Fish to 2020:
Supply and Demand in Changing Global Markets

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Outline of Presentation

- Fish supply – capture vs. aquaculture
- Fish demand – food and feed in the 1990s
- Brief description of projections model to 2020
- A look at the future: projections results
- Main issues and policy implications
Fish Supply –
Capture vs. Aquaculture
Fish Supply (1)

**Capture Fisheries**
- Slow growth since late 1980s; steady at around 95 million metric tons in late 1990s
- Majority of stocks are fully or over-exploited

**Aquaculture**
- Rises from 7% (1973), 12% (1985) to over 30% (2002) of total production
- Responsible for around 70% of total growth in food fish production by weight from 1985-2002
Fish Supply (2) – Capture Fisheries

Developed Countries
- Japan – decline in production due to EEZ and dwindling stocks of fish such as pilchard
- Production declined from 33.5 to 28 million metric tons during 1970 to 2002

Developing Countries
- China – largest producer whose share in global capture food fish production increased from 9% in 1973 to 21% in 1997
- Southeast Asia – tripled production from 5 to 15.63 million metric tons in 1973 to 2002; mainly contributed by Indonesia, Thailand
Fish Supply (3) – Aquaculture

Developing Countries

- Produced 58% of global aquaculture products in 1973 to over 90% in 2002 with 2.76 to 47 million metric tons during 1973-2002
- Boom in aquaculture is mainly attributed to expanded area
- Asia accounts for 87% production by weight

- China’s share is 68% in 1997 vs. 32% in 1973
- Part of Chinese government policies to promote aquaculture as a means to improve domestic food supply and increase foreign exchange earnings including policies targeted at seed and feed inputs
Fish Demand – Food and Feed
## Food Fish Consumption (1)

<table>
<thead>
<tr>
<th>Region</th>
<th>Total consumption (million metric tons)</th>
<th>Annual growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>4.9</td>
<td>8.7</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>5.4</td>
<td>7.9</td>
</tr>
<tr>
<td>India</td>
<td>1.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Latin America</td>
<td>2.1</td>
<td>3.6</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>2.6</td>
<td>3.7</td>
</tr>
<tr>
<td>United States</td>
<td>2.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Japan</td>
<td>7.6</td>
<td>7.4</td>
</tr>
<tr>
<td>Developing world</td>
<td>20.4</td>
<td>32.5</td>
</tr>
<tr>
<td>Developed world</td>
<td>25</td>
<td>29.4</td>
</tr>
<tr>
<td>World</td>
<td>45.4</td>
<td>61.9</td>
</tr>
</tbody>
</table>
Food Fish Consumption (2)

Developing Countries

- Important source of animal protein accounting for 20% in low-income food deficit countries vs. 13% in industrialized countries
- Growth in food fish consumption with increased share from 45% in 1973 to 70% in 1997
- China dominates aggregate consumption of fisheries products from 11% in 1973 to 36% in 1997
- Sub-Saharan Africa – stagnant per capita fish consumption for the last 30 years

Developed Countries

- Aggregate consumption level declined since 1985 as a consequence of lower per capita consumption in the former Eastern Bloc countries
## Feed Fish Demand (1)

<table>
<thead>
<tr>
<th>Region</th>
<th>Total use (thousand metric tons)</th>
<th>Annual growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>112</td>
<td>554</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>135</td>
<td>238</td>
</tr>
<tr>
<td>India</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td>Latin America</td>
<td>483</td>
<td>672</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>United States</td>
<td>334</td>
<td>463</td>
</tr>
<tr>
<td>Japan</td>
<td>828</td>
<td>1,052</td>
</tr>
<tr>
<td>Developing world</td>
<td>877</td>
<td>1,821</td>
</tr>
<tr>
<td>Developed world</td>
<td>3,637</td>
<td>4,273</td>
</tr>
<tr>
<td>World</td>
<td>4,514</td>
<td>6,094</td>
</tr>
</tbody>
</table>
Feed Fish Demand (2)

