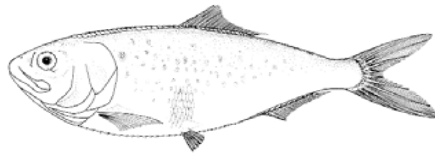


A Review of Fishmeal & Fish Oil in Animal Feed Production

**Presented by
Scott Herbert**

March 2008





Menhaden Fishery



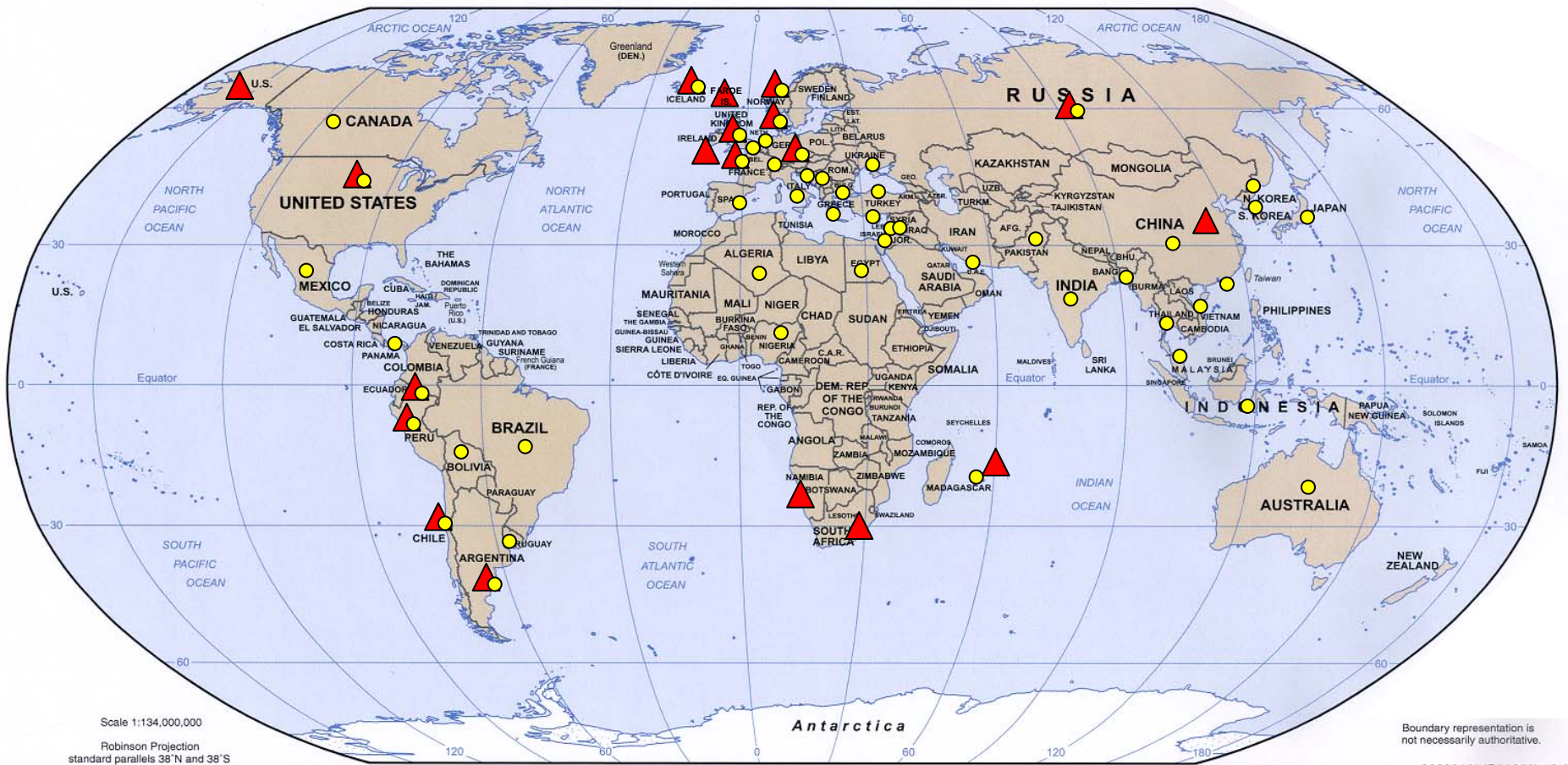
Average Production 1991-2007

Fish Meal: 133,000 Metric Tons

Fish Oil: 66,000 Metric Tons



International Fishmeal and Fish Oil Organization



▲ Producer Members

▲● Producer and Associate Members

● Associate Members

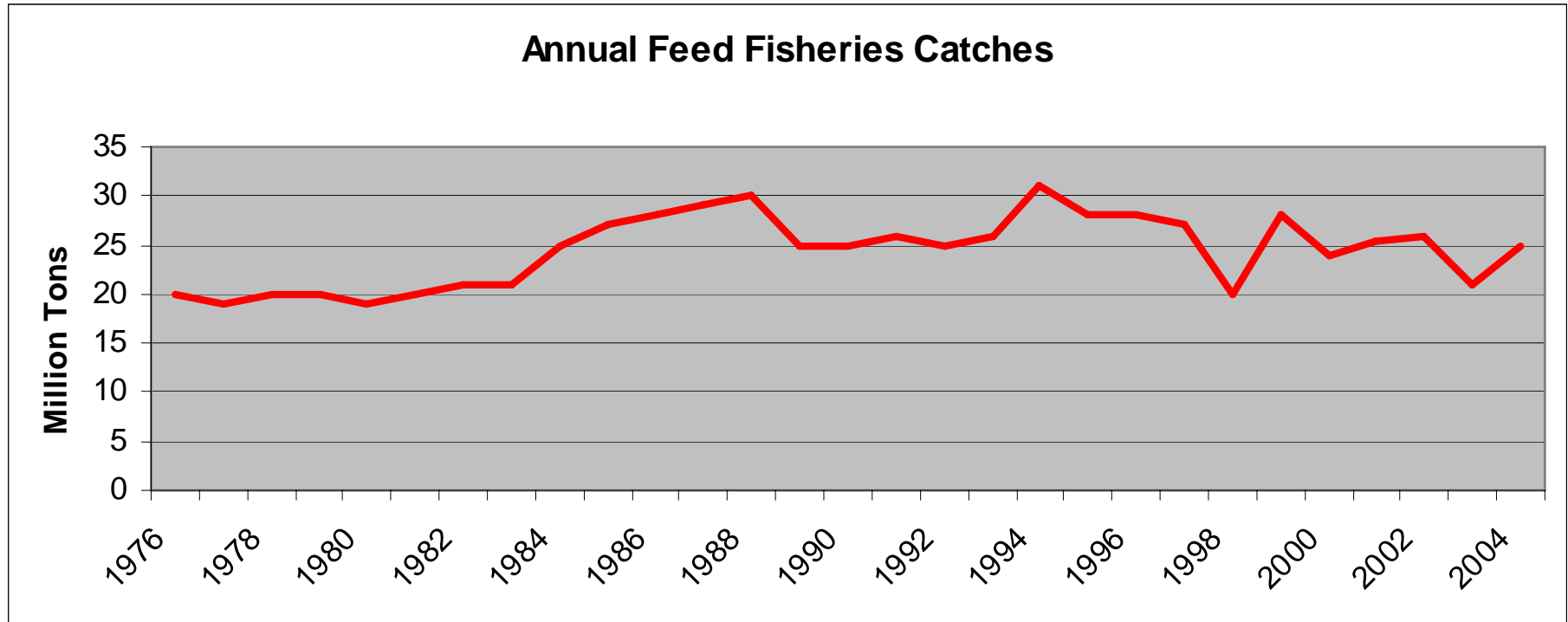
Source: IFFO data



IFFO Position on Sustainability

- IFFO members are all committed to sustainable fishing
- Almost all IFFO fishing is in countries that have agreed to adhere to the FAO Code of Responsible Fishing
- Strong controls and quotas are in place and enforced to ensure compliance
- IFFO has recently decided to implement a Code of Responsible Production (CORP) for the production of fish meal & fish oil
- This code demonstrates responsible business to business raw material procurement and production

