Maize to Milk: An Analysis of the Traceability Systems of Bulk Commodities
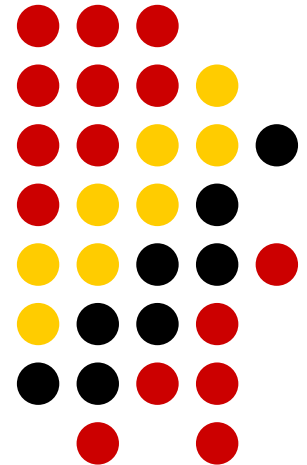
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June 29, 2009

Iowa Grain Quality Initiative

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ISUGQL

Presentation Outline

- Terminology
- Standards and Regulations
- Current Affairs
- Project Description
- Project Objectives
- Methodology
- Results
- Conclusions
- Future Work
- Acknowledgements

Terminology

- Traceability: the ability to track any food, feed, food-producing animal or substance that will be used for consumption, through all the stages of production, processing, and distribution (Official Journal of the European Union, 2002).

- Traceability system: totality of data and operations that is capable of maintaining desired information about a product and its components through all or part of its production and utilization chain. (International Organization of Standardization, 2007).

- Tracking: is the capability to follow the path of a specified unit and/or lot of trade items downstream through the supply chain as it moves between trading partners. (Can-Trace, 2004).

- Tracing: is the capability to identify the origin of a particular unit located within the supply chain by reference to records help upstream in the supply chain. (Can-Trace, 2004).

Terminology continued…

- Internal Traceability: monitors a product as it is delivered, processed, combined, packaged, within a facility.
- External Traceability: monitors a product from raw ingredients through processing to the consumer.

External Traceability

Internal Traceability
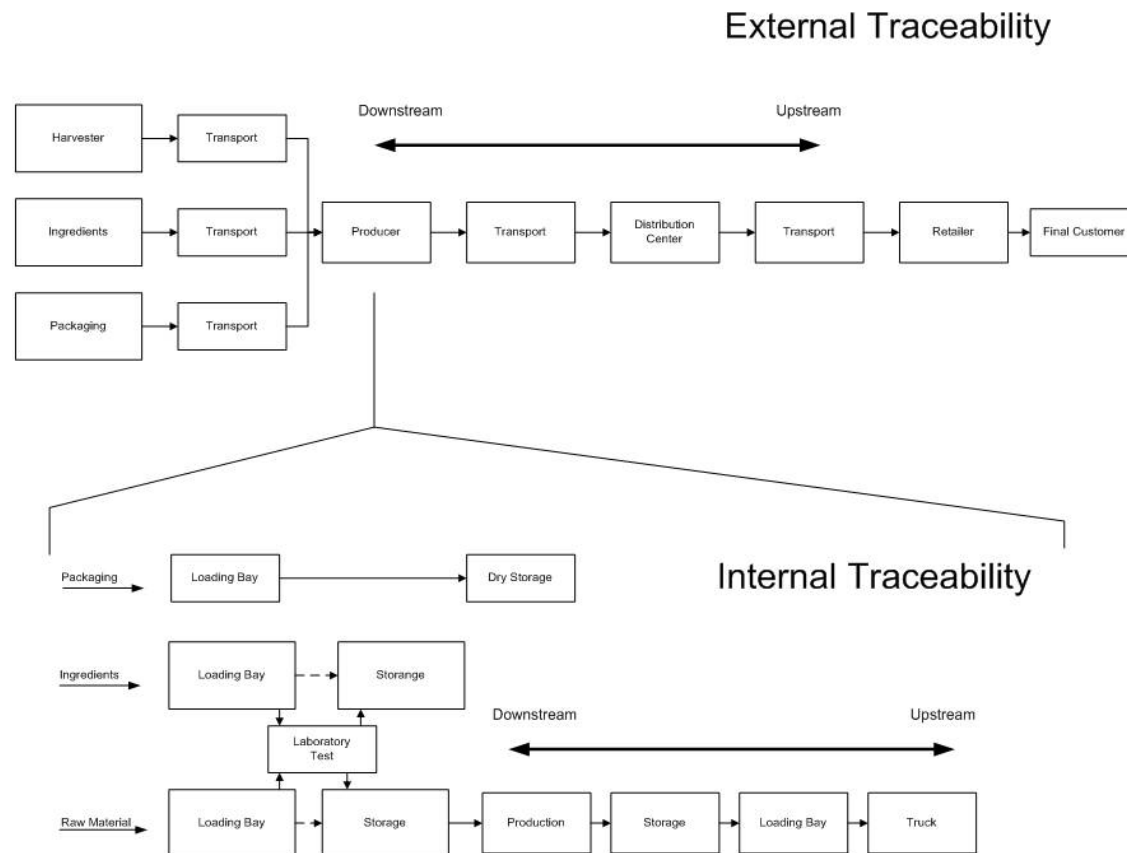
Standards and Regulations

- United States
  - Public Health Security and Bioterrorism Preparedness Act (June, 2002).

