Unlike Americans, Europeans consider GMOs a security threat because of their different attitudes towards genetically modified foods.

- US presumes them to be safe and as having great economic potential.
- EU presumes them to be risky and as not being useful.

How is food a security threat?

- Traditional ideas of security have broadened.
- Food security has always been crucial at the level of individuals.
- Lack of food security => unhappy citizens => change of government

Biotechnology

- Agriculture: genetic modification refers to the transfer of genes from one organism to another
  - Occurs in nature across related species
  - Man made GMOs insert desirable traits into plant seeds:
    - Round-up Ready, Bt, crops
    - YieldGard, Bacillus thuringiensis, Bt crops
    - "Golden rice" -- vitamin A enriched
    - Protein enhanced maize

Genetically Modified Organism (GMO) Definition:

- Organisms (and micro-organisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating or natural recombination. The use of "recombinant DNA technology" or "genetic engineering" allows selected individual genes to be transferred from one organism into another, sometimes between non-related species.” (MEMO/00/43)

Factors and Players

- Biotech industry
- Farmers
- Government subsidies
- Consumer preferences and fears
- Environmental factors
- Trade factors
- Bureaucratic politics
- Development & humanitarian issues

Benefits of GMOs

- Higher yields
- Lower costs
- Better for the environment
- Increase nutritional content
- More adaptable
### Context for Biotechnology

- **U.S.**
  - Belief in progress, science and technology.
  - Optimism about the future
  - Belief in biotechnology as a tool to aid the developing world
  - Major growth industry
  - Trusts the private sector more than gov't

- **Europe**
  - “If it ain’t broke, don’t fix it”
  - Glass half empty
  - Precautionary principle
  - No tangible benefits
  - Food as culture
  - Fear factor from food scandals
  - Trusts gov’t more than private sector

### Pros and Cons

- **Pros**
  - No till farming—saves land
  - Greater productivity—saves land
  - Reduce pesticide and herbicide use, reduction by 163 million pounds annually
  - Protein and vitamin enriched can alleviate hunger, malnutrition and disease

- **Cons**
  - Fears that biotech seeds could cause damage by spreading and finding new hosts
  - Fears that consumption might be damaging
  - Threat to traditional and organic farming because more efficient and more productive
  - Benefits to farmer and seed manufacturer, not consumer

### Additional Reasons Europeans are anti-GMO

- Dislike of corporate control of food
- Patents on plants court cases
- Sterility for a profit
- Dislike of relying on America
- Strong agricultural traditions
- EU Common Agricultural Policy (CAP)

### Europeans look at the risks, Americans look at the benefits, or are unaware of the issue

- Europe has had recent food security scares.
- Europe has experienced massive famine after both World Wars.
- WWII famine led to creation of policies that protect EU agriculture and promote EU food self-sufficiency.

### Differences in Policy

<table>
<thead>
<tr>
<th>USA</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;not different in kind from other agricultural breeding technologies&quot;</td>
<td>&quot;Inherently different food, dangerous technology&quot; classified with industrial waste &amp; pesticides</td>
</tr>
<tr>
<td>&quot;substantial equivalence&quot; &amp; thus, food presumed safe</td>
<td>Political decision</td>
</tr>
<tr>
<td>Administrative decision</td>
<td>Mandatory labeling</td>
</tr>
<tr>
<td>No labeling necessary</td>
<td>Approval necessary for all GMOs</td>
</tr>
<tr>
<td>Over 100 on the market</td>
<td>Only 3 for human consumption on market</td>
</tr>
<tr>
<td>Article 16 – countries can ban GMOs individually</td>
<td></td>
</tr>
</tbody>
</table>

### Hot Buttons

- In Europe, agricultural biotechnology.
- In the U.S., cloning and embryonic stem cell research.

