Traceability and Commodity Demand
Where are we coming from?
Where are we now?
Where are we going?

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Background

- Public Perception and Realities
- The Landscape of the Food Industry
- Global Production and Vertical food Chains
- Current International Tracing Initiatives

Technology and Cost Factors

- Review of current technology
- How does traceability impact industry operating cost

Policy Environment: Role of State, National, Foreign, Governments and International Governmental Organizations

US Federal (FDA voluntary guidelines, USDA animal ID)
Europe (Private Sector Initiatives)
Homeland Security Initiatives
Private Firms
Industry Coalitions
Foodborne Illness Raises Consumer Awareness & Creates Business Concerns

Some Cases that Got Our Attention

• 1996: Escherichia coli O157:H7 California lettuce

• 1996: Cyclospora parasite in Guatemalan raspberries (originally reported as originating in California strawberries by the Texas Department of Health) The California Strawberry Commission estimated that this false alarm led to $16 million in lost revenue to growers in the central coast of California

• 1997: Hepatitis A in Mexican Strawberries

• 2000, 2001, 2002: Salmonella, Mexican cantaloupes

• 2003: Hepatitis A in Mexican Green Onions

<table>
<thead>
<tr>
<th>Common food vehicles for pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pathogen</strong></td>
</tr>
<tr>
<td><strong>Campylobacter jejuni or coli</strong></td>
</tr>
<tr>
<td><strong>Clostridium perfringens</strong></td>
</tr>
<tr>
<td><strong>Escherichia coli O157:H7</strong></td>
</tr>
<tr>
<td><strong>Listeria monocytogenes</strong></td>
</tr>
<tr>
<td><strong>Salmonella (non-typhoid)</strong></td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
</tr>
<tr>
<td><strong>Vibrio sp.</strong></td>
</tr>
</tbody>
</table>

*Pathogens causing outbreaks and the foods associated with them are reported by CDC. For more information see: Surveillance for Foodborne Disease Outbreaks—United States, 1993–1997, Vol. 49, No SS01, 139112000*
### Estimated annual costs due to selected foodborne pathogens, 2000

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Estimated annual foodborne illnesses&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Costs&lt;sup&gt;1/4&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Billion 2000 dollars</td>
</tr>
<tr>
<td>Campylobacter spp</td>
<td>1,953,141</td>
<td>1.2</td>
</tr>
<tr>
<td>Salmonella&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1,341,873</td>
<td>2.4</td>
</tr>
<tr>
<td>E. coli O157</td>
<td>62,458</td>
<td>0.7</td>
</tr>
<tr>
<td>E. coli, non-O157 ST</td>
<td>31,229</td>
<td>0.3</td>
</tr>
<tr>
<td>Listeria monocytogen</td>
<td>2,493</td>
<td>2.3</td>
</tr>
<tr>
<td>Total</td>
<td>3,401,194</td>
<td>6.9</td>
</tr>
</tbody>
</table>

At Any Given Time
60% of the World’s Population Is Awake
And Some of Them Are Up to No Good
**New Products, In New Packages In New Places**

Expenditures on Food Away From Home

* Ken McCorkle

Source: USDA/ERS
### Concentration in GLOBAL FOOD RETAILERS

<table>
<thead>
<tr>
<th>Grocery Sales Company</th>
<th>Sales ($ billion)</th>
<th>Net Grocery Sales ($ billion)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wal-Mart</strong> U.S.</td>
<td>244.52</td>
<td>83.14</td>
<td>1</td>
</tr>
<tr>
<td><strong>Carrefour/Promodès</strong> France</td>
<td>64.77</td>
<td>45.34</td>
<td>3</td>
</tr>
<tr>
<td><strong>Ahold</strong> Holland</td>
<td>59.27</td>
<td>49.78</td>
<td>2</td>
</tr>
<tr>
<td><strong>Kroger</strong> U.S.</td>
<td>51.76</td>
<td>43.48</td>
<td>4</td>
</tr>
<tr>
<td><strong>METRO AG</strong> Germany/Switz.</td>
<td>48.56</td>
<td>24.28</td>
<td>11</td>
</tr>
<tr>
<td><strong>Target</strong> U.S.</td>
<td>43.92</td>
<td>7.47</td>
<td>27</td>
</tr>
<tr>
<td><strong>TESCO</strong> U.K.</td>
<td>39.52</td>
<td>28.46</td>
<td>8</td>
</tr>
<tr>
<td><strong>Costco</strong> U.S.</td>
<td>37.99</td>
<td>23.18</td>
<td>12</td>
</tr>
</tbody>
</table>

