SINCE 1950 WE HAVE CONSUMED 2X THE RESOURCES THAN ALL PRIOR HISTORY COMBINED

Population Growth Throughout History

Source: United Nations
RISING LIVING STANDARDS

Developing countries with fastest growing “middle class”

- China
- India
- Brazil
- Indonesia
- Russia
- Egypt
- Thailand
- Mexico
- Turkey
- Vietnam
- Philippines
- Iran
- Poland
- Nigeria

Households with real PPP incomes greater than $20,000 (in millions)

Source - USDA Foreign Agricultural Service
Global food system – Future projections

1. Increasing population
2. Changing diets
3. Losing land to urbanisation and rising sea levels
   4. Water limits
   5. Phosphorous limits
EFFICIENCIES OF DIFFERENT ANIMAL PROTEIN SECTORS

FOOD AND FRESH WATER REQUIREMENTS TO PRODUCE 1KG

8 kg feed  
1857 gallons

3 kg feed  
756 gallons

2 kg feed  
469 gallons

1.1 kg feed  
132 gallons

Aquatic organisms 10-20% more efficient than land animals at converting energy, water and feed to meat and protein

WHY?
### Yields and Retention Rates for Various Animals

<table>
<thead>
<tr>
<th></th>
<th>Atlantic Salmon</th>
<th>Pigs</th>
<th>Chicken</th>
<th>Lamb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Yield (%)</td>
<td>86-92</td>
<td>72.5</td>
<td>65.6</td>
<td>46.9</td>
</tr>
<tr>
<td>Energy Retention (%)</td>
<td>23</td>
<td>14</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Protein Retention (%)</td>
<td>31</td>
<td>18</td>
<td>21</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Bjorkli, 2002

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MAINE AQUACULTURE ASSOCIATION

Source: Bjorkli, 2002
SHARE OF U.S. CONSUMPTION SUPPLIED BY DOMESTIC PRODUCTION

% Domestically Sourced

Source: USDA2017, USDOC2016
KEY COMPONENTS OF AQUACULTURE DEVELOPMENT

- SUSTAINABLE AND COMPETITIVE AQUACULTURE DEVELOPMENT
- EDUCATION
- TRAINING
- REGULATORY CLIMATE
- BUSINESS SUPPORT
- RESEARCH
- MARKET DEMAND
- TECH TRANSFER
COMMON “TYPES” OF AQUACULTURE RESEARCH PROGRAMS

- SHORT/MEDIUM TERM “FAST” RESPONSE
- LONG TERM PROGRAMS
- REGIONAL FOCUSED
- SPECIES FOCUSED
- BOTTLENECK/CHALLENGE FOCUSED
- PRODUCTION METHOD FOCUSED
National Strategic Plan For Federal Aquaculture Research (2014-2019)

9 Strategic Goals

- Advance Understanding of the Interactions of Aquaculture and the Environment
- Employ Genetics to Increase Productivity and Protect Natural Populations
- Counter Disease in Aquatic Organisms and Improving Biosecurity
- Improve Production Efficiency and Well-Being
- Improve Nutrition and develop Novel Feeds
- Increase Supply of Nutritious, Safe, High-quality Seafood and Aquatic Products
- Improve Performance of Production Systems
- Create a Skilled Workforce and Enhance Technology Transfer
- Develop and Use Socioeconomic and Business Research to Advance Domestic Aquaculture
ROLE OF RESEARCH IN NATIONAL AQUACULTURE DEVELOPMENT

- Regulatory and Management Concerns
- "Sparing" Capital
- Reducing Risk
- Reducing Variability….Increasing Predictability
- Increasing Production Efficiency
- Increasing ROI
- Product/Method "Prospecting"
- Innovation
- Improving Public Understanding/Perception
INDUSTRY AQUACULTURE RESEARCH “PRIORITIES” 2018

- GENETICS
- ANIMAL/PLANT HEALTH AND WELFARE
- NUTRITION
- ENGINEERING/TECHNOLOGY
- SPECIES ASSESSMENT
- FARM/ENVIRONMENT INTERACTIONS
- PRODUCT DEVELOPMENT
- MARKET DYNAMICS AND CONSUMER PREFERENCES
- RISK ANALYSIS AND MANAGEMENT
- FARM/PRODUCTION PLANNING AND MANAGEMENT
- REGULATORY COSTS AND DUPLICATION