### OTHER FACTORS:
- Free trade/protectionism
- History (eugenics in Germany)
- Food and Health Safety History - mad cow disease, tainted meat, tainted soft drinks, & HIV tainted blood supply (France).
GMO Ignorance

<table>
<thead>
<tr>
<th>% Agreeing</th>
<th>US</th>
<th>EU</th>
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</thead>
<tbody>
<tr>
<td>Eating GM fruit can cause your genes to be modified</td>
<td>14</td>
<td>24</td>
</tr>
<tr>
<td>Ordinary tomatoes do not contain genes. Only genetically Modified ones do.</td>
<td>14</td>
<td>35</td>
</tr>
</tbody>
</table>


Science vs. Culture

- No evidence that consumption of GMO food is harmful
- Enormous consequences for land use, sustainable development
- Proven that GMO seeds allow efficient, productive farming that reduces land and pesticide use
- Research at early stages; enormous potential
- GMO seeds may contaminate neighboring conventional and organic plants due to cross-pollination from pollen drift
- Enormous consequences for farmers, consumers and agricultural biotech firms
- Social and political stigmatization

Changes in the US Public

- 60% of Americans are in favor of mandatory labeling of GMO foods.
- New private Non-GMO seal in the US—99.1% GMO free
- In 1997 78% said biotechnology would benefit them, and 14% said it wouldn’t.
- By 2005, these numbers were only 62% claiming benefits, and 21% seeing no benefit.

EU Public Opinion: Support for GMO Food

<table>
<thead>
<tr>
<th>Countries</th>
<th>Percent Support by Year</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1996</td>
</tr>
<tr>
<td>Spain</td>
<td>80</td>
</tr>
<tr>
<td>Portugal</td>
<td>72</td>
</tr>
<tr>
<td>Ireland</td>
<td>73</td>
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<tr>
<td>Italy</td>
<td>61</td>
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<tr>
<td>Netherlands</td>
<td>78</td>
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<tr>
<td>UK</td>
<td>67</td>
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</tbody>
</table>
EU Public Opinion: Support for GMO Food

<table>
<thead>
<tr>
<th>Year</th>
<th>Belgium</th>
<th>Denmark</th>
<th>Germany</th>
<th>France</th>
<th>Luxembourg</th>
<th>Greece</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>72</td>
<td>43</td>
<td>56</td>
<td>54</td>
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<td>1999</td>
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<td>45</td>
<td>48</td>
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<td>35</td>
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<tr>
<td>2005</td>
<td>45</td>
<td>42</td>
<td>30</td>
<td>29</td>
<td>20</td>
<td>12</td>
</tr>
</tbody>
</table>

Source: Eurobarometer, No. 64.3 May 2006.

EU Consumer Reasons to Buy GMO Food

- If healthier — 56%
- If less pesticide residue — 51%
- If environmental better — 49%
- If approved by authorities — 44%
- If cheaper — 36%

US/EU Disconnect

- US bewildered and annoyed by EU reaction
- Effective prohibition and stigmatization of US products

U.S./EU Stalemate

- EU had a 5 year moratorium on importation of GMO seeds
- U.S., Argentina, Canada have filed dispute proceedings in WTO against EU
- European “green parties” staunchly opposed to licensing of GMO foods.

Role of Science and Regulation

- USA — USDA, EPA, & FDA, science-based decision-making (but headed by a political appointee)
- Federal jurisdiction

- Europe — newly formed Food Safety organization
- Supranational and national regulation
- Scientists advise; government officials decide in EU and individual countries

Differences in Policy

**USA**

- “not different in kind from other agricultural breeding technologies”
- “substantial equivalence” & thus, food presumed safe
- Administrative Decision
- No labeling necessary
- Over 100 on the market

**EU**

- “Inherently different food, dangerous technology” — classified with industrial waste & pesticides
- Political Decision
- Mandatory Labeling
- Approval necessary for all GMOs
- Only 3 for human consumption on market
- Article 16 — countries can ban GMOs individually
Global Ag. Biotech Industry

- Ciba-Geigy and Sandoz begat Novartis, which is based in Switzerland but is establishing its primary research base in Cambridge Mass. (because of Harvard and MIT)
- Syngenta formed from Novartis and Zeneca (UK)
- Monsanto (US) bought Agracetus and Calgene (which has a joint development agreement with French-based Rhone-Poulenc and was sold by Pharmacia (Italy and Sweden and then US)
- Pharmacia was bought by Pfizer (US)
- Pioneer Seeds (US) now a division of Dupont (US)

