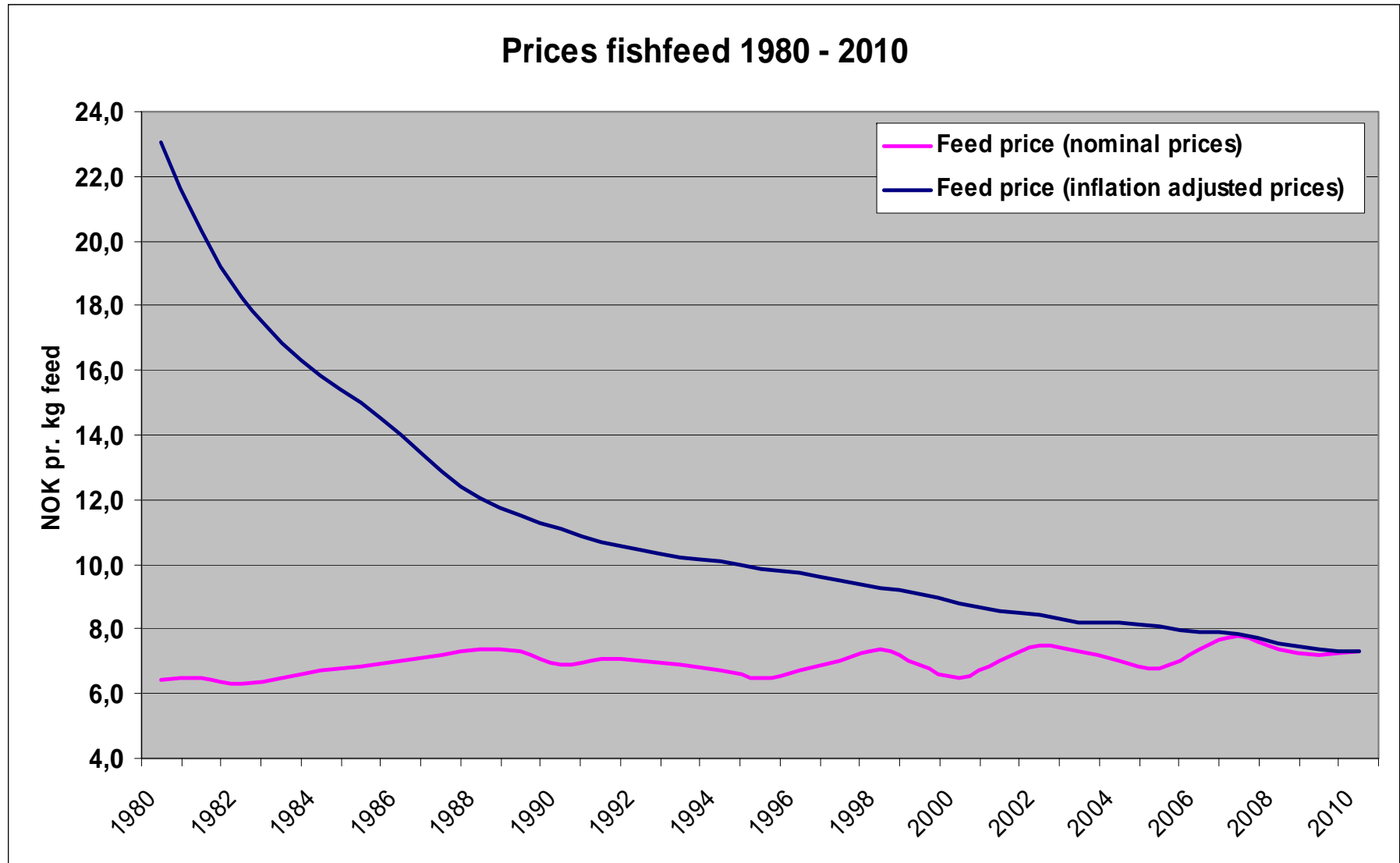


# Challenge: Shortage of marine protein When will feed prices increase?



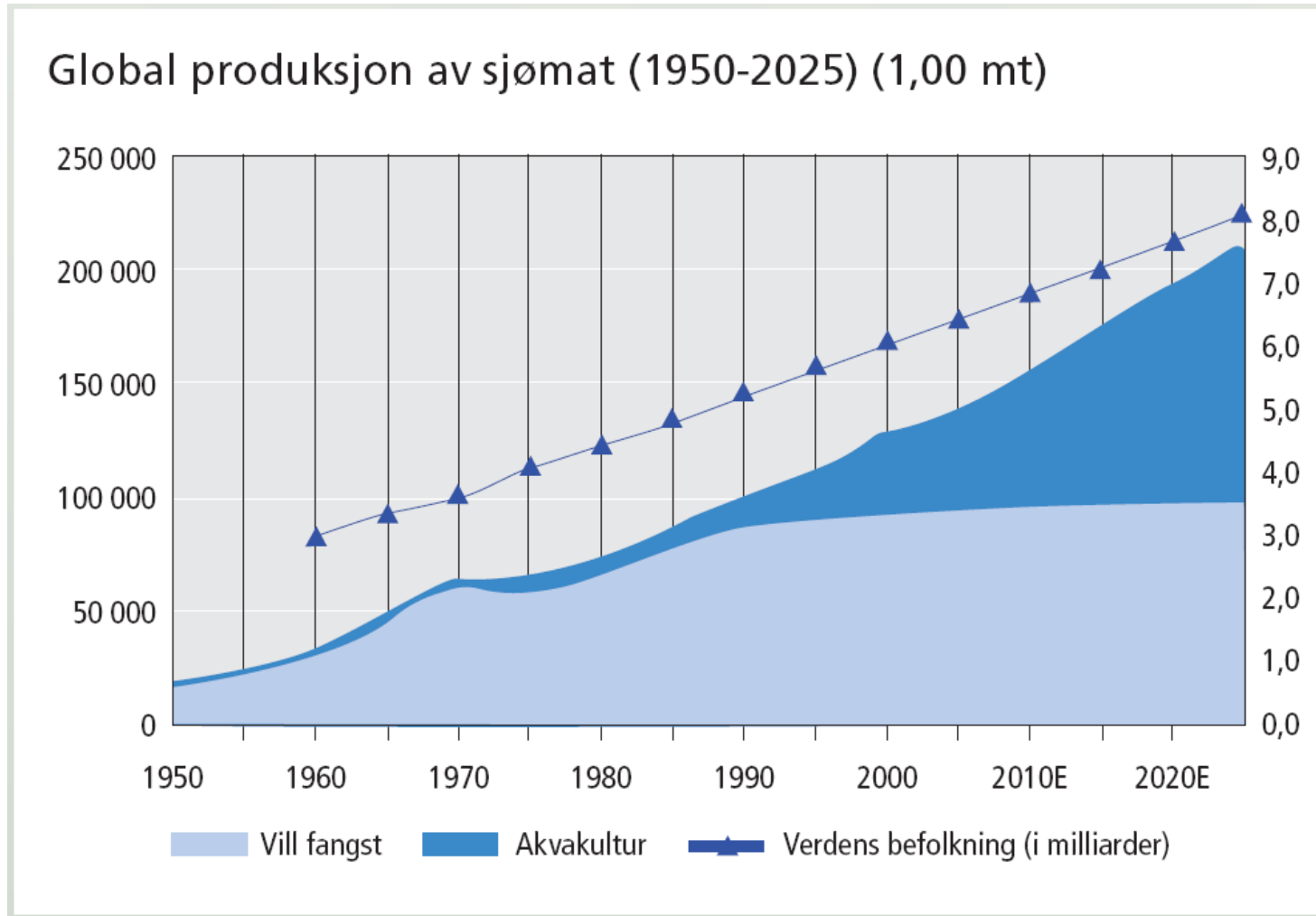
Kjell Bjordal, Cermaq/EWOS Group

# Have feed prices ever increased?



- The global supply of seafood
- Fish meal supply and use
- R&D and development of alternatives
- Trends in use of raw materials
- Sustainable or not, the omega 3 as example
- Future:
  - Alternatives, options and feed prices...