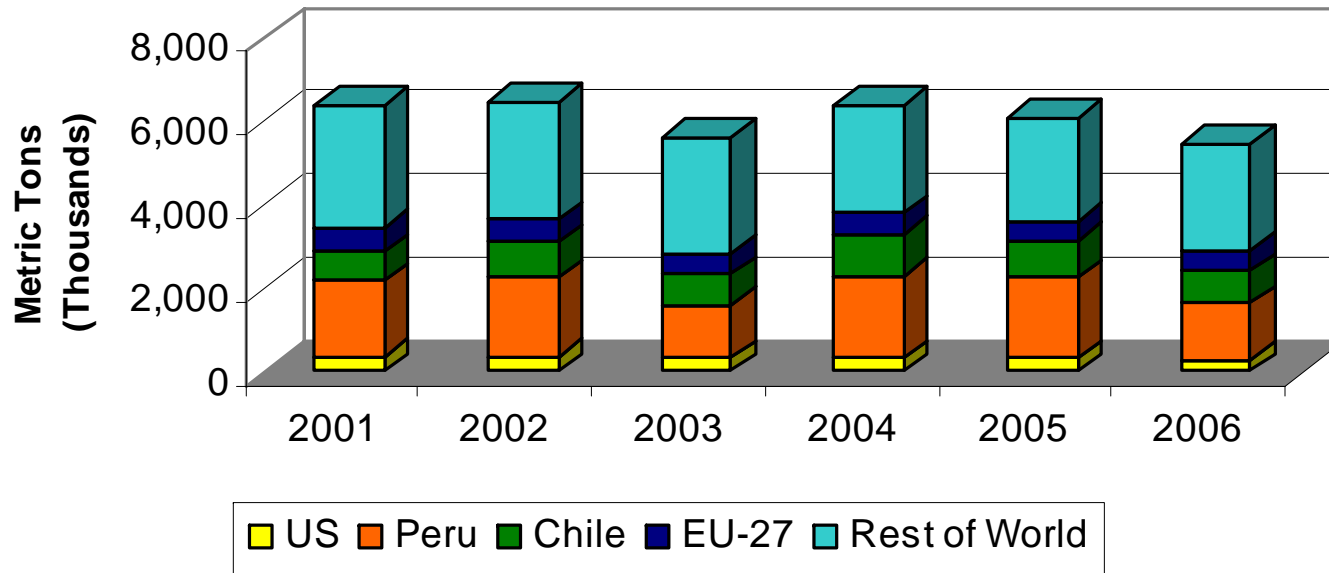
Global Reduction Fisheries



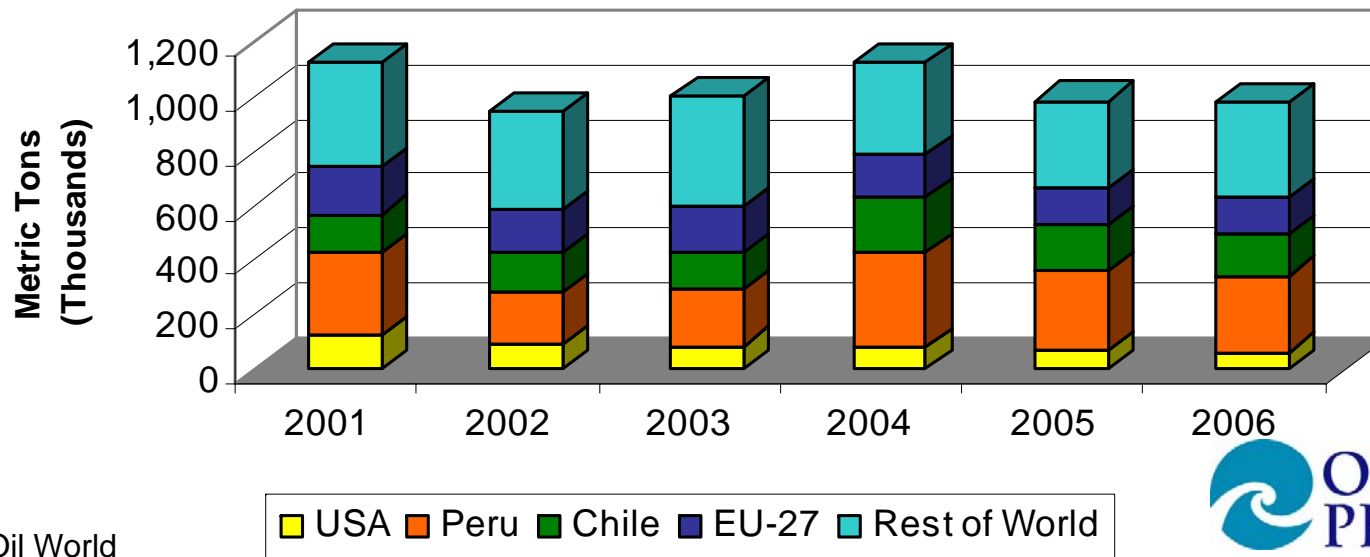
Source: IFFO data



Fish Meal Production 2001-2006



Fish Oil Production 2001-2006

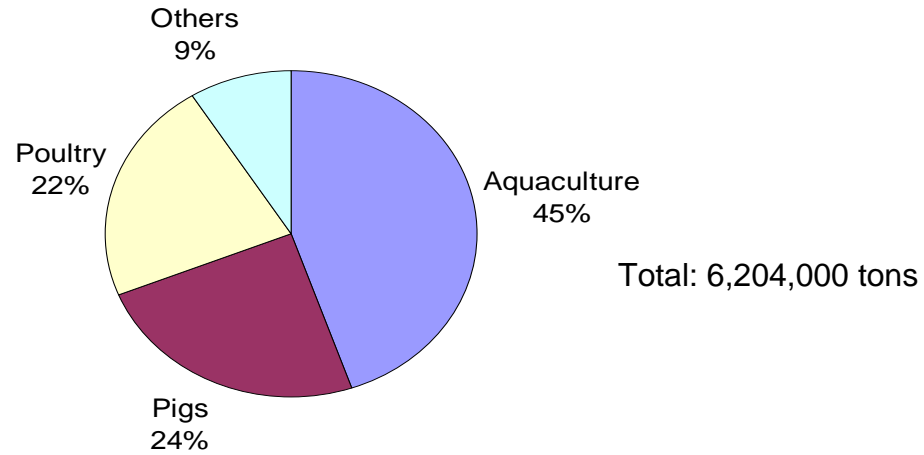


Source: Oil World

