Novus Poultry Roundtable
Feeding the World and the Role of Poultry

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Conventional Wisdom About Feeding the World

- More grain on less land with less water, plenty of grain for meat and biofuels
- All problems can be solved with additional technology
- Norman Borlaug versus Thomas Malthus
Unconventional Wisdom

- No shortage of technology
- Limits to biophysical systems (soil & water)
- “Limits to Growth” of 1972
Trillions of Calories from Corn, Soybeans, Wheat and Rice
Price in Dollars Per Million Kcal
Per Capita Consumption of Meat & Eggs

7,000,000,000 people in 2010
43 Kg per Capita

9,000,000,000 people in 2050
60 Kg or 30 Kg?

SURE_
You're right in liking MEAT
## MMT of Meat and Eggs in 2050

<table>
<thead>
<tr>
<th>Meat</th>
<th>Now</th>
<th>60 KG</th>
<th>30 KG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>56</td>
<td>94</td>
<td>25</td>
</tr>
<tr>
<td>Pork</td>
<td>101</td>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>Chicken</td>
<td>74</td>
<td>150</td>
<td>80</td>
</tr>
<tr>
<td>Turkey</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Egg</td>
<td>68</td>
<td>136</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>304</strong></td>
<td><strong>540</strong></td>
<td><strong>270</strong></td>
</tr>
</tbody>
</table>
Additional Poultry and Egg Production

- 150 MMT increase between 2010 and 2050
- 40 MMT increase even with grain crash
- Most of the increase will be in middle income countries in Asia, Eastern Europe, the Middle East and Latin America
World Poultry Production MMT 1985-2040
World Egg Production MMT 1985-2040

- **Expected**
- **Unexpected**

Bar chart showing egg production from 1985 to 2040, with expected and unexpected trends indicated.
Who is Competitive?

- Grain exporters and countries with low tariff barriers on feed ingredients
- Countries with low labor Costs
- Countries with a good business climate
Highest Per Capita Production of Corn
Combined with Lowest Labor Costs

#1 Romania
#2 Serbia
#3 Hungary
#4 South Africa
#5 Brazil
#6 Ukraine
#7 Argentina
#8 China
#9 United States
#10 Mexico
#11 Thailand
#12 Indonesia
#13 Philippines
#14 India
#15 Egypt
Demographic Studies of the 7 Billion People on the Planet

Where Will Poultry Consumption Grow the Fastest?
<table>
<thead>
<tr>
<th>Income Quintile</th>
<th>Income Per Capita</th>
<th>Chicken kg/Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30,000</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>8,000</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>3,500</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>1,500</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>730</td>
<td>2</td>
</tr>
</tbody>
</table>
First Quintile - $30,000/ year

- US, Europe, Japan and rich everywhere
- 70% of world income
- Further Processed and value added products
- Slow Growth - Not Income Elastic
Second Quintile - $8,000/year

- Represented everywhere US, Russia, Europe, Asia
- Buy fresh and frozen cold chain chicken
- Old Engine of World Growth
Third Quintile - $3,500/ year

- Parts of China, India, Middle East, Latin Am.
- Wet/Cold Chain Market
- Income Elastic
- New Engine of Growth
Fourth Quintile - $4/ Day

- Latin America, Asia, Africa, Haiti
- The Visible Poor
- Chronic Grinding Poverty
- Wet Market
- Slow Growth
Fifth Quintile - $2/Day

- Asia and Sub Saharan Africa.
- Chronically Undernourished
- Unimaginable Poverty and Misery
- No Growth
### Examples of large % Third Quintile Countries – Highest Potential Growth

<table>
<thead>
<tr>
<th>South Africa</th>
<th>Panama</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costa Rica</td>
<td>Kazakhstan</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Jamaica</td>
</tr>
<tr>
<td>Belarus</td>
<td>Serbia</td>
</tr>
<tr>
<td>Algeria</td>
<td>Peru</td>
</tr>
<tr>
<td>Iran</td>
<td>Thailand</td>
</tr>
<tr>
<td>Colombia</td>
<td>China</td>
</tr>
<tr>
<td>Angola</td>
<td>Jordan</td>
</tr>
</tbody>
</table>
Peak World Oil Production?

