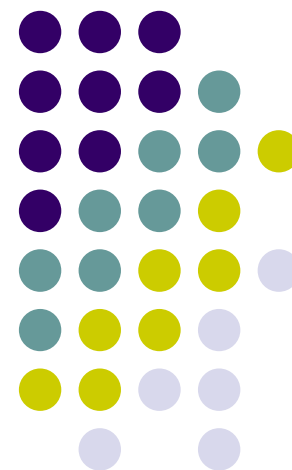


Economic Aspects of Regulation and Legislative Requirements: Traceability

Helen Jensen
Iowa State University
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Overview



- Background
- Systemic interactions in food systems
- Functions of traceability systems
- Traceability and tracking systems
- Issues of feasibility, costs and consumer willingness to pay
- Regulation



Background

- Commingling of products in agriculture
- Strong dependencies between agent decisions in supply chains

And...

- Increased consumer demand for differentiated products and quality assurance
- Agricultural systems moving from being commodity based to one based on differentiated food products

Systemic interactions & failures



1. Interconnected stages in food production systems
2. Mistrust communication and information
3. Asymmetric information and coordination failures
4. Failures in technologies and overload of system

Ref. Hennessy, Roosen and Jensen, *Food Policy*, 2003



1. System interconnectivity

- Consequences are known but cause is not
- Cause is known but mixing occurs

- Consequences:
 - Losses spread through much of the system
 - Mixing increases size of loss
 - Knowing cause (source) allows limiting losses

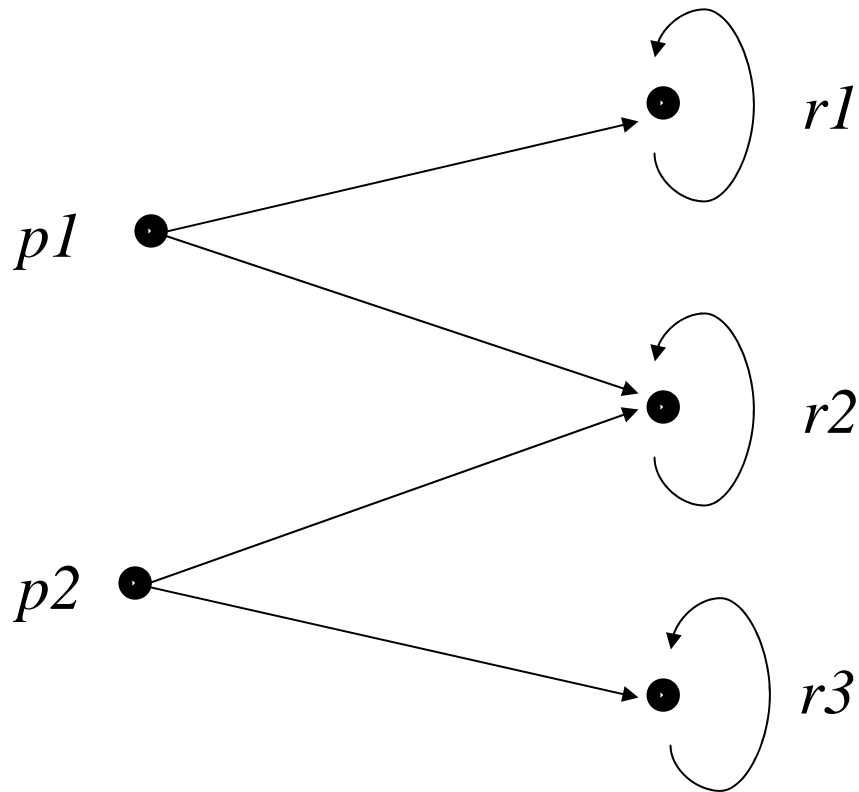


Fig. 1. Node diagram of retailers and providers

Source: Hennessy, Roosen and Jensen 2003

1. System interconnectivity



Potential approaches and policies to reduce interconnectedness

- Improvements in product traceability
- Closing of the system
- Investment in information management, audit infrastructure
- Improved detection methods and technologies



2. Mistrust in communication

- Mistrust the sender or provider
 - E.g., credence goods
- Mistrust the process

- Consequences
 - Uninformed consumers
 - Private branding
 - Loss of consumer confidence, confusion
 - EU, 1990s BSE, collapse of consumer confidence

2. Mistrust in communication



- Potential approaches and policies to reduce mistrust and improve communication
 - Improve communication (method and speed) about product
 - Require third party testing
 - Mandate labeling
 - Develop efficient procedures for assigning liability



3. Asymmetric information

- Coordination failure
- Distorted incentives

- Consequences
 - Under-provision or lack of care in protecting quality
 - Insufficient information to consumers

3. Asymmetric information



- Potential approaches and policies to enhance information and improve incentives
 - Improve testing, traceability and verification methods
 - Encourage cooperation (contracting) in supply relationships
 - Foster vertical integration for quality control

System failures and response



- Interconnected food production systems
 - Improve traceability, reduce losses
- Mistrust in communication and information
 - Labeling, product testing, assign liability
- Asymmetric information and coordination failures
 - Product testing/verification, contracting
 - Vertical integration

Functions of a Traceability System



- Reduce losses in case of failure
 - Reactive (faster recall or traceback)
 - Ex post cost reduction
 - Ex post information function (reduce liability)
- Supply side management
- Reduce information costs to consumers
 - Ex ante quality and information verification
 - Enhance differentiated markets

Traceability systems for meats



- Hypothetical traceability
 - DNA match to animal of origin
- Farm to retail traceability
 - Maintain farm/animal identity of all cuts from the farm through the cutting and distribution system
- Batch traceability
 - Maintain farm (batch) identity of the carcass
- Commingled product