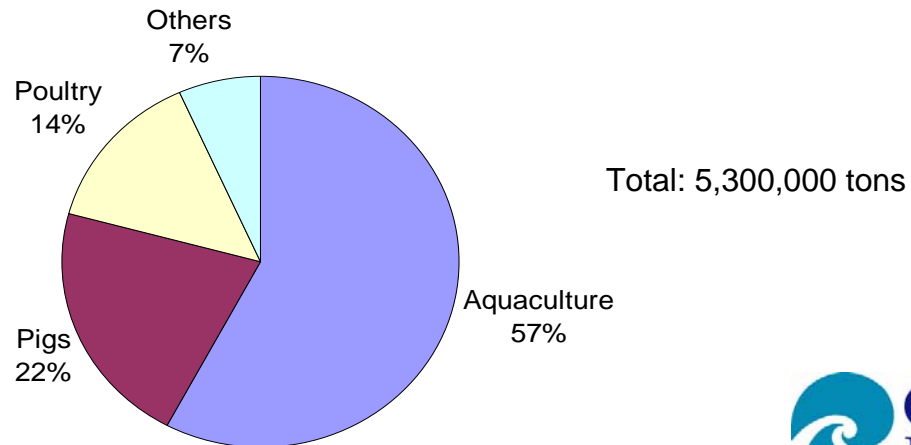


Estimated Global Fishmeal Consumption

Fishmeal Consumption 2002



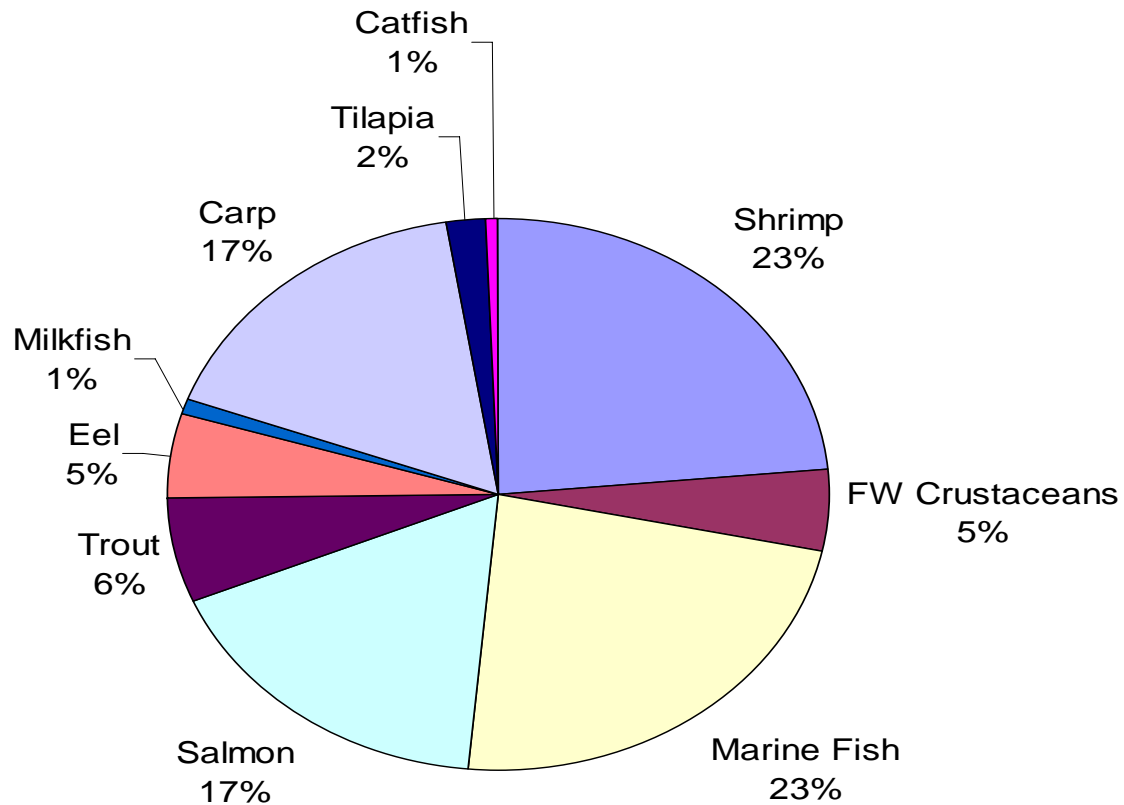
Fishmeal Consumption 2006



Source: IFFO data



Estimated Fish Meal Consumption in Aquafeed 2006

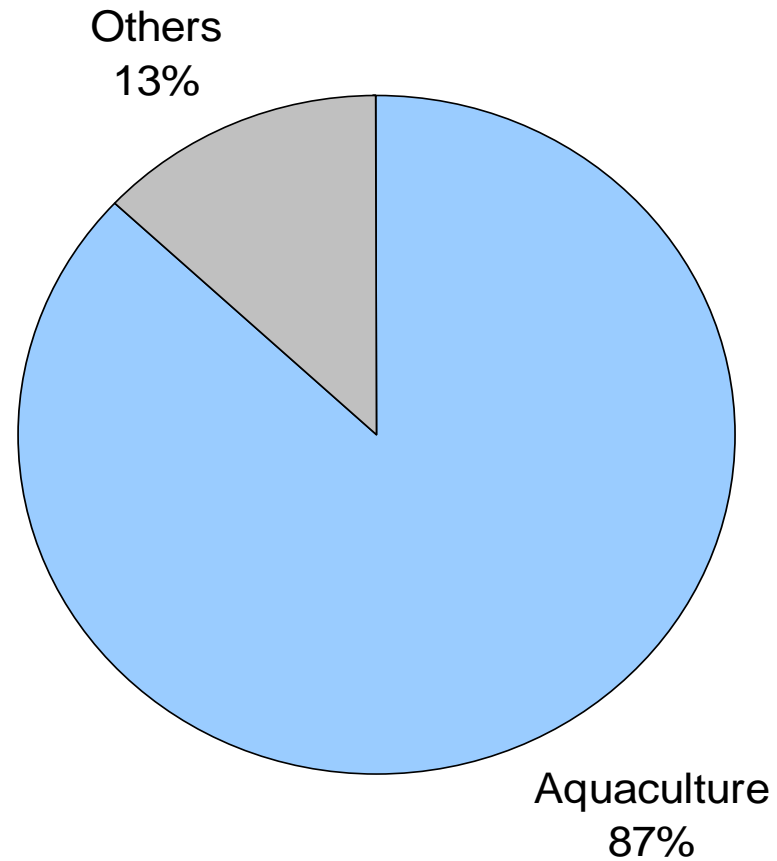