- Fishmeal and fish oil – derived from wild-caught fisheries used for feeding terrestrial livestock and farmed fish.
- Demand is determined by demand for livestock and fish, influenced by feed conversion efficiency, relative prices of competing feeds, outlook for competing sectors that also consume fishmeal and fish oil.
- Demand for fishmeal and fish oil has increased significantly in China and Southeast Asia with rapid growing poultry, pig and aquaculture sectors.
- Demand in other regions has declined with substitutions of maize and soybean for fishmeal.
IMPACT Model

The Policy Analysis Tool
IMPACT Overview (1)

- IMPACT is a food and agricultural sector supply and demand model
- 36 countries and regions
- 28 commodities: 6 fish, 6 livestock, cereals, roots & tubers, milk, eggs, soybeans, oils, oilcakes, and meals
- Model specified as a set of country-level supply and demand equations
IMPACT Overview (2)

- Country-level models are linked to the rest of the world through trade
- World food prices are determined annually at levels that clear international commodity markets
- Model output: prices, production and consumption levels, net trade by commodity and region, annually to 2020
IMPACT Fish Categories

- **Low-Value Food Fish** (carp, sardines)
- **High-Value Finfish** (salmon, tuna)
- **Crustaceans** (shrimp, crabs)
- **Mollusks** (clams, oysters, squid)

All the above are disaggregated into wild-caught and farm-raised, plus:

- **Fishmeal**
- **Fish oil**
Scenarios for Sensitivity Analysis

- Baseline (best estimate)
- Faster Aquaculture Expansion (more investment)
- Slower Aquaculture Expansion (less investment)
- Ecological Collapse (very pessimistic)
Baseline Projections
<table>
<thead>
<tr>
<th>Category</th>
<th>1997</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low value food fish</td>
<td>7.5</td>
<td>8.2</td>
</tr>
<tr>
<td>High value finfish</td>
<td>4.5</td>
<td>4.2</td>
</tr>
<tr>
<td>Mollusks</td>
<td>2.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Crustaceans</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Total food fish</strong></td>
<td><strong>15.8</strong></td>
<td><strong>17.1</strong></td>
</tr>
</tbody>
</table>
Food Fish Demand, 1997 and Projected 2020, Baseline Scenario

(million mt)

- **China**: 53 (1997), 33 (2020)
- **SE Asia**: 11 (1997), 17 (2020)
- **India**: 5 (1997), 7 (2020)
- **Other Developing**: 14 (1997), 22 (2020)
- **Developed**: 28 (1997), 29 (2020)
### Share of World Fish Production (%), Baseline Scenario

<table>
<thead>
<tr>
<th></th>
<th>1973</th>
<th>1997</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>10</td>
<td>36</td>
<td>41</td>
</tr>
<tr>
<td>Other Developing</td>
<td>33</td>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>Japan</td>
<td>17</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>EU 15</td>
<td>13</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>All Developed</td>
<td>56</td>
<td>27</td>
<td>21</td>
</tr>
</tbody>
</table>
Developing Countries continue to Dominate Production

Share of World Fish Production (%)

All Scenarios

Projected Food Fish Supply to 2020 ('000 mt)

- Ecological collapse
  - Developed: 22%
  - Developing: 78%

- Slower aquaculture
  - Developed: 23%
  - Developing: 77%

- Faster aquaculture
  - Developed: 20%
  - Developing: 80%

- Most likely
  - Developed: 21%
  - Developing: 79%

- 1997 actual
  - Developed: 27%
  - Developing: 73%
Share of Aquaculture in Fish Production, 1997 and Increase from 1997-2020, Baseline Scenario

Fish production 1997
- Capture: 69%
- Aquaculture: 31%

Increase in fish production, 1997-2020
- Capture: 32%
- Aquaculture: 68%
Share of Aquaculture in Fish Production
(All Scenarios)