# Aquaculture will secure the future supply of seafood for the growing global population

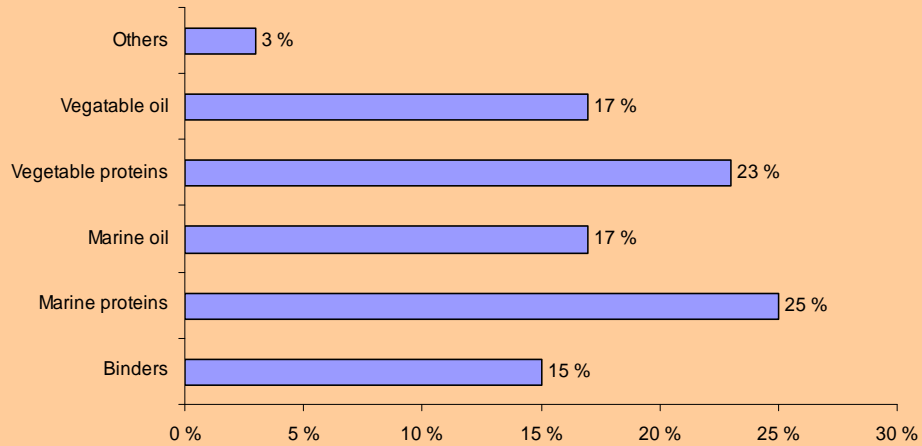


Kilde: FAO

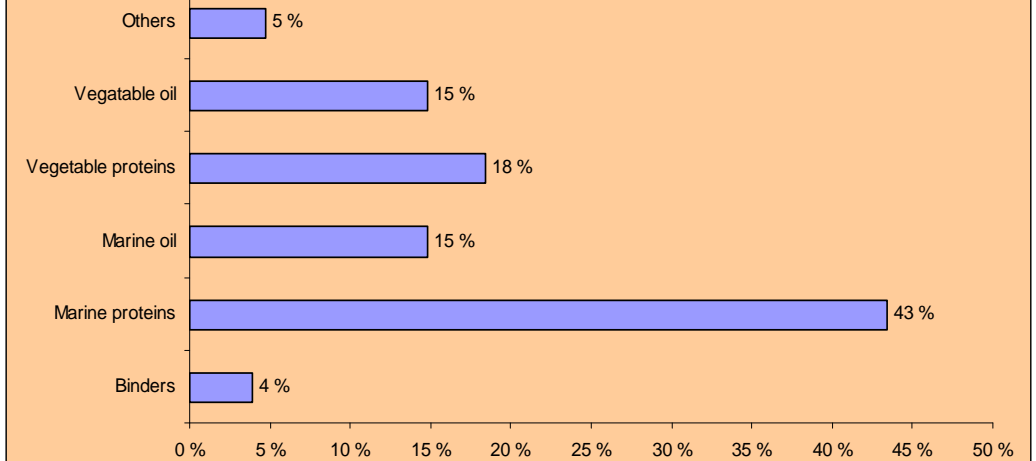
# Typical salmon feed composition



### Main Components



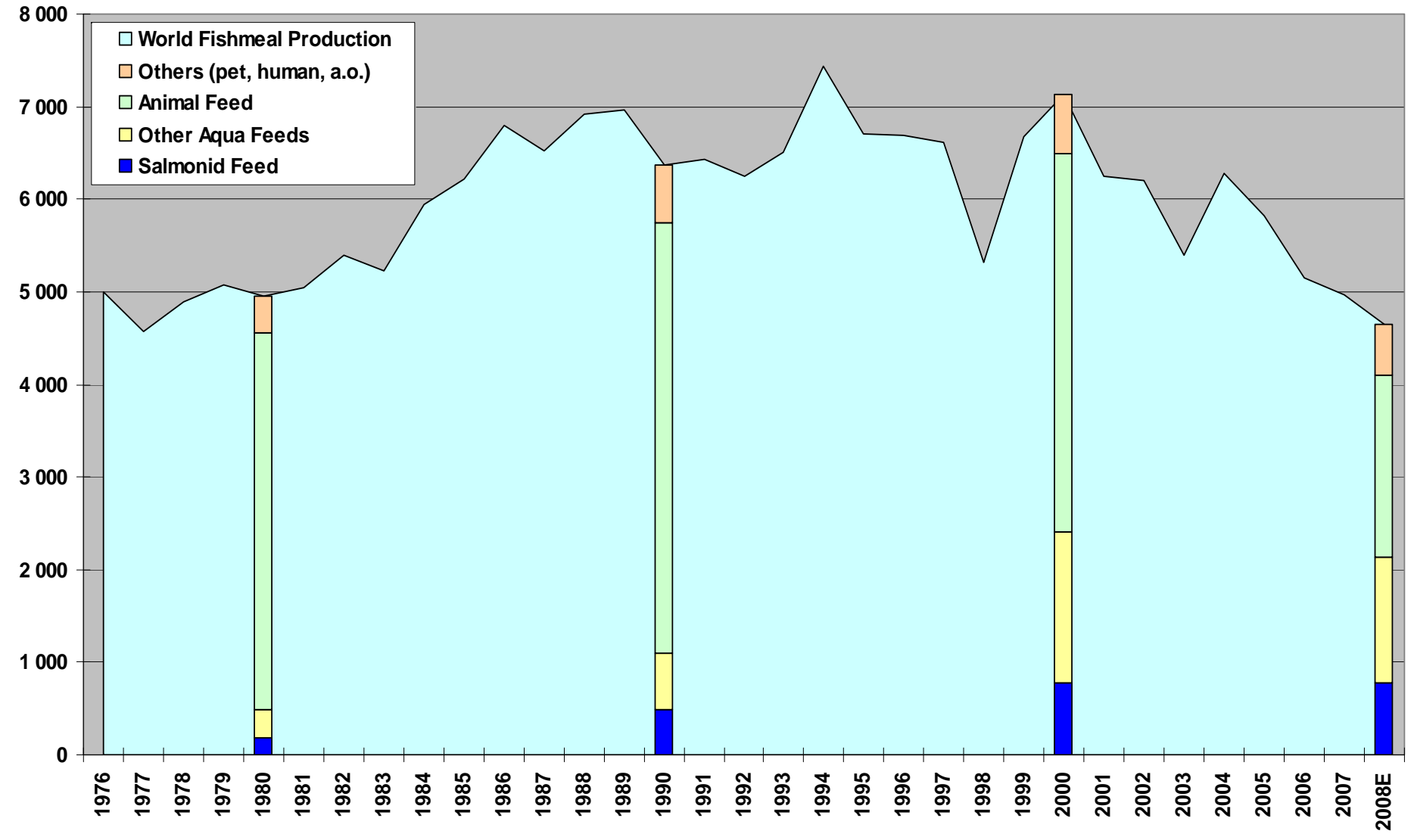