Total: 3,037,800 tons

Source: IFFO data



Estimated Fish Oil Consumption 2006

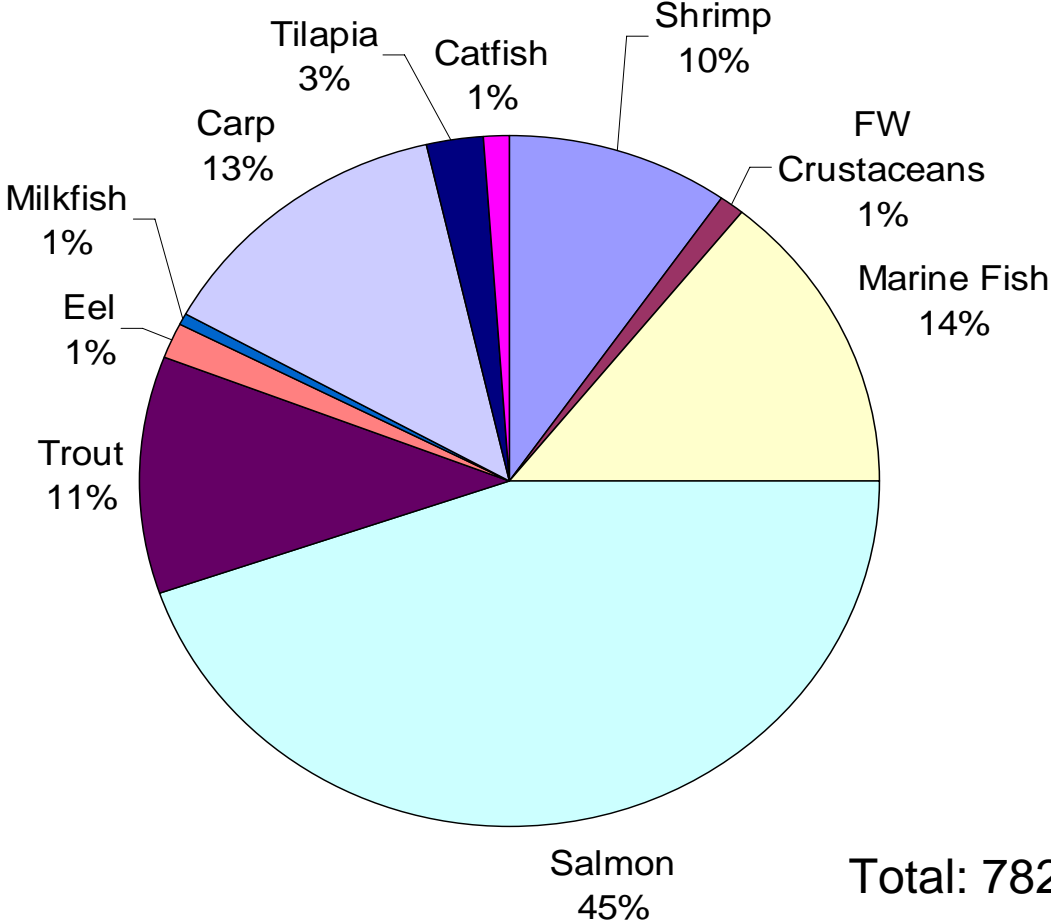


Total: 900,000 tons

Source: IFFO data



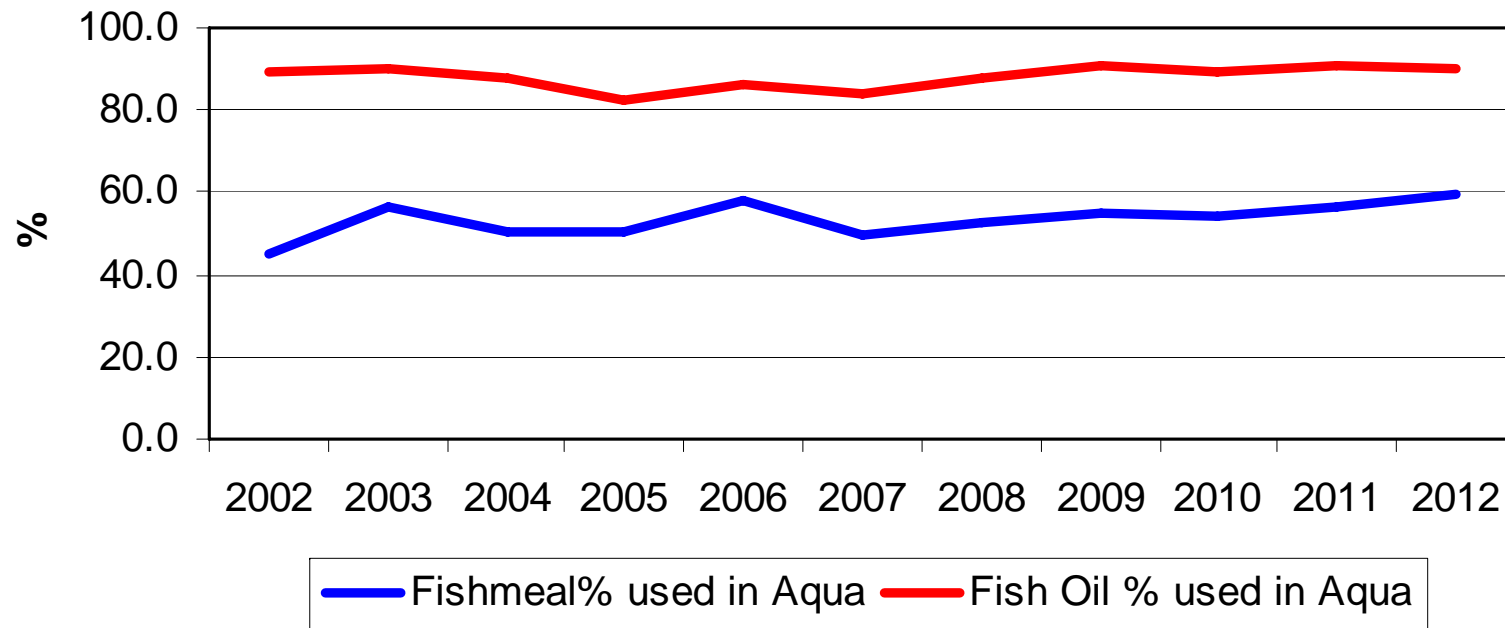
Estimated Fish Oil Consumption in Aquafeed 2006



