Traceability activities in the United States and the TRACE project

Maitri Thakur
Charles R. Hurburgh
Department of Agricultural and Biosystems Engineering
Department of Industrial and Manufacturing Systems Engineering
Iowa State University, Ames, Iowa
Contents

• Introduction
• Traceability drivers in the US
• Traceability research at Iowa State University
  – Relation to TRACE project
• Outreach
• Future activities
• Conclusions
Introduction

• ISO 8402: Traceability is the ability to trace the history, application or location of an entity by means of recorded identifications
  – Internal traceability
  – Chain traceability

• This is the original definition; later definitions weaker and more complex.
Traceability drivers in USA

• Regulatory compliance
• Liability issues
• Financial considerations:
  – Brand image, brand value
  – Litigation
  – Repetitive audits
• Consumer trust
• Inventory management
• New legislation
Traceability drivers in USA

Regulatory compliance and liability issues

• Should be able to demonstrate the ability to meet all local, state and federal requirements

• Registration requirement under the Bioterrorism Act of 2002

• Bioterrorism Act mandates that all members of food chain shall be able to trace goods one step forward and one step backward, as well as know the shipper/transporter of goods
## Traceability drivers in USA

<table>
<thead>
<tr>
<th>Existing Legislation (Bioterrorism Act 2002)</th>
<th>HR 2749 (Passed)</th>
<th>S 510 (Passed Mark-up)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-Up, One Down Traceback</td>
<td>All-Up, All down Traceback</td>
<td>All-Up, All down Traceback including importers and exporters</td>
</tr>
<tr>
<td>Little Enforcement</td>
<td>Major Enforcement</td>
<td>Major Enforcement follows H.R. 2749</td>
</tr>
<tr>
<td>Farms, Restaurants and Groceries exempt, ambiguous link to the farm</td>
<td>Farms, Restaurants and Groceries included, clear traceback document links to the farm</td>
<td>Some Farms, Restaurants are exempt, but HACCP for all facilities with clear traceback links to the farm</td>
</tr>
<tr>
<td>Any form of records</td>
<td>Only electronic records</td>
<td>Only electronic records</td>
</tr>
<tr>
<td>Voluntary Recall</td>
<td>Mandatory Recall</td>
<td>Mandatory Recall</td>
</tr>
<tr>
<td>Reasonable Record Access by FDA</td>
<td>Mandatory Immediate Access to Records</td>
<td>Mandatory Immediate Access to Records</td>
</tr>
<tr>
<td>No facility registration fees required</td>
<td>US-$500 facility registration fee required every year</td>
<td>Facility registration fee is required every year with two year records retention</td>
</tr>
<tr>
<td>Any type of lot code identifier</td>
<td>Unique traceback identifier for product coding with standardized recordkeeping</td>
<td>Testing Labs must report all food contamination to FDA with unique food code</td>
</tr>
</tbody>
</table>
Traceability drivers in USA

Financial Considerations – Multiple Audits

- AACC/ICC estimates $US 9 billion per year
- Proprietary schemes – 90-95% overlap but
- Different formats, order of items, auditor emphasis
- Food Processing industry gathering around GFSI (Global Food Safety Initiative) to certify harmonized audit schemes.

http://www.mygfsi.com/
Traceability Research
Iowa State University

• **Guidelines:**
  – Framework for implementation of traceability in bulk grain supply chain
  – Sector-specific guidelines: Soybeans and Milk

• **Implementation:**
  – GIS based farm traceability model
  – Internal traceability database model for grain elevator

• **System analysis and optimization:**
  – Decision making and risk analysis
  – Cost benefit analysis of an on-farm traceability system
  – Optimization of internal and chain traceability
Traceability research at ISU

Data Management and Optimal Decision Policies

- Stochastic optimization model for storage assignment policy to minimize lot dispersion
- Blending optimization model for outgoing shipments
- GIS farm traceability model

Relational data model for grain elevator record keeping

Decision making and risk analysis

- Employee Grain Handling Decisions
- Quality Management Systems Manual
- Fault Tree Analysis of Employee Decision Making Process
- Educational Intervention/Training Materials

Framework for traceability implementation

- Determination of the Usage Requirements of Traceability System
- Procedure Development of Internal Traceability System
- Information Exchange Protocol among supply chain actors

Cost-benefit Analysis

- Determination of purity-level requirements of Identity Preserved (IP) grains
- Cost-benefit analysis of on-farm traceability system for segregation of Identity Preserved grains
- Procedure Development of Internal Traceability System