![Bar chart showing oil production over time](chart.png)

- **1950**: Low production
- **1970**: Moderate increase
- **1990**: Steady growth
- **2010**: Significant peak
- **2030**: Decline expected
- **2050**: Continued decline
Extraction of Oil from Wells in existence in 2010
Millions of Barrels/Day

- 2010: 80
- 2020: 60
- 2030: 40
- 2040: 20

[Bar chart showing extraction levels for each year]
Corn and Oil are Increasingly Linked
### Long-Run Corn Price/Ton at Various Crude Oil Prices

CARD – Iowa State

<table>
<thead>
<tr>
<th>Oil</th>
<th>Corn Metric</th>
<th>Corn Bushel</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 50</td>
<td>$ 134</td>
<td>$3.35</td>
</tr>
<tr>
<td>$ 70</td>
<td>$ 188</td>
<td>$4.70</td>
</tr>
<tr>
<td>$ 90</td>
<td>$ 240</td>
<td>$6.00</td>
</tr>
</tbody>
</table>
Ethanol Percentage of the US Corn Crop

![Bar chart showing the ethanol percentage of the US corn crop from 2002 to 2010. The chart shows a significant increase in the ethanol percentage between 2006 and 2008, with the percentage peaking in 2008.](image)
US Corn Use for Ethanol in MMT

![Bar chart showing the increase in US corn use for ethanol in MMT from 2003 to 2015. The chart indicates a steady increase each year, with the highest use in 2015.]
MMT of Feed Ingredients Consumed by the World Poultry Industry 1985-2010
Feed Costs are at a New Higher Level
Meat becomes a luxury for a larger part of the population during an economic recession.

A recession provides a preview of the limits of growth if such limits exist.
World Economic Growth in %

-3 -2 -1 0 1 2 3 4

2007 2008 2009 2010 2011 2012
World Meat Per Capita Consumption – Kg (USDA)
World GDP Growth Rate & % Increase in World Chicken Meat Production

FAO and World Bank
World Poultry Production

4% Growth
20th Century

2% Growth
21st Century
<table>
<thead>
<tr>
<th>Year</th>
<th>Price 2000 Dollars – Chicago Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>$ 400</td>
</tr>
<tr>
<td>2000</td>
<td>$ 100</td>
</tr>
<tr>
<td>2100</td>
<td>$ 250</td>
</tr>
</tbody>
</table>
Inflation Adjusted Cost of Broiler Live Production (2000 $’s/kilo)

<table>
<thead>
<tr>
<th>Year</th>
<th>$/Kilo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>$0.80</td>
</tr>
<tr>
<td>1990</td>
<td>$0.57</td>
</tr>
<tr>
<td>1995</td>
<td>$0.54</td>
</tr>
<tr>
<td>2000</td>
<td>$0.55</td>
</tr>
<tr>
<td>2005</td>
<td>$0.60</td>
</tr>
<tr>
<td>2010</td>
<td>$0.80</td>
</tr>
<tr>
<td>2015</td>
<td>$1.00</td>
</tr>
</tbody>
</table>
World Chicken and Egg
Per Capita Consumption
Unexpected

kg

Chicken
Egg

0  2  4  6  8  10  12

Factors that Influence the Consumption of Poultry & Eggs

- Real income per capita
- Distribution of income
- Cost of grain
- Population size
Poultry Will Do Well Despite Higher Grain Costs and Possible Grain Crisis

- Better feed conversion compared to beef and pork
  - Beef: 4 to 1
  - Pork: 3 to 1
  - Poultry: 2 to 1
# Chicken Genetics

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight</th>
<th>FCR</th>
<th>Mortality</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>1.0</td>
<td>4.7</td>
<td>18</td>
<td>112</td>
</tr>
<tr>
<td>1965</td>
<td>1.6</td>
<td>2.4</td>
<td>6</td>
<td>63</td>
</tr>
<tr>
<td>2005</td>
<td>2.4</td>
<td>1.7</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>2045</td>
<td>3.2</td>
<td>1.6</td>
<td>3</td>
<td>40</td>
</tr>
</tbody>
</table>
Comparing Beef, Pork, Chicken

- **Beef** - 4 kg of grain, 365 days & 16,000 liters of water
- **Pork** - 3 kg of grain, 180 days & 6,000 liters of water
- **Chicken** - 2 kg of grain, 42 days & 3,000 liters of water
World Chicken Trade
In Millions of Metric Tons - USDA to 2010
Recessions provide a preview of the limits to growth if there are limits to growth.

- Poultry is the most sustainable major meat, Eggs are the most sustainable animal protein.