Source: IFFO data



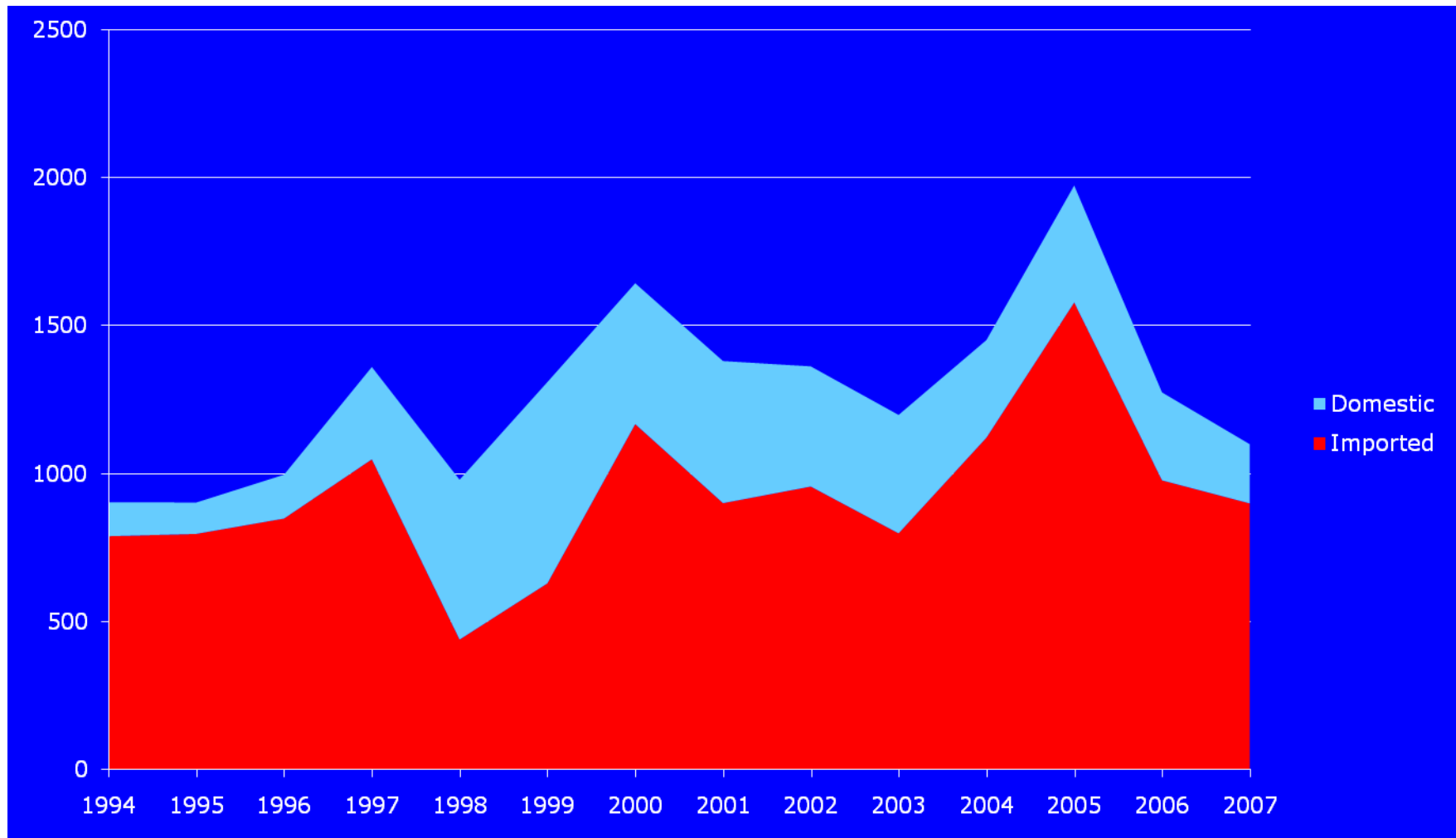
Fishmeal & Oil used in Aquaculture



Source: IFFO data



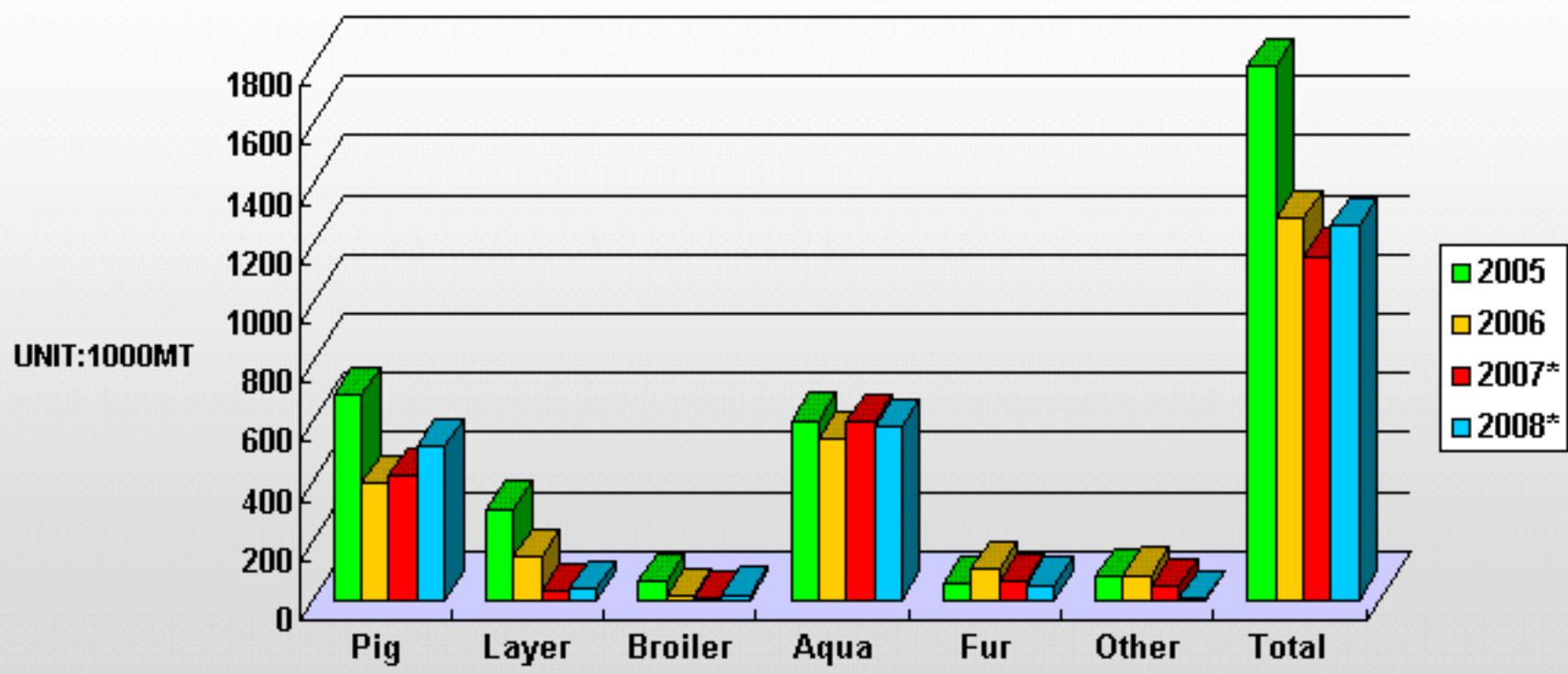
1994-2007 China Fishmeal Usage (Thousand Tons)