Source: R. Cook, 2002

### Increasing Adoption of Retail Distribution

**Table 4.1—Supermarket share in national food retail (Latin America)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent</th>
<th>Past</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td></td>
<td>17 in 1985</td>
<td>57</td>
</tr>
<tr>
<td>Brazil</td>
<td></td>
<td>30 in 1980</td>
<td>75</td>
</tr>
<tr>
<td>Chile</td>
<td>NA</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>NA</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>NA</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td>15 in 1984</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>NA</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>5-10 in 1980</td>
<td>50 in 2000</td>
<td></td>
</tr>
</tbody>
</table>

Notes: NA = not available.

Source: Reardon, T., and J.A. Berdegué, 2002.

**Table 4.2—Supermarket share in national retail (Other Asia Pacific)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent</th>
<th>1999</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>China (urban)</td>
<td></td>
<td>30</td>
<td>48</td>
</tr>
<tr>
<td>Indonesia</td>
<td></td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Korea</td>
<td></td>
<td>61</td>
<td>65</td>
</tr>
<tr>
<td>Malaysia</td>
<td></td>
<td>27</td>
<td>31</td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td>52</td>
<td>57</td>
</tr>
<tr>
<td>Taiwan</td>
<td></td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>Thailand</td>
<td></td>
<td>35</td>
<td>43</td>
</tr>
</tbody>
</table>

Source: Hu et al., 2005.
Tracing fresh produce through the food marketing system

Farmers’ markets/roadside stands → Consumers

Food service → Intermediaries: wholesalers/brokers/repackers/exporters/importers

Exports → Importers

Shippers

Growers → Processors

AEB-830 • Traceability in the U.S. Food Supply
USDA/Economic Research Service • 13
Networks Give Rise to Concerns

What happens to the merchandise during transportation by truck, container, rail, or boat?

During transportation a number of events can create both economical and health hazards:

1. Pilferage
2. Sabotage / Terrorism
3. Change in temperature

Other sources of concern:

Modern satellite systems allow transport companies to see where trucks, containers and boats are, what is their speed, the inside temperature and changes in temperature etc. Based on set parameters instant alerts can be given on a variety of events, such as (but not limited to):

- truck unscheduled stops / starts
- tethering / un-tethering trailer
- unacceptable change in temperature
  - trailer / container opened
- foreign gasses in trailer / container

It is anticipated that worldwide systems will be available by early 2005
At each control point in the farm, the pack house, the trucks, the containers, the repackaging centre, the Retailer DC, lot numbers and bar codes are created linking all Traceability information to the very beginning.

Tracing Fruit & Vegetables from farms to supermarkets

Tracing Processed Food
Pasta Example

Each * is a control point and generates a traceability lot number tracing back to the beginning.
Vegetable Information Traceability Components

Source: John Deere Food Origins

The depth of a traceability system depends on the attributes of interest

<table>
<thead>
<tr>
<th>Stages of production</th>
<th>Attributes of interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing</td>
<td>Decaf, Fair trade</td>
</tr>
<tr>
<td>Sales from producer to wholesaler/retailer</td>
<td>Fair wage</td>
</tr>
<tr>
<td>Transportation</td>
<td>Shade grown</td>
</tr>
<tr>
<td>Storage</td>
<td>Non-GE</td>
</tr>
<tr>
<td>Harvest</td>
<td>Safety</td>
</tr>
<tr>
<td>Cultivation</td>
<td></td>
</tr>
<tr>
<td>Bean/seed</td>
<td></td>
</tr>
</tbody>
</table>

Necessary depth of traceability
Is Food Safety As an Attribute with Value Consistent in an Increasingly Global Food System

Salinas Valley Lettuce Harvest Traceability in Practice

Chinese Carrot Harvest

Salinas Valley Lettuce Harvest
**International Government and Private Initiatives**

EU, Requires traceability for all businesses in the food chain
From January 1005.