Traceability: Farm to retail



- Animals arrive with individual animal identification (EU passport no., scanner code, tatoos)
- ID is scanned when animals arrive at the plant
- ID maintained with carcass
- Pieces from meat cut from one animal are kept together in container with animal ID, tracked to final cut
- Meat cut placed in vacuum bag, scanned, tag printed and inserted
- Product: animal identified meat product
- Est. Cost: fixed costs +50%; variable costs +20%

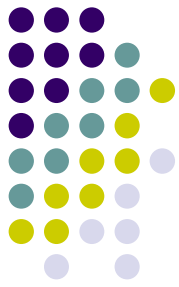
The Van Drie Group



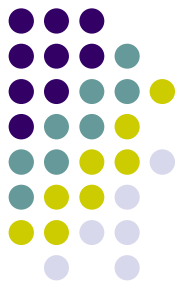
- Sells premium veal, dominant market share
- Does full traceability, can even track all of the parts of a particular animal after it is sold



**Ear tag is coded in the system.
The system knows where the animal is
located**

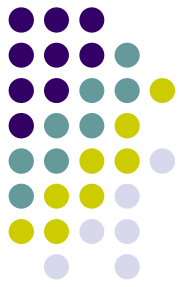


Chips embedded in the containers remember where the meat came from



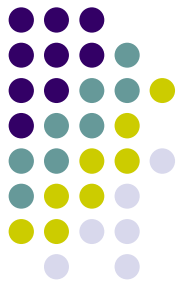
The system also remembers the location of the containers





Traceability: Farm to retail

- Product: animal identified meat product
- Estimated Cost:
 - Fixed costs +50%
 - Variable costs +20%

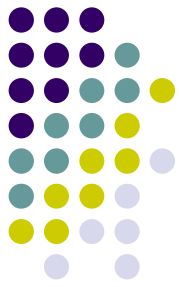


Traceability: Batch

- Animals arrive with individual animal identification
- First stage: ID is scanned when animals arrive and maintained with carcass
- Second stage: most carcasses cut and processed without further efforts to track to animal
- May stop line speed to achieve smaller batch
- Batch id to day, or batched segment of day
- Product: batch identified meat product

Some “organic” pigs

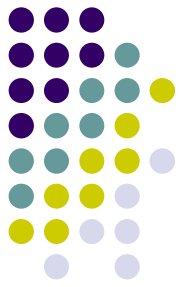




Commingled animals

- Mixing of animals prior to delivery
- Mixing of animals at slaughter and in processing
- Mixing of ingredient product in meat processing
- Product: commingled sourced

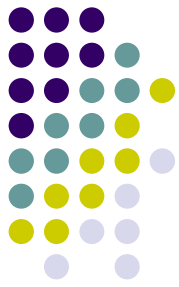




Feasibility and costs

- Farm (animal) to retail traceability costs are high and premium likely only in limited markets
- Batch system – market forces determine batch size
 - Batch traceability increases incentives to take care
 - Additional flexibility in batch identified carcasses for cutting elsewhere

McDonald's Promise to Consumers



- McDonalds' Corporation plan (2006)
 - 10% of its US beef purchases traceable from farm to table by the end of the year
- “We believe it’s an essential component of consumer confidence that when an issue develops, within a 48-hour time period...we get the message to the consumer that we can contain the problem, we know where the animal came from, we’re ready to deal...with the issue”

John Hayes, McDonalds' Corp. senior director of US supply,
May 2006

Demand: Are Consumers Willing to Pay (WTP) for Traceability and Characteristics that Can Be Verified With Traceability?



- Level of public information and awareness differ across country, so WTP likely to vary by country
 - US vs. Canada
 - US vs. EU
- Data limited and costs for market-based information are high
- An alternative to obtain an initial answer is to conduct auction experiments

Average Bids During Final Five Rounds in the US and Canada for Roast Beef



● Beef in USD

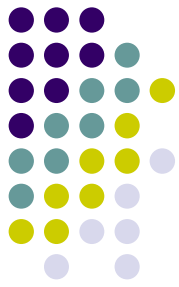
- Animal Welfare \$0.48 (16% premium)
- Food Safety \$0.60 (20%)
- Traceability \$0.21 (7%)
- Combined Attributes \$1.05 (35%)

● Beef in CDN

- Animal Welfare \$0.65 (13% premium)
- Food Safety \$0.62 (12.4%)
- Traceability \$0.34 (6.8%)
- Combined Attributes \$1.30 (26%)



Average Bids During Final Five Rounds in the US and Canada for Ham

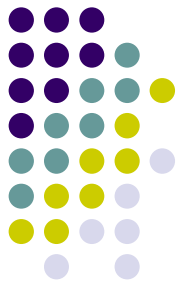


● Ham in USD

- Animal Welfare \$0.60 (20% premium)
- Food Safety \$0.69 (23%)
- Traceability \$0.54 (18%)
- Combined Attributes \$1.29 (43%)

● Ham in CDN

- Animal Welfare \$0.63 (12.6% premium)
- Food Safety \$0.66 (13.2%)
- Traceability \$0.34 (6.8%)
- Combined Attributes \$1.07 (21.4%)



Final comments

- Are traceability systems feasible?
 - Yes – range of systems and functions
 - Market incentives drive the type of assurance and control system
- What is the cost of traceability systems?
 - Current U.S. systems rely in batch traceability to reduce system failures
 - Costs of information technologies are decreasing
- Transition from commodity markets to differentiated markets and demand in international markets
 - Support traceability systems through higher premiums
 - Reduce system interconnectivity