Source: IFFO data

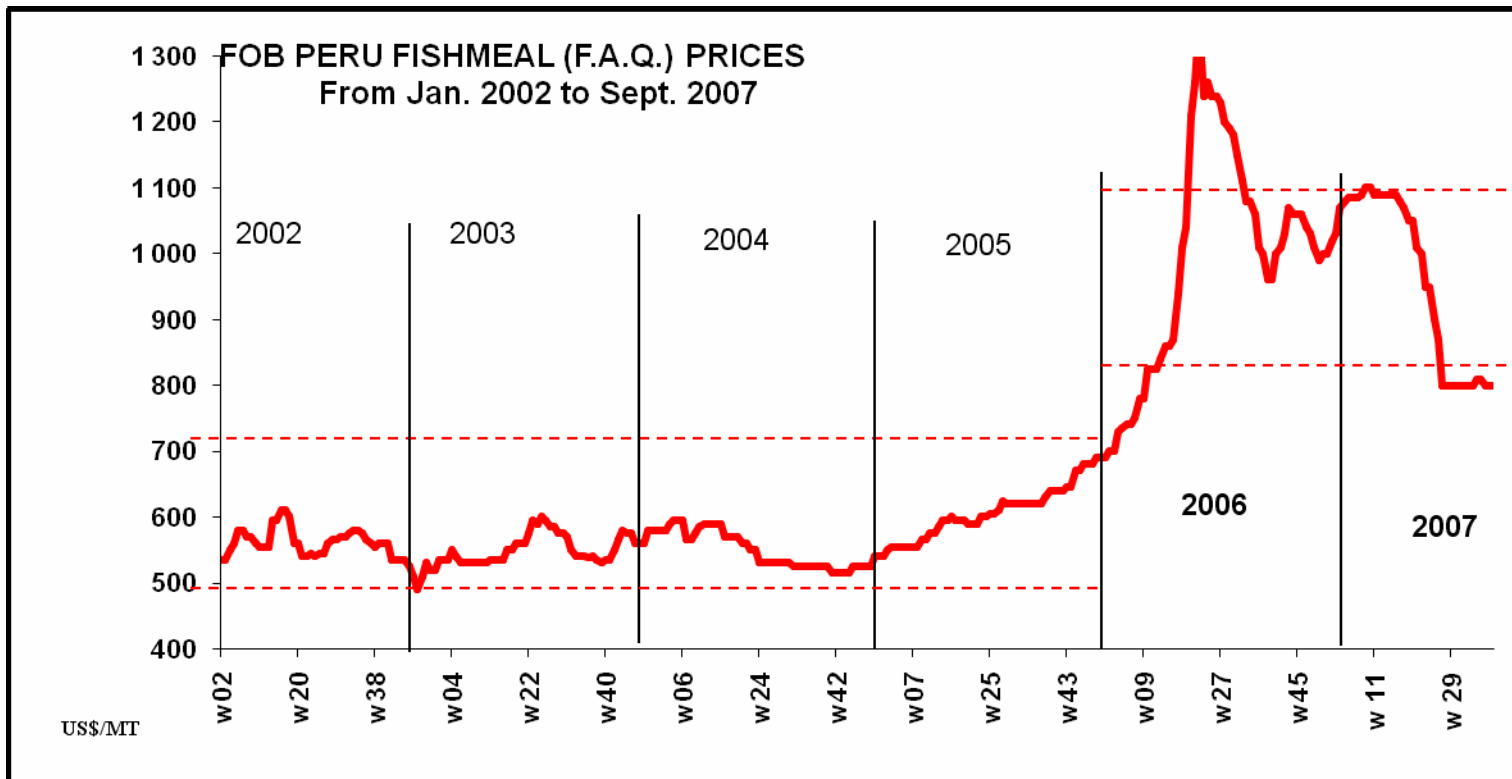


CHINA FISHMEAL CONSUMPTION 2005-2007



WWW.CHINAJCI.COM ©2005-2007

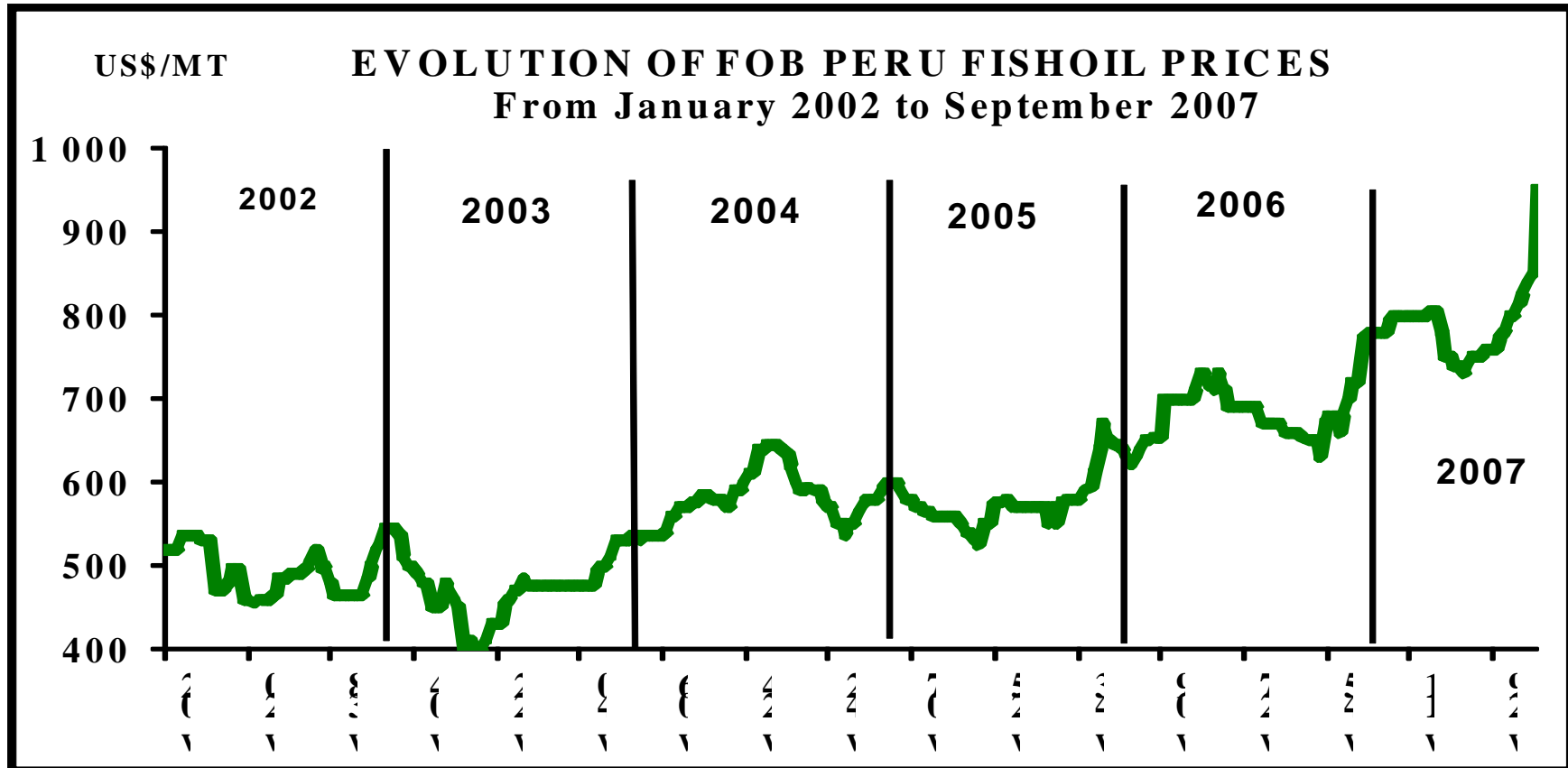
Fishmeal Price \$/ton



Source: IFFO data



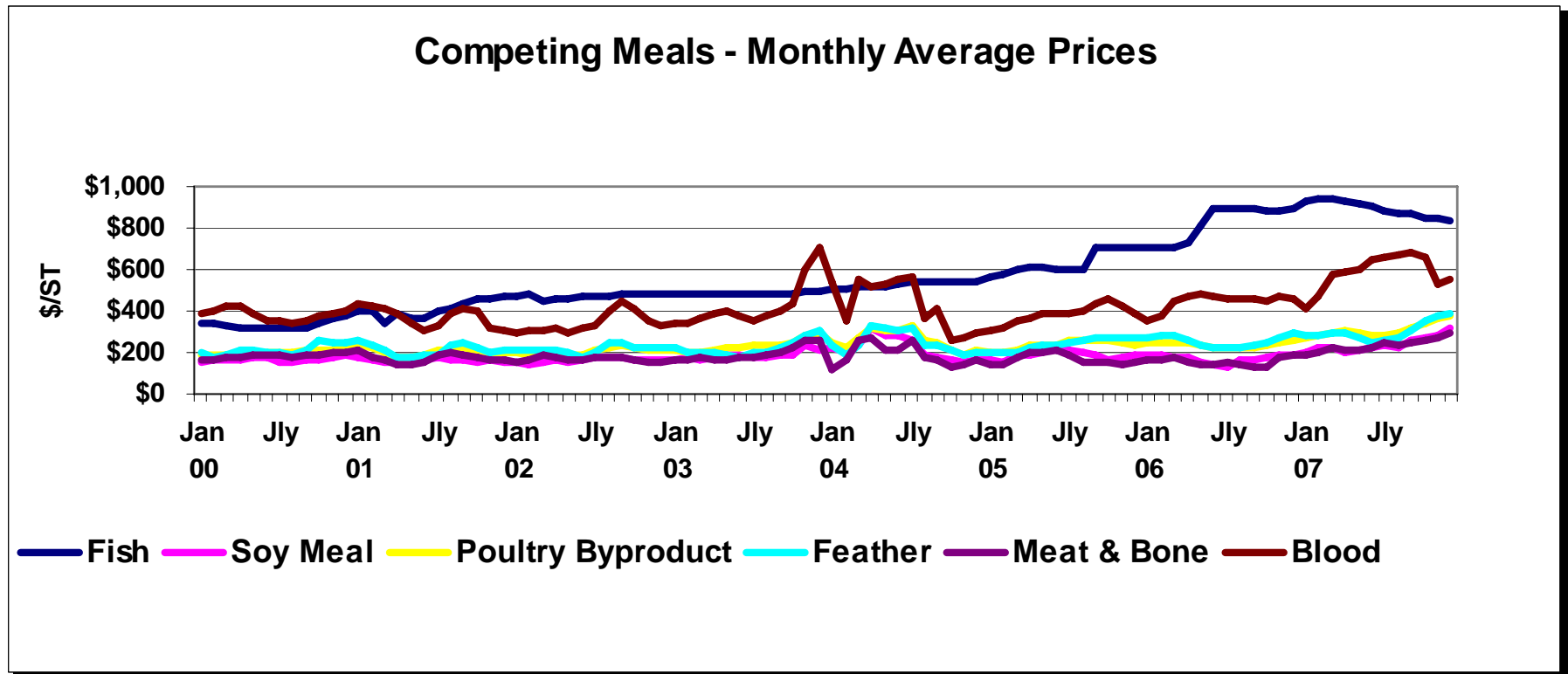
Fish Oil Price



Source: IFFO data



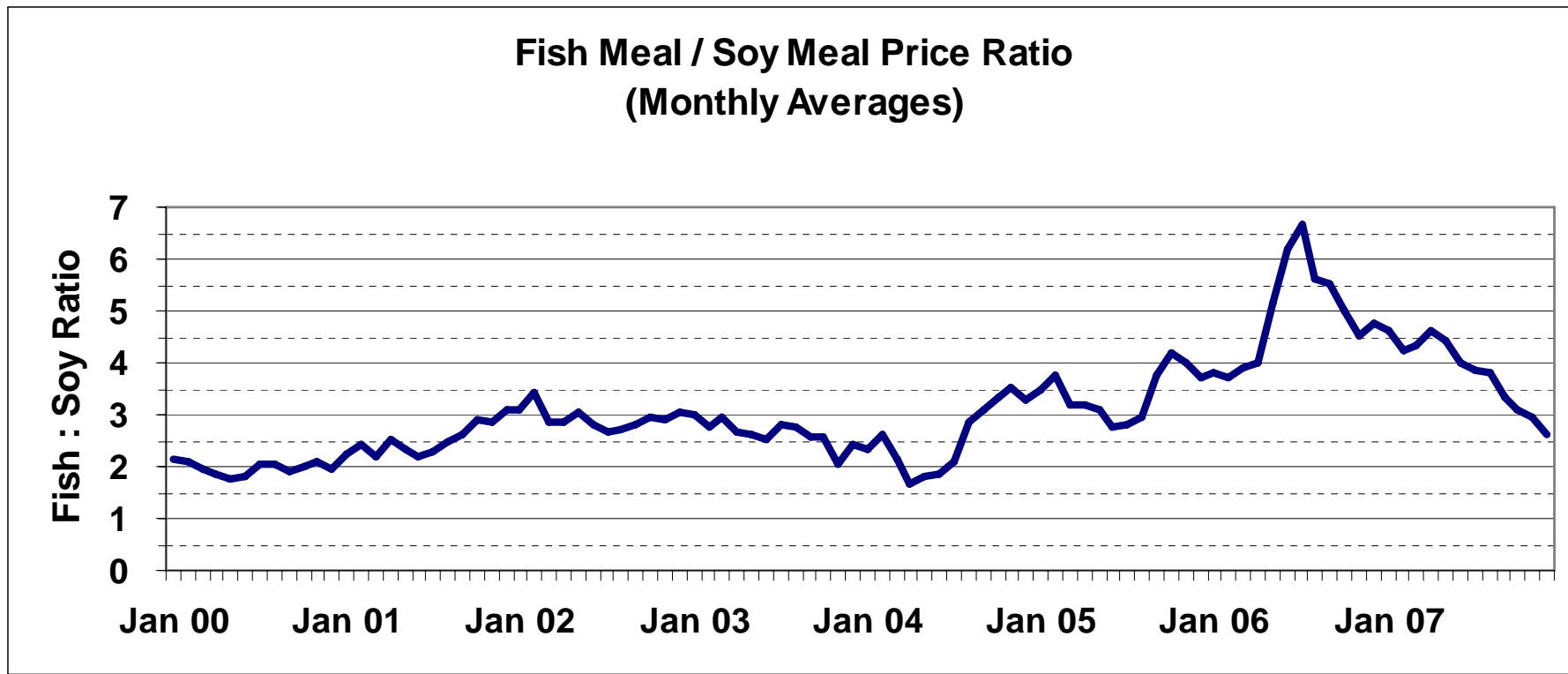
Competing Meals – Monthly Averages



Source: The Jacobsen monthly reports; <http://www.thejacobsen.com/>



Fish Meal/Soy Meal Price Ratio



Source: The Jacobsen monthly reports; <http://www.thejacobsen.com/>



Fish Meal - the Complete Nutrition Source

Protein

- ✓ Complete Amino Acid Profile
- ✓ High Protein Digestibility