US record keeping requirements by December 2005 or 2006
Depending on the size of business. (Bioterrorism Act Sec. 306)

Japan traceability on beef obligatory as of December 2004
Coming to other agricultural products

**Global Food Safety Initiative**

**CIES - The Food Business Forum** is the only independent global food business network. It serves the **CEOs and senior management** of 175 retailer and 175 supplier member companies, and their subsidiaries, in over 150 countries.

**WHAT IS EUREP**

EUREP (*Euro-Retailer Produce Working Group*) sets out a framework for developing **Good Agricultural Practices** (GAP) globally for horticultural products (e.g. fruits, vegetables, potatoes, salads, cut flowers and nursery stock).

The EUREP framework outlines the minimum standard / framework acceptable to the leading retailers in Europe, and is based on **Integrated Crop Management** (ICM). This is a philosophy that recognises the need for crop production to be economically and environmentally sustainable. It is anticipated that this framework will lead to "in-country" product assurance.
7. COMPLIANCE LEVELS FOR EUREGAP CERTIFICATION

7.1 Compliance with EUREGAP Fruit and Vegetables consists of three types of control points: Major Musts, Minor Musts and Recommendations, and must be fulfilled as follows. (See also chapters 11 & 12 of this document, Sanctions and Non-compliance)

7.1.1 MAJOR MUSTS:
100% compliance of all applicable Major Must Control Points is compulsory.

7.1.2 MINOR MUSTS:
95% compliance of all applicable Minor Must Control Points is compulsory. For the sake of calculation, the following formula will apply:

\[
\frac{(\text{Total number of Minor Must Control Points}) - \text{(Not Applicable)}}{\text{Scored on the form)}} = \frac{(\text{Total Major Must Control Point Non compliance allowable})}{5}\%
\]

7.1.3 RECOMMENDATIONS:
No minimum percentage of compliance is set.

7.2 All Control Points in the CIPCC must be audited, including the RECOMMENDATIONS.

7.3 Control Points that are indicated by “No NIA” in the Compliance Criteria field, unless specifically indicated in the respective Compliance Criteria text, must be audited and may not be justified as being “not applicable”. Exceptions can only be granted by the EUREGAP Technical and Standards Committee for Fruit and Vegetables and will be published by EUREGAP as an annex to the CIPCC.
Global Food Safety Initiative of CIES, association of 250 global food retailers
And suppliers to attempt to harmonize food safety standards among members
While certification to EUREP(GAP) will result in additional costs to growers, there will be numerous benefits. Long-term benefits include more motivated farm workers due to improved facilities, training and better working conditions with a subsequent increase in living standards. This would obviously also result in better productivity and outputs to the ultimate benefit for the grower.

European View of Value of Such Systems

An Alternative View

Cost Associated with Adopting Food Safety Standards Not Limited to but may Include

- Investment in New Infrastructure (water purification)
- Training for Workers to Improve Hygiene in the Field
- Upgraded Recordkeeping Systems
- Third Party Audits for Compliance with Customer Standards for GAPs in the fields and GMPs in the packing house
But Returns to Investment Not Necessarily Reflected in Price Premium

- Reduced Liability in case of Event
- Greater Market Access to Buyers Who Require Third Party Certification

Examples of Cost Reductions from Traceability Systems

- Load Sequencing / Raw Product Allocation
  Prior notification of product attributes; allocate incoming Product to most appropriate processing line

- Ingredient Management
  selection of food ingredients from raw products based on location And attributes of alternative lots

- RFID Asset Tracking
  Tracking raw product field bins
Conclusion: The Future will see increasing multiple demands on Fresh and Processed suppliers and producers while competition will make non-compliance not an option, it is the cost of remaining in the game.

Quality:
• taste
• freshness
• temperature
• shelf-life
• nutritional value
• consistency

Quantity

Costs

Specific requirements:
• packaging
• pallets
• size
• tailor-made

Tracking and tracing

Flexibility

On-time delivery

Safety: Microbial and Pesticides

Suppliers & Producers

Source: Adapted from Rabobank Mexico

Research Agenda

• Case Studies of Existing Systems
• Survey of Grower/Processors

Cost vs. Attribute Values
Mandatory vs. Voluntary
Government vs. Private
Global Harmonization vs. Barriers to Trade

ARI Project on Traceability Systems in Specialty Crop Industry, CSUF/CAB, UC/AIC, and CalPolySLO/CISSC