- European Union
  - EC 178/2002 General Principles of Food Law (February, 2002).
  - EC 1829/2003 GM Food and Feed (September, 2003).
  - EC 1830/2003 GM Traceability and Labeling (September, 2003).

- Canada
  - Can-Trace (2004).

- Internationally
  - ISO 22000 (September, 2005).
  - ISO 22005 (July, 2007).

Current Affairs

Bovine Spongiform
Encephalopathy

"Mad Cow Disease"

Aflatoxin
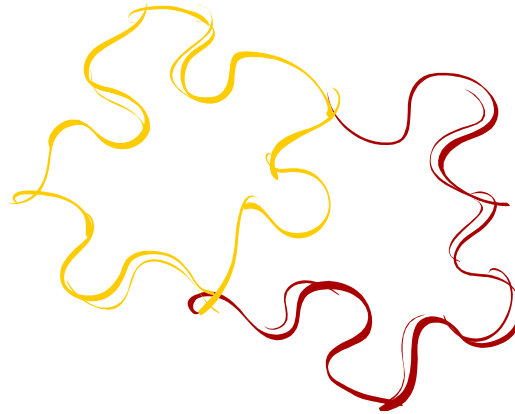
E.Coli O157:H7

Salmonella

Melamine

Salmonella

What's Next
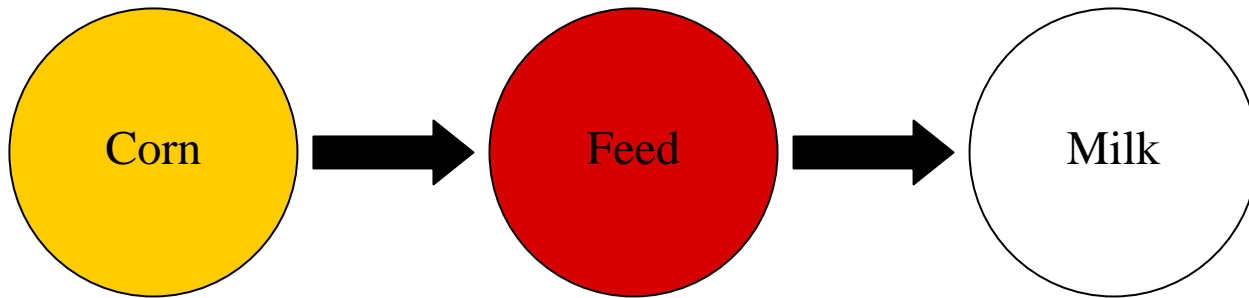
Internal Traceability

External Traceability

Bulk Commodities

Corporate Interest

Project Description

Corn → Feed → Milk

1. Analyze internal traceability system currently in place by each respective entity.

2. Analyze external traceability system among all participants.

3. Analyze information exchange between each entity.

Aflatoxin

- Aflatoxins are toxic metabolites produced by certain fungi in/on foods and feeds, especially tree nuts, peanuts, corn, and cottonseed.

- Aflatoxin B1, the most toxic and carcinogenic can be metabolized when ingested by dairy cattle and shows up as M1 in milk.

- Ethanol can be produced with aflatoxin contaminated corn.