Fat

- ✓ EPA and DHA

Minerals

- ✓ Calcium, Phosphorus and Magnesium





Health Benefits of Fish Meal

- Improved growth rates
- Improved reproductive performance
- Improved feed conversion efficiency
- Improved palatability
- Natural, not Synthetic
- No BSE issues



Fish Oil – Contains Omega-3 Fatty Acids

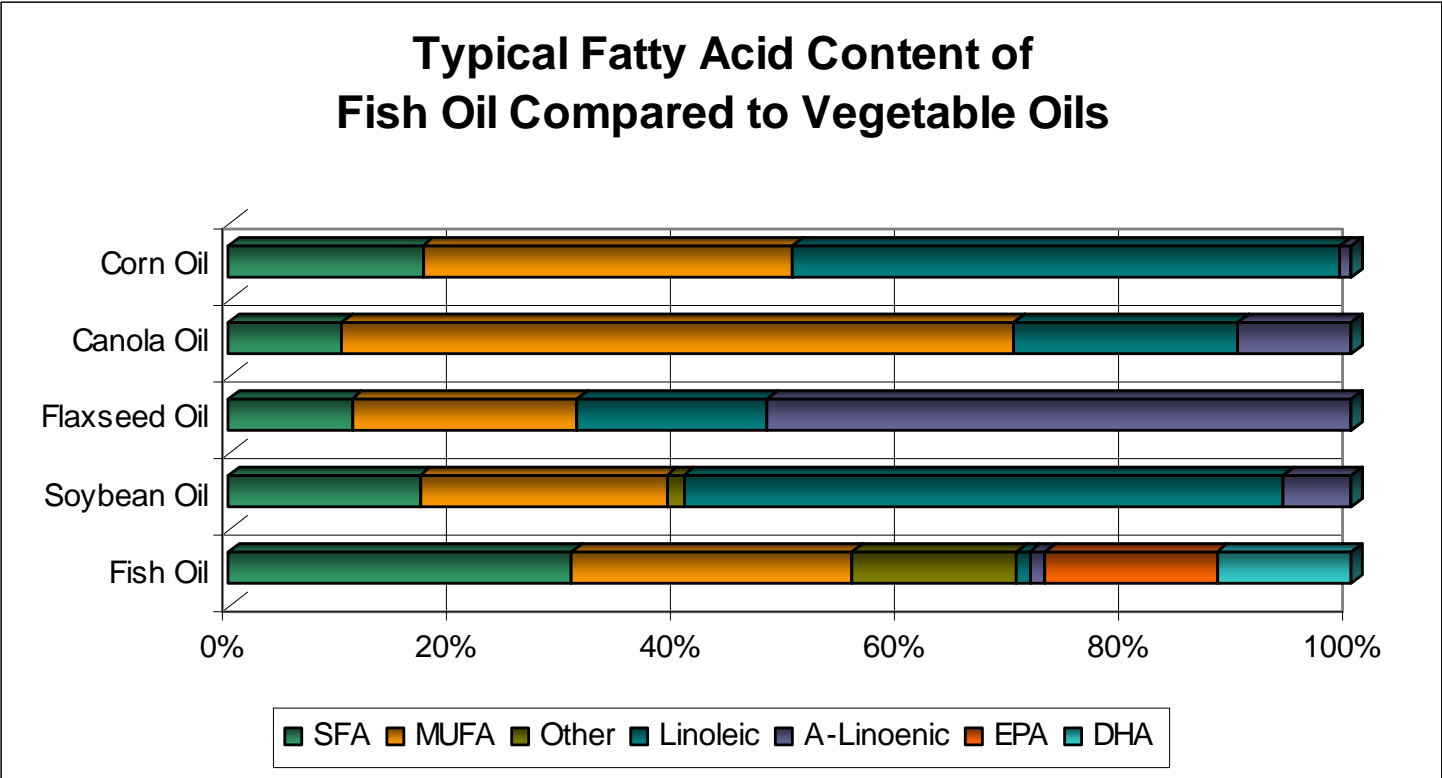
- ✓ **Rich, natural source of EPA and DHA**
- ✓ **No need to convert from other fatty acids**
- ✓ **Better absorbed than other fatty acids**



Health Benefits of Fish Oil

- Improves trainability
- Improves neurological development
- Strengthens the immune system
- Improves skin and hair coat
- Inhibits inflammatory response
- Improves bone development
- Improves birth weight and gestational duration
- Promotes renal health
- Conversion of ALA (Flax) to EPA and DHA in animals is inefficient

Typical Fatty Acid Content of Fish Oil Compared to Vegetable Oils



Conclusion

- As meat consumption grows there is a rising demand for protein and oil.
- In the future as complementary sources of protein and fat will be required.
- Regulatory authorities will continue to protect marine sources for use in animal and aquatic feed.
- Fish meal and fish oil production is stable and will always be available to serve as a base for nutrition.