### Component Cost



# World Fish Meal Production & Use

Sources:  
Production: FAO  
Usage: IFFO

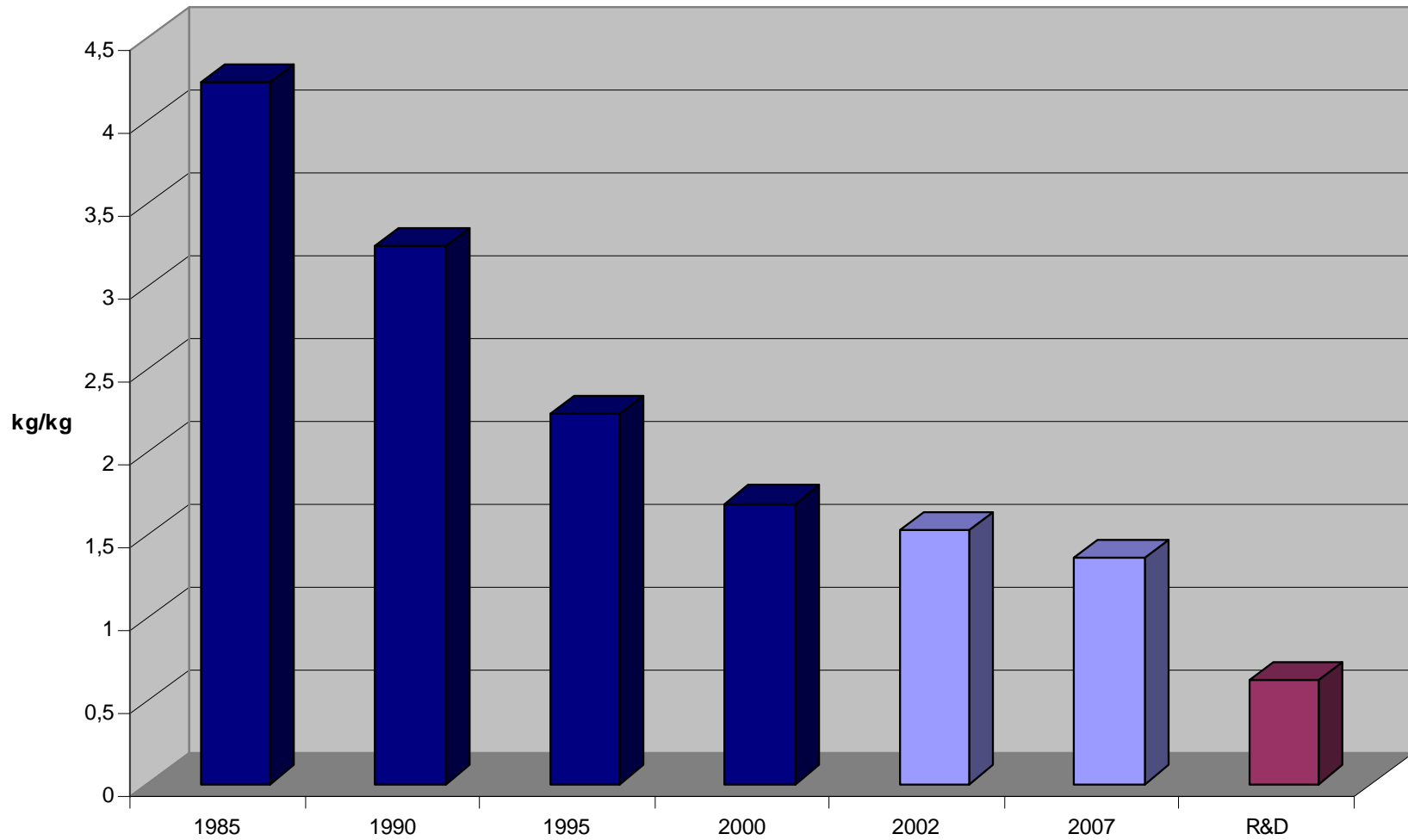
1000 tons



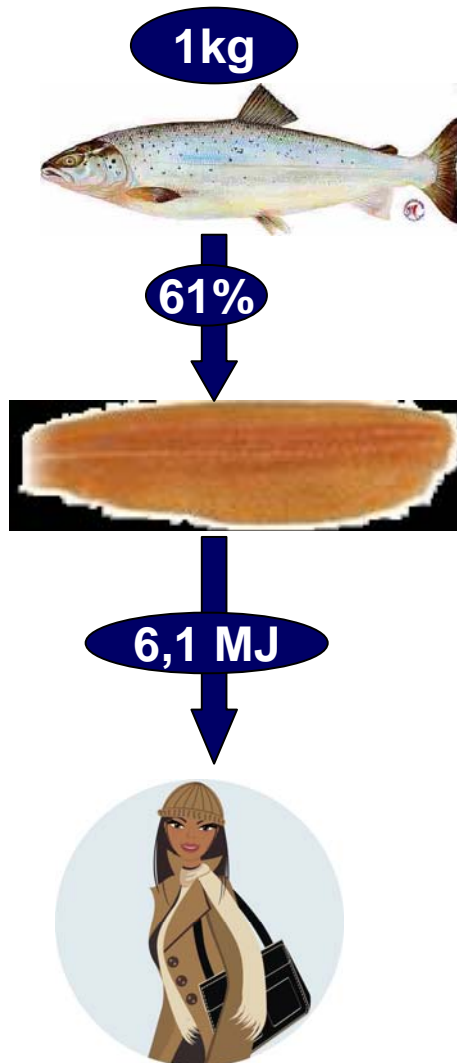
# This change our marine protein dependency