Table 2. FDA Guidance Levels for Aflatoxin Fed to Food Animals	
Commodity	Amount
Corn for interstate movement	20 ppb
Corn for lactating cows	20 ppb
Milk	0.5 ppb for fluid milk
Corn for breeding beef cattle/swine or mature poultry	300 ppb
Corn for finishing swine > 100 lbs	200 ppb
Corn for finishing beef cattle	300 ppb

Aflatoxin Risk Example
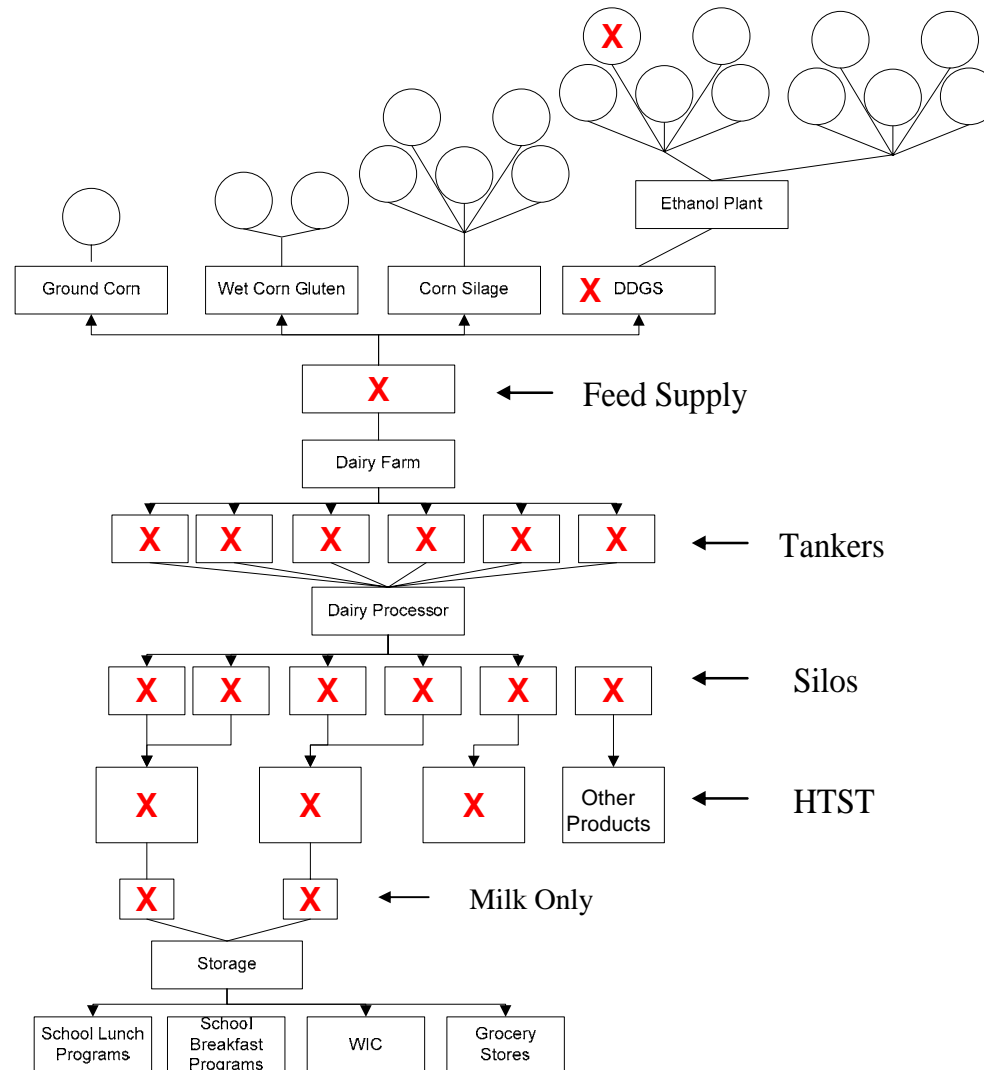
Project Objectives

- Create a model/map for tracing these commodities from corn to milk.

- Identify gaps in the traceability systems.

- Provide quality control/quality management strategies and recommendations to improve the external traceability system.