Quality Management Systems Manual

Educational Intervention/Training Materials

Cost-benefit Analysis
Framework for implementation of traceability

• Inspired by TraceFood framework to develop generic guidelines for implementation
• Systems approach
• First step: define usage requirements of the traceability system
• IDEF0 technique to define process inputs, outputs, controls and mechanisms
• Sequence diagram for information exchange between supply chain actors
Framework for implementation of traceability

Grain Supply Chain Traceability System

- Record Breeding Practices
- Record Farming Practices
- Authenticate Claims
- Comply with Food Safety Regulations
- Protect Integrity of Brand Name
- Record Handling/Storage Practices
- Record Processing Practices
- Document Chain of Custody

Determine Traceability Plan

1. Regulatory Compliance (ISO22000 standard)
   - Implement Traceability Plan
     - ISO 22000 Certification (Regulatory Need)
     - Segregate different crops (Business Need)
     - Specialty grains (Consumer Demand)
   - Traceability System Manual

Evaluate System Performance

2. Implementation Report
   - Performance Report (QMS reports)
     - Audit reports
   - System Validation
     - Production Practices Documentation
     - QMS Documentation
     - ISO Certification
     - Customer Satisfaction Validation Certificates

System Maintenance

3. Industry Standards
   - Personnel
   - Procedures

Final TRACE conference “How to trace the origin of food?” 2-3 December 2009 - Autoworld - Brussels - Belgium
Sector-specific guidelines

• Inspired by TraceFood framework to develop sector-specific guidelines for implementation

• Soybean value chain
  – In collaboration with NOFIMA
  – Inspired by TraceFish project and study conducted in chicken sector

• Milk supply chain
  – Used Process Mapping technique
Sector-specific guidelines: Soybeans
Sector-specific guidelines: Milk
Implementation: ER modeling

- GIS based farm traceability model
- Internal traceability at a grain elevator
System Analysis and Optimization

• Analysis of employee decision making within a grain elevator
• The risk analysis examines selected operations that affect grain quality; from seed purchase to end user delivery, using fault tree analysis
• Cost-benefit analysis of an on-farm traceability system for Identity preserved grain
System Analysis and Optimization

- Optimization models to minimizing mixing of bulk products
Outreach

• Agricultural and Food Traceability Conference held in June 2009 at Des Moines, Iowa
• Organized in conjunction with WP4 and WP5 researchers of TRACE project
• Concluding event for Food Chain Economic Analysis Project funded by USDA
Outreach

Traceability Conference
- Implementation of internal traceability: grain and milk
- Economic aspects of regulations
- Process mapping to facilitate traceability
- Third party audit to verify sources
- Distribution perspective
- Challenges and incentives: Meat products
- Sourcing raw material: Beer
- QMS to promote traceability: Bulk grain

Traceability Workshop
- TraceTracker: Case based experiences with multiple actors
- Maritech: Electronic data interchange
- RIKILT: Traceability and Food Safety
- FoodReg: Case based experiences in standalone SMEs
- SINTEF: Traceability and Food Safety
- SINTEF: TraceFood Wiki

FoodReg:
- Case based experiences in standalone SMEs

TraceTracker:
- Case based experiences with multiple actors

Maritech:
- Electronic data interchange

RIKILT:
- Traceability and Food Safety

SINTEF:
- Traceability and Food Safety
- TraceFood Wiki

SINTEF:
- How to implement electronic traceability
Traceability Conference & Workshop
June 9 & 10, June 11, 2009

- Hosted approximately 60 people for 1 ½ day conference and 1 day workshop
- Attendees from business, scientific, and academic communities
- Speakers offered strategies, methods, regulatory initiatives, and economic implications of traceability
- Excellent initial discussion on traceability in U.S.
- Expanded potential for further research and collaboration between Iowa State University researchers and EU scientific community
Future activities

- Sector-specific guidelines for implementation of traceability in various food supply chains: Produce chains (ongoing)
- Optimization of internal and chain traceability efforts
- Data mining to identify food product recall patterns
Conclusions

• Traceability activities in US are mostly driven by regulatory compliance issues
• Iowa State University has been involved in traceability research since 2003
• Several research activities have been inspired by the TRACE project
• The outreach component was conducted in collaboration with TRACE researchers (WP4/5)
• The future activities include application of optimization, data mining techniques as well as developing sector-specific standards for various food products
Thank you!

maitri@iastate.edu

www.iowagrain.org