Biofoods/Biofuels
Challenge, Opportunity, Optimism

Chris Policinski
President & CEO
Land O’Lakes, Inc.
Dr. Borlaug and the “Green Revolution”
Our success will depend on taking a reasoned, rational and science-based approach.
We must maintain a sense of urgency in dealing with the issue of global hunger.
The ability to meet demands related to biofuels is just one challenge in the fight against hunger.
Topics

• Current situation
• Reasons for optimism
• Importance of influencing public opinion
World Population Growth

GROWTH EXPRESSED IN BILLIONS OF PEOPLE PER YEAR

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>2.6</td>
</tr>
<tr>
<td>1960</td>
<td>3.0</td>
</tr>
<tr>
<td>1970</td>
<td>3.7</td>
</tr>
<tr>
<td>1980</td>
<td>4.4</td>
</tr>
<tr>
<td>1990</td>
<td>5.2</td>
</tr>
<tr>
<td>2000</td>
<td>6.1</td>
</tr>
<tr>
<td>2007</td>
<td>6.6</td>
</tr>
<tr>
<td>2010</td>
<td>6.8</td>
</tr>
<tr>
<td>2020</td>
<td>7.6</td>
</tr>
<tr>
<td>2030</td>
<td>8.3</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau

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“Agricultural biotechnology is one tool that holds great promise for alleviating hunger and poverty.”

- National Academies
New Uses for Agricultural Production
Dramatic Increase in Demand for Biofuels
Ethanol Production/Corn Use

Production expressed in billions of gallons per year

<table>
<thead>
<tr>
<th>Year</th>
<th>Ethanol Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004/05</td>
<td>3.7</td>
</tr>
<tr>
<td>2005/06</td>
<td>4.6</td>
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<tr>
<td>2006/07</td>
<td>5.9</td>
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<tr>
<td>2007/08</td>
<td>7.0</td>
</tr>
<tr>
<td>2010/11</td>
<td>9.7</td>
</tr>
</tbody>
</table>

Projected 27.6% of crop

Source: FAPRI 2006
U.S. Corn Production

1966 – 4.2 billion bushels
2005 – 11 billion bushels
2007 – 13 billion bushels (est.)

Source: USDA (NASS and ERS), Renewable Fuels Information Website, Land O’Lakes Seed
More than 80% of corn production increase is traced to improved yields.
U.S. producers have a long history of developing and embracing safe, proven science and technology.

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Growth in Corn Yields

GROWTH EXPRESSED IN BUSHELS PER ACRE PER YEAR

Source: USDA National Agricultural Statistics Service
Growth in Wheat Yields

Growth expressed in bushels per acre per year

Source: USDA National Agricultural Statistics Service
Income % Spent on Food (U.S.)

Amount expressed in percentage of disposable income per year

1929: 23.4%
1939: 21.3%
1949: 22.1%
1959: 17.8%
1969: 13.7%
1979: 13.4%
1989: 11.0%
1999: 10.7%
2005: 9.9%

Source: USDA Economic Research Service
Science and technology have made agriculture more productive, sustainable and environmentally friendly.
U.S. Biotech Results (2003)

YIELD EXPRESSED IN POUNDS PER YEAR

YIELD ON SIX MAIN CROPS: 5.3 BILLION

PESTICIDE USE: -46.4 MILLION

Source: National Center for Food and Agriculture Policy
Biotech Crops

• Increase yields
• Reduce pesticide use
• Enable use of more benign herbicides
• Allow expansion of conservation tillage
• Make U.S. commodity crops cheaper for developing nations
• Promote food safety
Precision Agriculture

- Reduced risk
- Improved yields
- More efficient equipment/energy use
- Enhanced environmental stewardship
Science and technology have a lot to offer as we work to feed and fuel the world.
Meeting the Food, Feed & Fuel Challenge

1. Develop genetics that:
   - Increase yields
   - Add characteristics with specific food, feed and fuel value

2. Improve biofuel production/efficiency

3. Develop additional renewable energy sources
U.S. agriculture has the resources, record of success, the will and the obligation to lead the way.
Develop genetics that improve yields and deliver specific food, feed and fuel value.
Future Corn Grain Production

Production Expressed in Billions of Bushels Per Year

Assumptions:
- *One-third of corn for ethanol currently converted to Distillers Grains
- Two-thirds converted to Liquid Ethanol and CO2 gas – conversion rates will improve
- U.S. corn acres planted stabilize at 90M acres
- Corn yields follow the past 10 years’ trend line
- 5B bushels of grain will produce approximately 15B gallons of ethanol

Source: USDA-ERS, USDA-NASS, NCGA, www.ethanolrfa.org, and internal sources
Improve the Efficiency of Biofuel Production
E3 BioFuels: Mead, Nebraska

Photos: E3 BioFuels (http://www.e3biofuels.com/)
Develop Additional Sources of Renewable Energy
U.S. Needs vs. Corn/Soybean Potential

% OF NEED FULFILLED BY GAS/DIESEL VS. BIOFUELS

Source: National Geographic, October 2007
Alfalfa for Biofuels

Environmental benefits
- Deep rooted, perennial legume
- Net nitrogen contribution to rotation
- Net carbon credits in rotation
- Soil erosion benefits versus row crops
- Improved soil tilth

Rotational benefits
- Nitrogen credits to following crop
- Yield benefits to following crop
- Corn stover available October-May, alfalfa stems available May-October
We need to be serious about generating energy from:

- Crop waste/byproducts
- Non-food crops
- Other renewable, non-agricultural sources
Meeting the Food, Feed & Fuel Challenge

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2. Improve biofuel production efficiency

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Remain Focused on Feeding a Hungry World

- Better delivery of nutrition
- Expand production in nutrition-deficit regions
- Reduce poverty
Meeting the Challenge

• A rational, data- and science-based approach

• Address policy, public opinion and “production” issues
We have an obligation to lead debate and discussion... and shape opinion and policy.
“The majority of agricultural scientists, myself included, anticipate great benefits from biotechnology in the coming decades to help meet our future needs for food, feed, fiber and biofuels.”

- Dr. Norman Borlaug