Methodology

- Selection of a dairy processor
  - Kick off meeting
- Interview and tour series
  - Quality Assurance Director
  - Assistant Director of Plant Operations
  - Dairy Farm Owner
  - Dairy processing facility tour
  - Dairy farm tour
- Assessment and data analysis
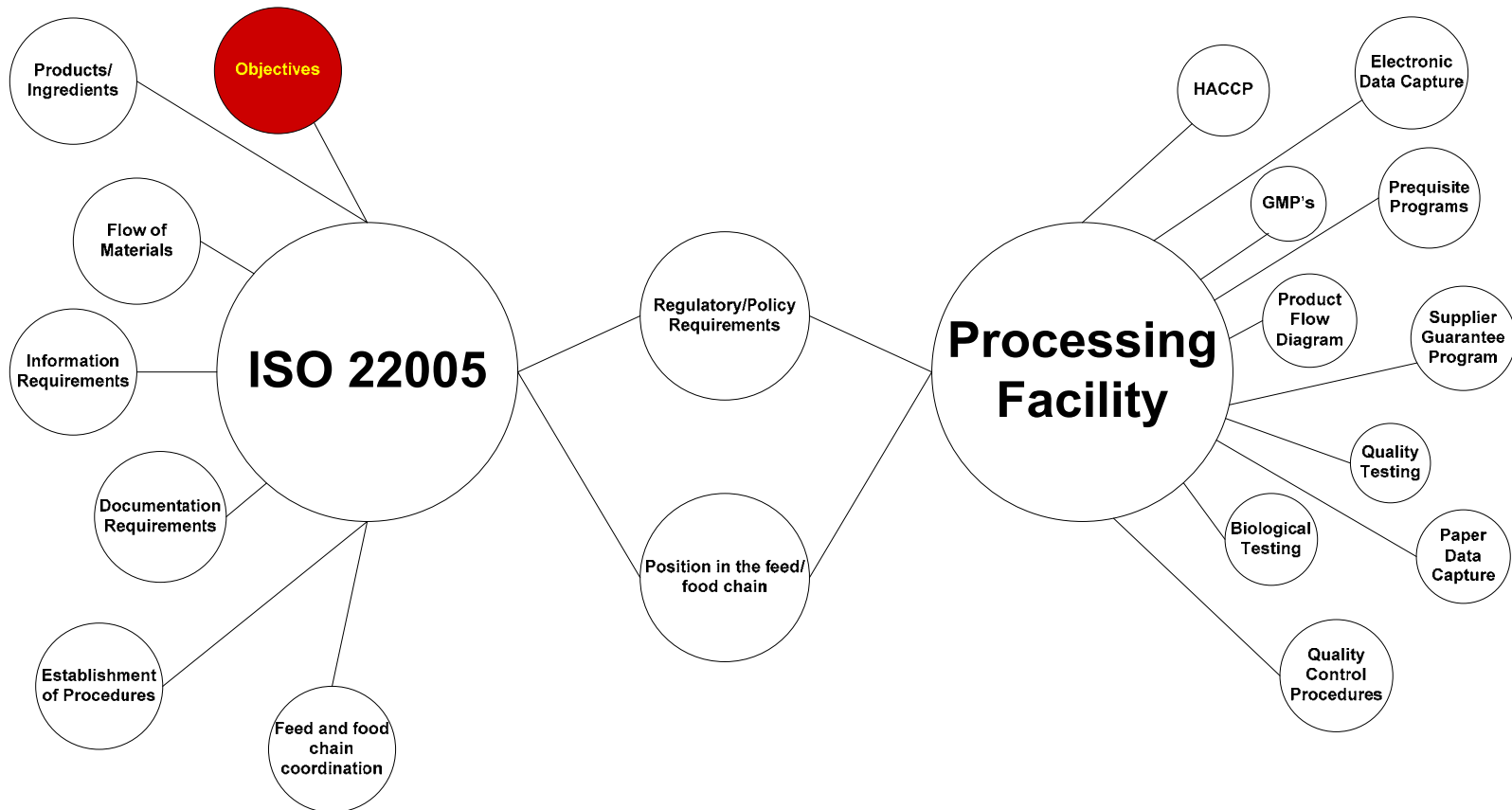
Demographics

- Dairy Processor
  - Regional
  - 300+ milk and dairy products
  - 387 miles, 4 states
- Dairy Farm
  - Milks 2300 cows/day
  - Provides processor with 17,000+ lbs/day of milk
- Feed Network
  - 1 ethanol plant
  - Corn suppliers all within 5 miles of dairy farm
  - Feed ingredients originate in at least 5 states

Interview & Tour Series

- Semi-structured interview style
  - Traceability Systems
  - Regulations & Standards
  - Data Management Practices
  - Product Standards
  - Standard Operating Procedures
  - Approximate number of suppliers

- Documentation
  - HACCP Procedures
  - Product Movement Records
  - Pasteurization Charts
  - Bills of Lading

Assessment

ISO 22005

- Products/Ingredients
- Objectives
- Flow of Materials
- Information Requirements
- Documentation Requirements
- Establishment of Procedures
- Feed and food chain coordination