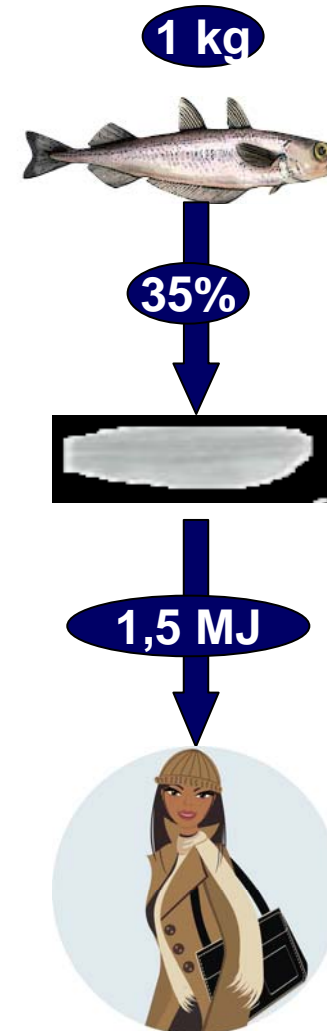
Protein used vs protein produced



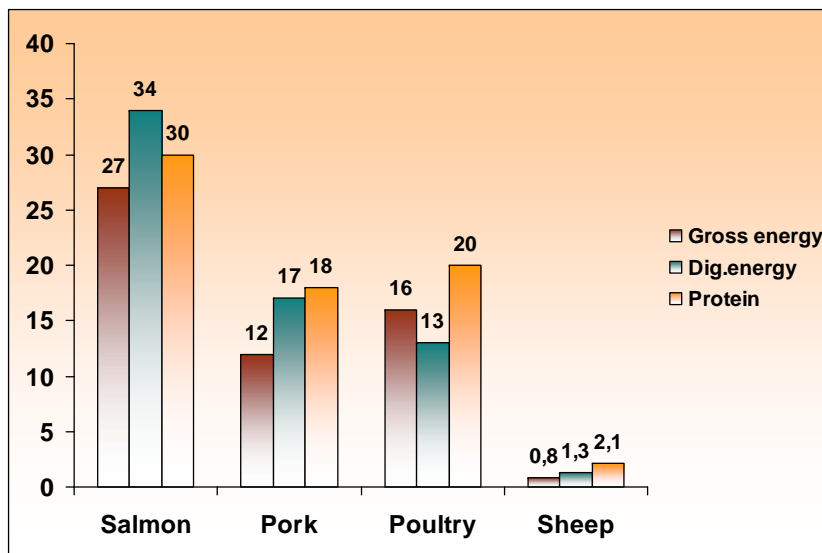
## Salmon



## Blue Whiting



# Farmed salmon, the most effective farmed animal



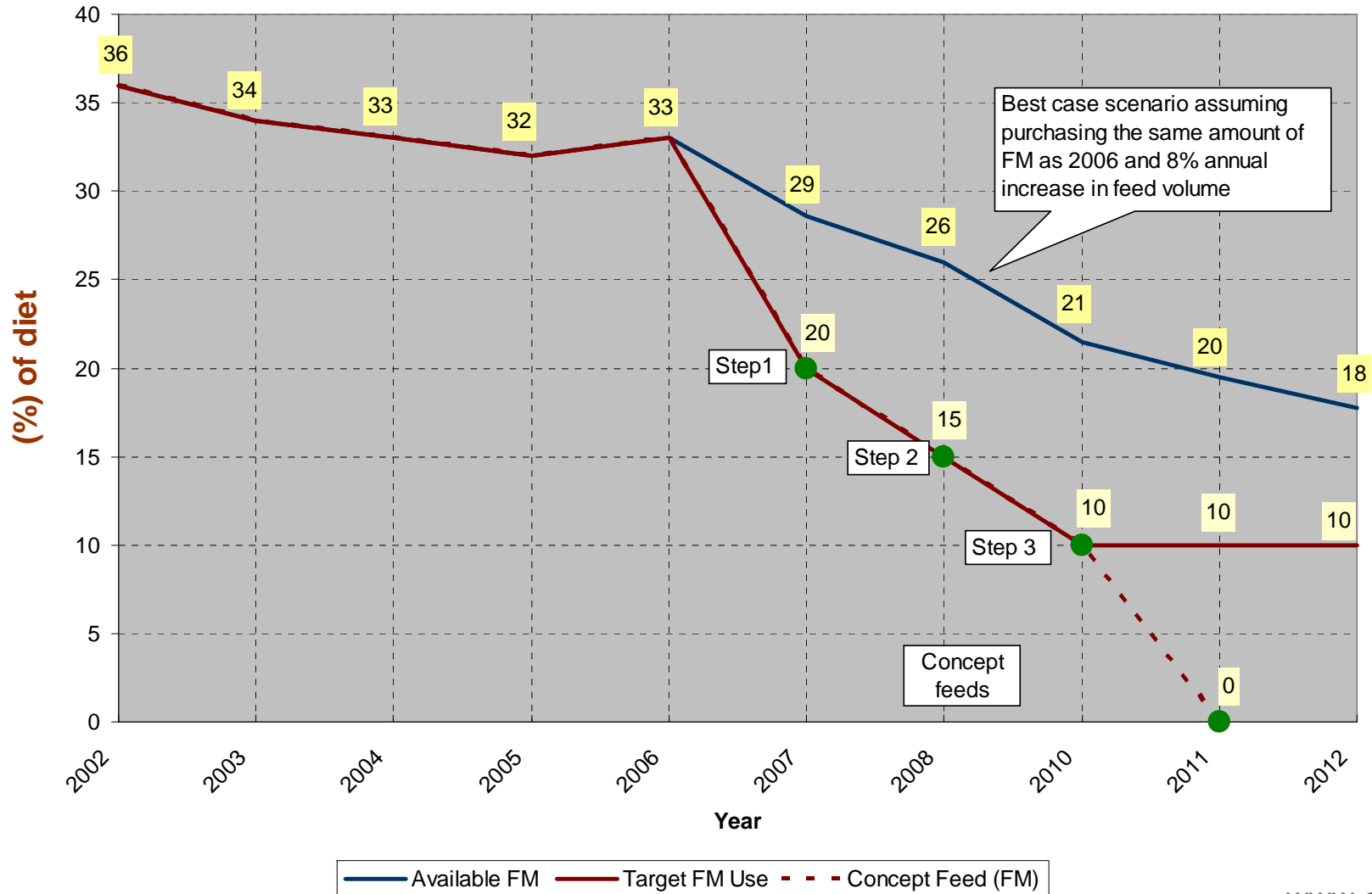
- We have by far the most effective feed-to-food conversion in farmed salmon
- Why should we not use fish where it is best utilized?
- We could turn around and state that not using fish meal for farmed salmon is unsustainable?

