Fisheries and Farming: Interdependence of Fisheries, Animal Production and Aquaculture

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2007
Introduction

- Fishmeal is a critical feed component for:
  - Poultry
  - Pork
  - Aquaculture (Salmon, trout and shrimp)
- Relatively fixed supply vs. increasing demand
- Issues regarding substitutability across protein sources
Trends in Global Aquaculture Production

Source: FAO FISHSTAT 2006
Trends in Global Animal Production

- Eggs (Total Weight): 63.8% increase from 1994 to 2003
- Pork (Dressed Carcass Weight): 41.1% increase from 1994 to 2003
- Poultry (Ready-to-cook weight): 86.7% increase from 1994 to 2003
- Aquaculture (Live weight): 214.9% increase from 1994 to 2003

Source: FAO FISHSTAT 2006; FAOSTAT 2006
Trends in Global Fishmeal Production

Average Production (1984-2004): 6.5 MMT

Source: FAO FISHSTAT 2006
Fishmeal Production

- Peru is the major supplier of both fish meal and fish oil.
- In Peru the major species harvested are anchovy (Engraulis ringens) and jack mackerel (Trachurus symmetricus).
- Both species are small in size, have a short life span, and are highly influenced by El Niño events.
El Niño Events

- Calculating El Niño /La Niña Events:
  - Measured as the departure in monthly sea surface temperature from its long-term mean averaged over the NINO 3.4 region.
  - El Niño and La Niña typically develop between April and June (Spring in the Northern Hemisphere /Autumn in the Southern Hemisphere)
  - The duration of El Niño and La Niña events can vary substantially from event to event
El Niño Events

- **Strong El Niño Events**
  - 1982-83
  - 1987-88
  - 1993-94
  - 1994-95
  - 1997-98

- **Mild El Niño Events**
  - 1991-92
  - 1992-93
  - 2002-03
  - 2004-05

- **Strong La Niña Events**
  - 1988-89
  - 1998-99

- **Mild La Niña Events**
  - 2000-01

Source: Western Regional Climate Center  [http://www.wrcc.dri.edu/enso/ensodef.html](http://www.wrcc.dri.edu/enso/ensodef.html)
El Niño Events

Source: NOAA--National Weather Service--Climate Prediction Center
http://www.cpc.ncep.noaa.gov/data/indices/sstoi.indices
Has the price relationship changed?

- Given the rapid growth in poultry, pork and aquaculture sectors---
- Has the historic relationship between fishmeal and soybean meal prices broken down?
Issues of Substitutability

The critical question is:

Does fishmeal have unique nutritional properties that distinguish it from the general oilseed market?
Prices of Fishmeal (Atlanta) and Soybean Meal (Chicago)

Source: Feedstuffs and CBOT
Has the price relationship changed?

  - Cross-commodity hedging with soybean meal.
- **Asche & Tveteras (2004)** (Data 1981-1999, monthly)
  - Fishmeal and soybean meal are strong substitutes.
Price Ratio of Fishmeal (Atlanta) to Soybean Meal (Chicago)

Price, US$/Tonne (Monthly Average)

Source: Feedstuffs and CBOT
Findings


- It appears the historic price relationship has broken down.
Price Ratio of Fishmeal (Atlanta) to Soybean Meal (Chicago)

Price, US$/Tonne (Monthly Average)

Structural Break 11/8/95 - 12/18/96

Structural Break 6/24/98 – 8/30/00

Source: Feedstuffs and CBOT
Price Ratio of Fishmeal (Atlanta) to Soybean Meal (Chicago) with additional Fishmeal (Hamburg) and Soybean Meal (Rotterdam/Hamburg) data (July 2004 – February 2006)

Predicted fishmeal use vs. Estimated actual fishmeal use

Sources: (1) Various Sources (2) Based on 1997 fishmeal/aquaculture production ratio (Naylor et al. 2000) (3) 2010, Pike and Barlow (2002); 2012, Pike (2005)
Explanations for divergence

- **Change in Species Mix?**
  - NO
  - The share of carnivores raised has not changed. Has remained 18.8-24.8% over past 20 years.

- **Change in FCR?**
  - YES
  - FCRs have declined for salmon from over 2.0 to 1.3 over the past 20 years.

- **Better use of fishmeal, better farm management practices?**
  - YES
Conclusions

- Empirical evidence supports hypothesis of a structural change.
- This is due to increased demand for fishmeal from poultry, pork, and aquaculture in specialty diets.
- Provides economic incentive for innovation.
- Evidence of such innovations include
  - Declining FCR, new feed formulations, better farm management practices.
Recent Industry Developments

- Fishmeal prices skyrocketed in May 2006 to almost $1400/tonne. (USD)
- Soymeal prices are relatively stable around $210/tonne (USD) over the course of 2006.
- Fishmeal/Soybean meal price ratio is normally around 2; during this past year it exceeded 6.
- El Niño Event confirmed for 2006 and was stronger than initially forecast.
  - Catches for 2007 not expected to be much higher than 2006 harvest levels)
Recent Industry Developments

Fishmeal and soymeal prices

Recent Industry Developments

Ratio fishmeal prices versus soymeal prices