Growing Share of Aquaculture to Total Production

- Ecological collapse:
  - Capture: 49%
  - Culture: 51%

- Slower aquaculture expansion:
  - Capture: 65%
  - Culture: 35%

- Faster aquaculture expansion:
  - Capture: 52%
  - Culture: 48%

- Most likely:
  - Capture: 59%
  - Culture: 41%

- 1997 actual:
  - Capture: 69%
  - Culture: 31%

Production (’000 mt)
<table>
<thead>
<tr>
<th>Region</th>
<th>1997</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>0.18</td>
<td>0.54</td>
</tr>
<tr>
<td>SE Asia</td>
<td>1.13</td>
<td>0.48</td>
</tr>
<tr>
<td>India</td>
<td>0.12</td>
<td>0.43</td>
</tr>
<tr>
<td>Latin America</td>
<td>2.44</td>
<td>3.05</td>
</tr>
<tr>
<td>Other developing</td>
<td>0.18</td>
<td>-1.69</td>
</tr>
<tr>
<td>Developed</td>
<td>-4.05</td>
<td>-2.81</td>
</tr>
</tbody>
</table>
Poor to Feel the Pinch of Rising Fish Prices

Fish Prices Under All Scenarios

- Fish meal & oil efficiency
- Ecological collapse
- Slower aquaculture expansion
- Faster aquaculture expansion
- Most likely (current trend)

Low-value Food Fish: [Diagram showing the impact on low-value food fish]
Poultry Meat: [Diagram showing the impact on poultry meat]
Main Issues Raised by the Projection Results
Where will Supply Come From?

- Capture still accounted for over 2/3 of world food fish in late 1990s
- But 2/3 of the projected 40% growth in global food fish production to 2020 will be farmed
- The big growth in aquaculture is projected to be in Asia
The Future of Prices

- Fish are the only food commodities projected to increase in (real) price.

- High-value finfish and crustacean real prices will increase by 15% through 2020; low-value fish prices will rise by 6%.

- Increased food security risks.

- Fishmeal & oil prices projected to rise by 18%, and will be more volatile in future.
Prices and Scenarios

- Only scenario that lowers price of low-value food fish is higher levels of aquaculture investment

- Ecological collapse in capture fisheries results in very large price increases
Outlook for Trade

- Developing countries will remain net importers of low-value fish, exporters of high-value fish.
- Fisheries trade is likely to be increasingly South-South.
- More rapid aquaculture growth results in higher net exports from South-North.
- Pessimistic scenarios lead to lower South-North exports.
China is a Major Player (for sure)

- Concerns have been raised about the accuracy of capture data for China
- Building the “Pessimistic” view into the model only reduces world consumption by 1 kg/cap in 2020, mostly within China itself, due to price adjustments elsewhere
- Discounting Chinese data (incl. aquaculture) by 20% does not significantly alter the trend conclusions of this policy exercise
Conclusions
Increasing Pressure on Capture Fisheries

- Demand pressures will push prices higher, which will further increase environmental pressure
- Literature suggests that community-based coastal management will be critical in developing countries
- These higher prices will also push aquaculture development forward…
Investment in Aquaculture is Key

- Higher investment in aquaculture raises per capita food fish consumption by almost 2 kg per person in 2020
- Investment in aquaculture is the best way to increase access of the poor to fish (the only scenario with a decline in price of low-value food fish)
- Targeting aquaculture investment to non-carnivorous species will be most effective from a food security standpoint
Implications for the Poor

- Poor may substitute away from fish toward meat, with negative nutritional outcomes
- Intensification and scaling-up of aquaculture production risks exclusion of poor smallholders
- But appropriate aquaculture development would spur economic activity, improve incomes
Opportunities and Challenges

- Need to find the right mix of policy and institutional support to improve governance and access to resources and information
- Not clear whether private sector incentives exist to expand sustainable technologies for small-scale, non-carnivorous aquaculture (scope for policy exists here)
- Tremendous opportunities exist... as well as tremendous risks for the environment and poor consumers/producers of fish
Thank You!