Feed efficiency in salmon, compared with other farmed animals (Austreng 1994)

# Leading Marine Independence

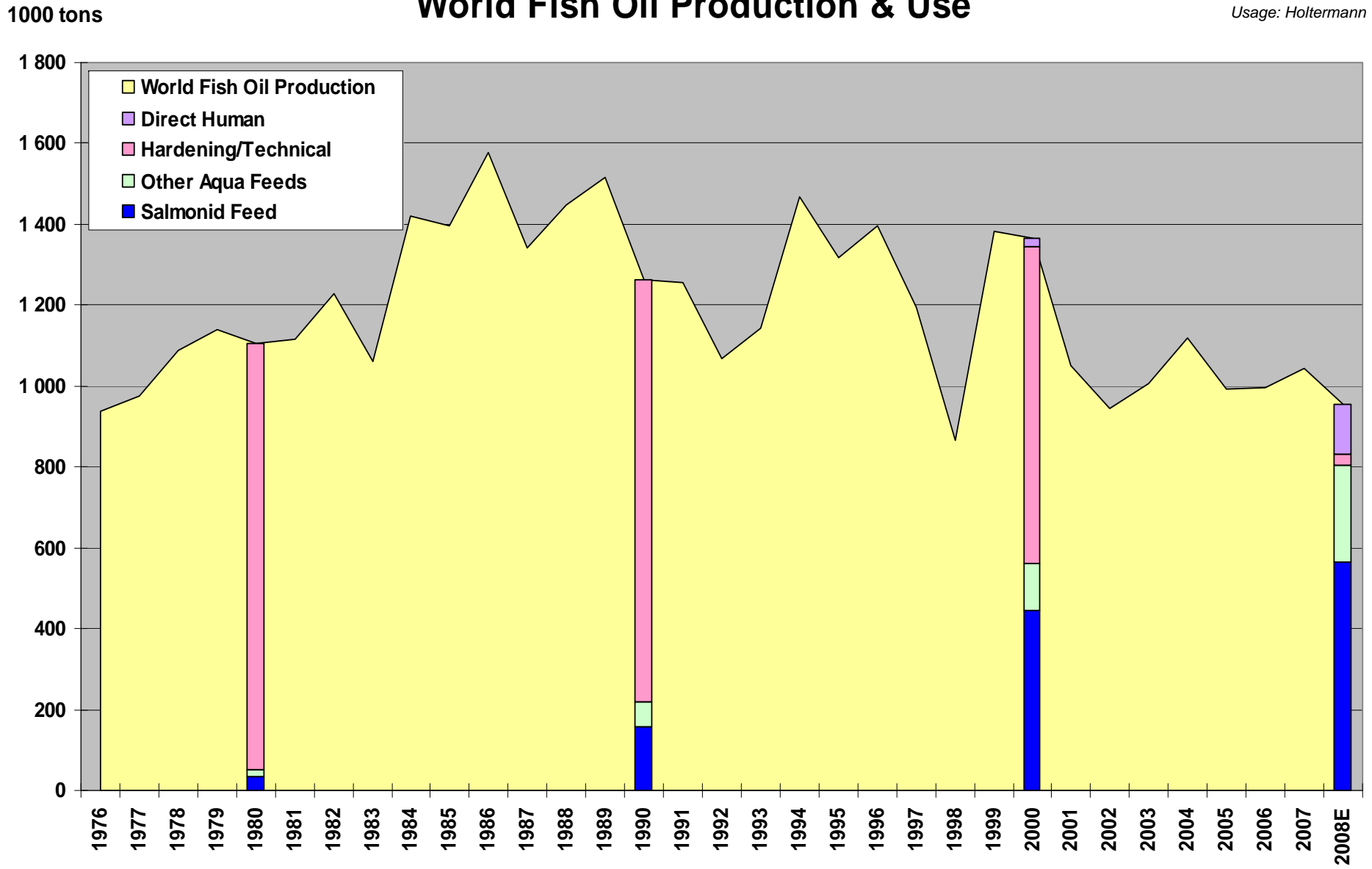


Fish meal usage (% of diet) in EWOS Feeds

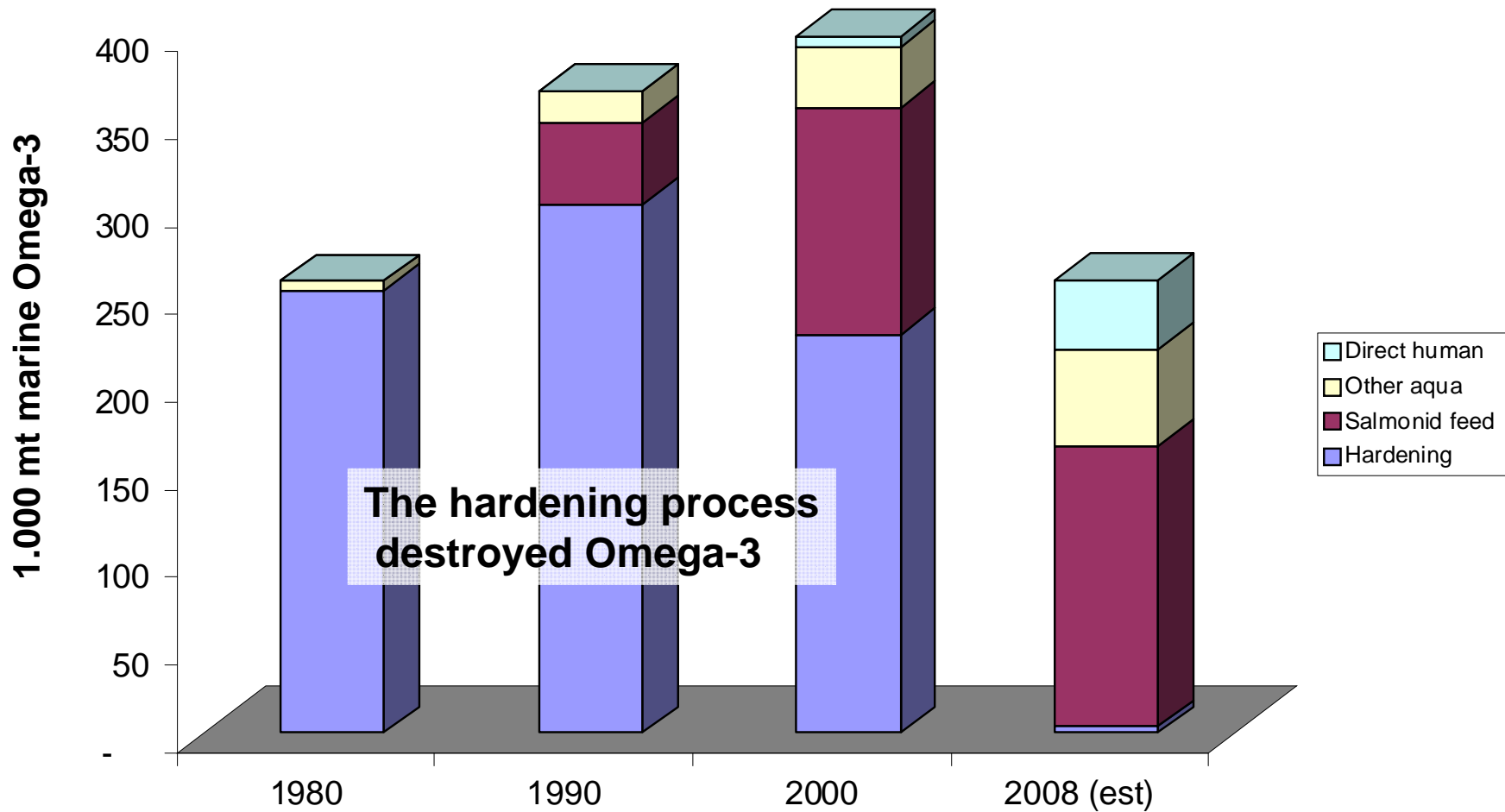


# World Fish Oil Production & Use

Sources:  
 Production: FAO  
 Usage: Holtermann



# Aquaculture has transferred Omega-3 to food



## Protein:

- **Vegetable Proteins**

- **Commodities:** Soy, maize gluten, sunflower meal, lupins, peas, beans, etc.
- **Concentrated vegetable proteins:** SPC, PPC, wheat gluten, etc.

- **Animal Byproducts** (>15 mill. Mt – More than 3 times larger than fish meal)

- Blood meal, poultry and feather meals, etc.

- **Fermentation Products**

- Single Cell Protein, yeasts, microalgae, etc.

- **Marine Proteins**

- Marine byproducts (FPC), krill meal, copepods, etc.