Regulatory/Policy Requirements

Position in the feed/food chain

Processing Facility

- HACCP
- Electronic Data Capture
- GMP's
- Prequisite Programs
- Product Flow Diagram
- Supplier Guarantee Program
- Quality Testing
- Biological Testing
- Paper Data Capture
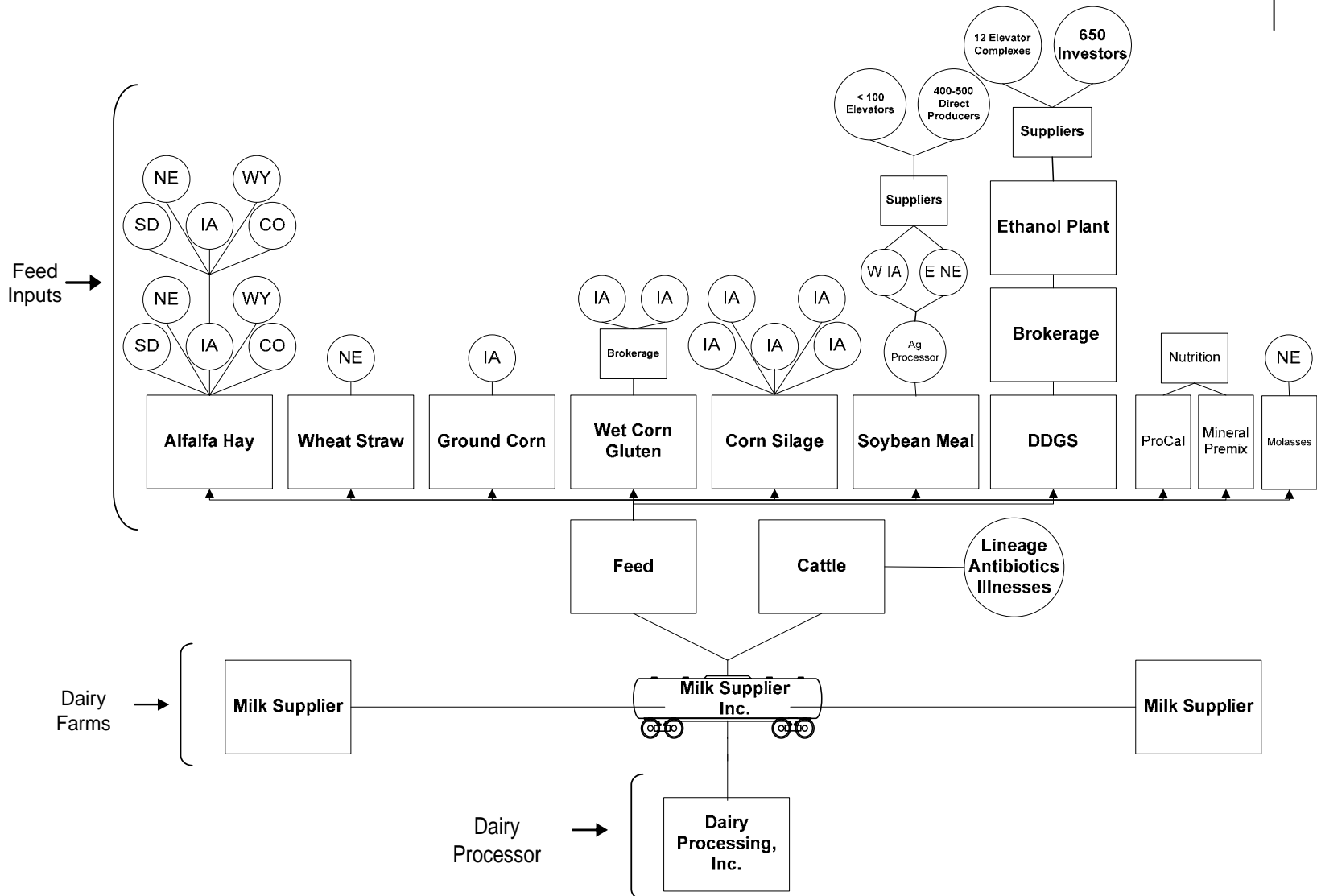- Quality Control Procedures

Compatibility Table

Results

- Create a model/map for tracing these commodities from corn to milk.