Red, White and Green

- Europe divides biotechnology into red, white and green
- "Red" biotechnology is pharmaceutical. No acceptance problems anywhere (but watch out for nutraceuticals)
- "White" biotechnology refers to biotechnological processes for industrial uses, such as for remediation or for purifying exhaust fumes.
- "Green" biotechnology refers to agricultural biotechnology. Strong objections in Europe, some concerns from U.S. farmers and agribusiness firms who fear loss of EU market.

Traceability/Labeling

- EU threshold 0.9% to qualify as GMO
- Traceability and identity preservation requirements
- Cost to farmers-???
- EU favors labeling
- U.S. opposed -- labeling process vs. content (75% of U.S. processed foods contain biotech ingredients)

Consequences: Continent

- Hostile climate for EU agricultural biotechnologists may lead to exodus
- Field trials sabotaged
- 2000 French scientists signed petition to government protesting destruction of 25 field trials (½ of total)

Consequences: Great Britain

London Times:

- "More than 100 leading scientists have made a once-in-a-generation appeal to Tony Blair to save British science from a tide of neglect and abuse that is driving the brightest young brains abroad"

Consequences

- More than 100 British scientists protested to Tony Blair the lack of support for plant biotechnology
- Public process "GM nation?" – more than 600 debates
- Scientific panel did not object to GM agriculture, but public opposed and government remained silent
Factors Contributing to Opposition to Biotech Agriculture in Great Britain

- Fears about safety of food as a result of mad cow disease
- Distrust of government as a result of mad cow disease
- Trusted authorities—environmental groups and NGOs
- Precautionary principle and lack of tangible benefit to consumer
- Cultural and emotional as opposed to scientific

Developing World: Unintended Consequences

- US/EU conflict—Zambian crisis
- Norman Borlaug, "Responsible biotechnology is not the problem; starvation is!"
- 800 million go hungry every day; 38 million Africans face death because of famine; 90% of Africans suffer from hunger or related diseases
- 70% of the African population works in agriculture
- IP issues
- Africa only continent that does not use high yield seeds
  - Protein enriched maize
  - Vitamin enriched cassava
  - Potential to deliver vaccines through everyday food

GMO Wheat: Test Case

- Monsanto has developed hard red spring wheat that is herbicide resistant, Roundup Ready wheat.
- Like Roundup Ready soybeans, wheat will reduce herbicide use and will grow efficiently and productively
- Uncertain market conditions and risk of co-mingling with non-GMO wheat make farmers reluctant to use it
- US farmers and consumer groups petitioned government to suspend production of GM wheat until its potential impact on exports could be determined.

Lessons Learned

- Science and public confidence both affect the regulation of GMO food.
- People view food safety and security as a matter of national sovereignty.
- WTO members may establish and maintain divergent regulations for animal, plant and human safety.
- GMO foods have been stigmatized in Europe by years of controversy.

In the long run, the GMO conflict will not hurt US/EU relations

- Europeans do not like GMOs partly due to their new untested nature.
- Time will either prove that they are harmless, or show unintended side-effects.
- Time will help reduce misinformation and harmonize regulation.

Will this issue continue to cause a transatlantic rift?

No, the optimistic view:

- Farmers finding new markets or changing practices to meet EU standards.
- Many corporations are declaring their products GMO free.
- US citizens starting to respond more like EU citizens.
However …
- The rift has already lasted 20 years.
- Little domestic pressure to exert change.
- Policies are too entrenched. Each side is satisfied with its policy.
- WTO is not effective in this area; it has already ruled against the EU; the EU refuses to comply.

On the Horizon

- Consumption of cloned animals – recently received approval by FDA
- Nutraceuticals – vitamin and nutrient enhanced foods. For regulatory purposes, are they food or pharmaceuticals?
- WTO trade disputes between U.S. and Europe – protracted disagreements over GMO food and “private standards”
- Individualized medicine – affordable genomic sequencing