## Oils

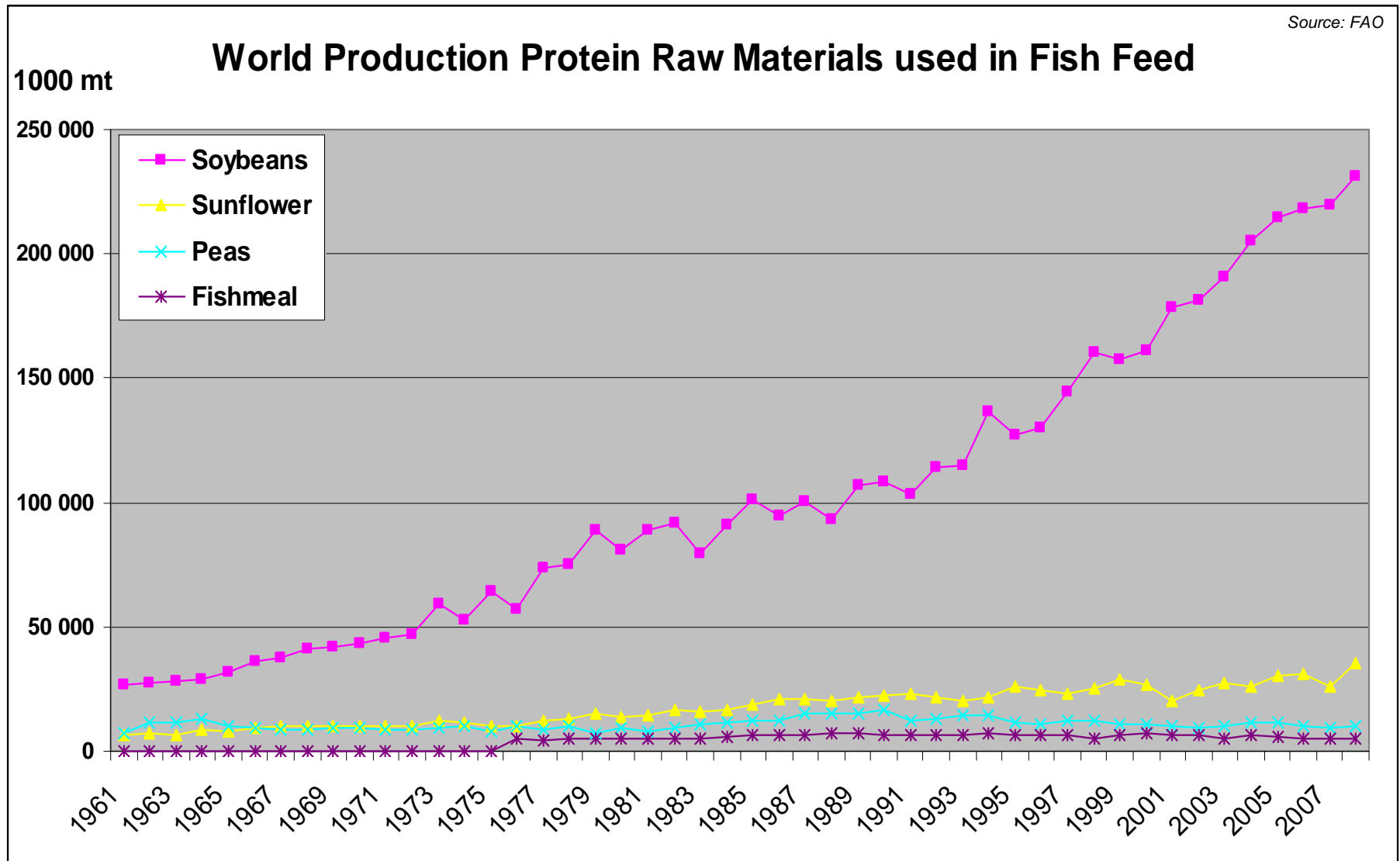
- **Vegetable Oils**

- **Commodities:** Rapeseed oil, soy oil, palm oil, etc.
- **Future products (GMO):** Soy and rapeseed oils with Omega-3

- **Animal Byproducts**

- Animal fats

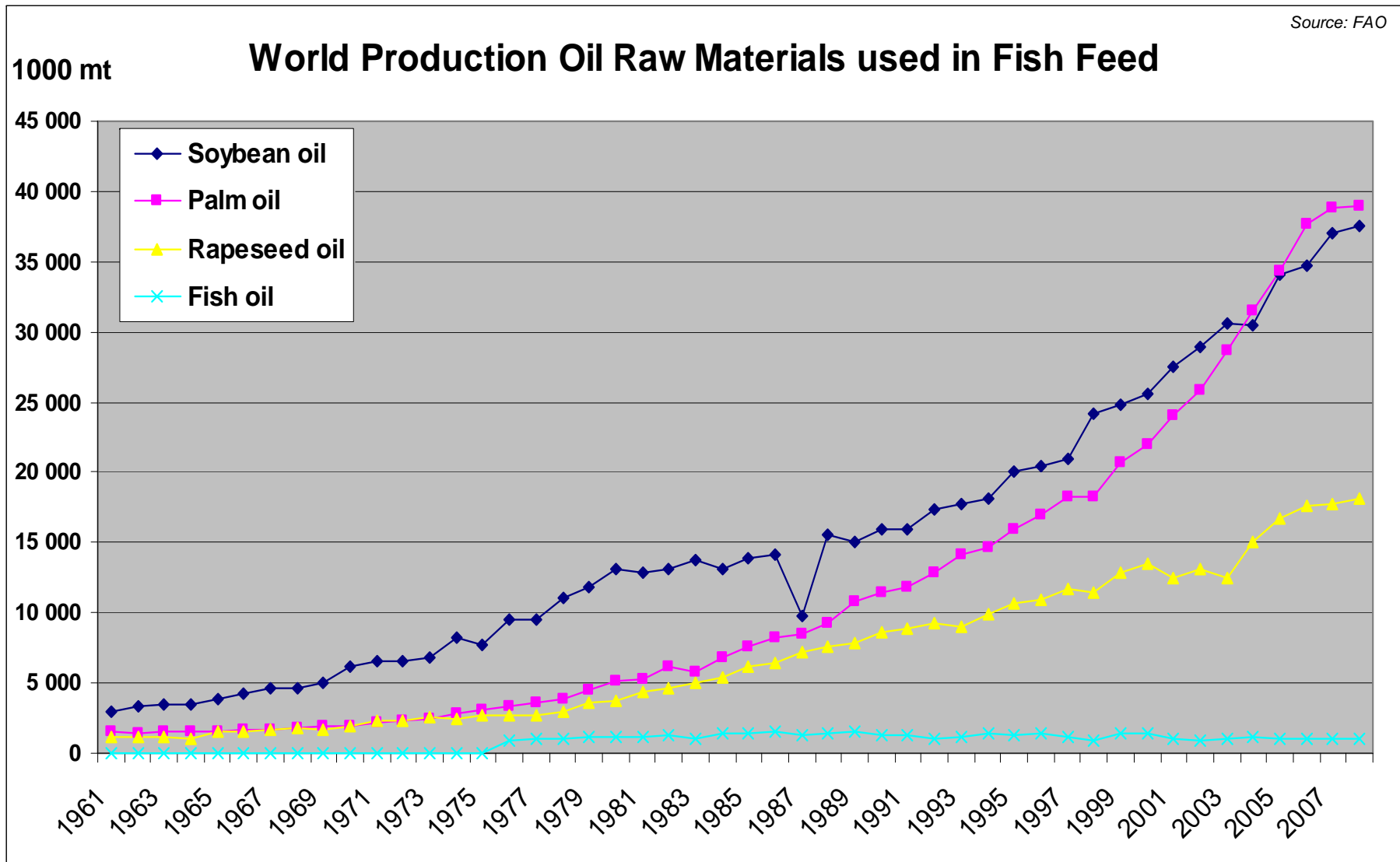
# Availability alternative proteins



# Availability alternative oils



Source: FAO



## The obvious option for increased supply of marine raw materials:



- ELIMINATE DEFECTS IN FISHERY REGULATIONS

-Yearly by-catch thrown back to sea as biological waste is 10 times higher than marine raw materials consumed by norwegian salmon farming.

# Projections? The cost of feeding the salmon will continue being lower than the yearly variation in salmon price.