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Supply Chain Mapping
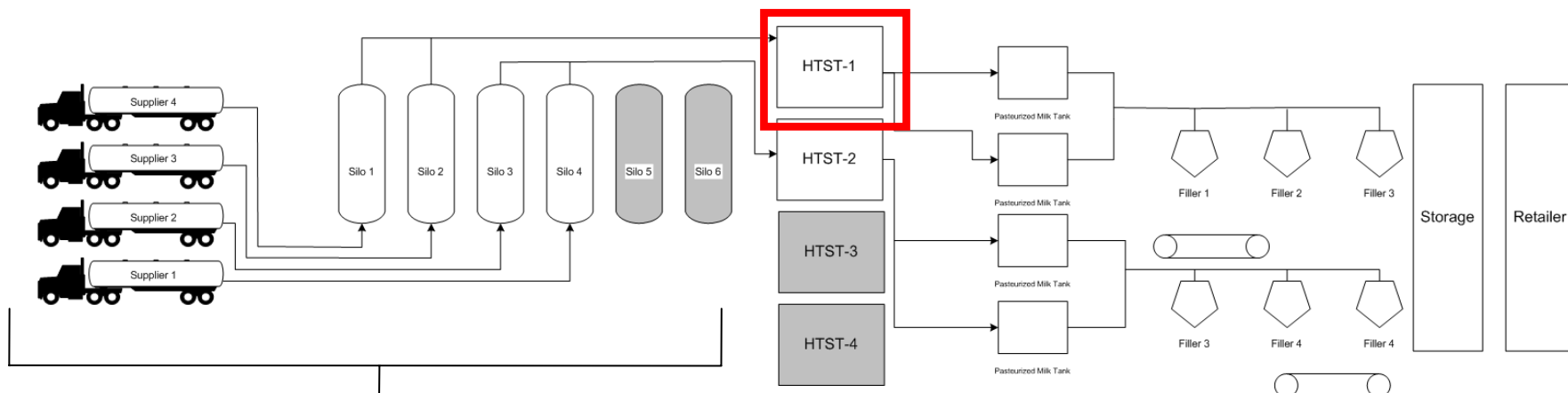
Supply Chain Mapping

Supply Chain Diagram

Results

- Create a model/map for tracing these commodities from corn to milk.

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Identified Gaps

- Date Received
- Supplier
- Bill of Lading
- Operator
- Silo Destination
- Silo Level

- Silo Source
- Product
- Product Total
- Product Destination
- Cream Destination
- Cream Total

- Filler ID
- Product Description
- PT Tank Source
- Date Received
- UPC Number
- Sell By Date
- Cooler Location
- Pallet ID
- Quantity
- Product Destination
- Route ID
- Order Number

Identified Gaps

- Inconsistent capture of data, both electronic and paper.

- Lack of a product recall procedure.

- Lack of objectives, the foundation of an ISO 22005 traceability system.

- Inconsistent method of data capture.

Results

- Create a model/map for tracing these commodities from corn to milk.

- Identify gaps in the traceability systems.

- Provide quality control/quality management strategies and recommendations to improve the external traceability system.

Quality Control/Quality Management Strategies

- Standardization of data collection methods and adoption of uniform data format.

- Implementation of product standards at the processor level that will subsequently affect the entire supply chain.

- Requirement of all suppliers to develop and implement defined traceability systems to achieve feed and food chain coordination.

- Implementation of monitoring and verification systems to ensure supplier compliance with company standards.

Conclusions

- Efficient and effective chain of custody system.

- After developing objectives, a traceability system can be developed by integrating additions and alterations to existing quality and safety programs.

- Through consistent data collection, communication, and coordination it is possible to identify the origin of feed ingredients that contribute to a processed milk product found on a local grocery store shelf.

Future Work

- Work with management to develop recall policy.

- Implement traceability concepts in already established quality assurance and HACCP procedures.

- Eventually, develop a defined traceability system based on ISO 22005 standards.

- Implement/ update training to educate employees on basic concepts of traceability and its importance and well as to refresh employees on processes and procedures.

Acknowledgements

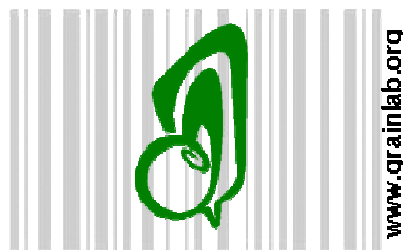Dr. Charles R. Hurburgh Jr.

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Thank You!

ProCal
Wyoming
South Dakota
Bunge
Alfalfa Hay
Soybean Meal
DDGS
Molasses
Wheat Straw
Nebraska
Corn Silage Iowa