SYSTEMS OF PRODUCT IDENTIFICATION

- **(Full) Commingling**
  - Output from different sources and/or with different characteristics pooled into a single lot
  - Motivation:
    - Exploit economies of scale in commercialization
- **Product Identification**
  - Output from different sources and/or with different characteristics kept separate/identified to varying degrees
  - Motivations:
    - Exploit consumers’ willingness to pay for different quality
    - Ensure safety of food chain

SYSTEMS OF PRODUCT IDENTIFICATION

- **Product identification**
  - Various terms used to denote identification systems
    - Traceability
    - Segregation
    - Identity preservation (IP)
  - Often same term used with different meanings
  - Extent of identification/tolerance/differentiation may vary substantially, depending on many factors

SYSTEMS OF PRODUCT IDENTIFICATION

- **Traceability**
  - Recordkeeping system:
    - "ability for the retrieval of the history and use or location of an article or an activity through a registered identification" (ISO 8402)
  - Sometimes designed to trace back sources of hazardous products that entered supply chains destined for human consumption
    - Example: EU directive requiring traceability of GMOs and GMO products to provide “a safety net should any unforeseen adverse effects be established”
  - Sometimes designed to manage input/output flows
    - Example: Ranchers using electronic identification ear tags to track information on animals’ lineage, vaccination records, health data, and other individual characteristics
SYSTEMS OF PRODUCT IDENTIFICATION

- Segregation
  - System to keep apart one crop or batch of food ingredients from others
  - Usually designed to prevent potentially hazardous crop/meat products from entering supply chains destined for human consumption
  - Does not necessarily require traceability
  - Example:
    - Registration process for new varieties
      - Contracts with government regulators to ensure that certain novel varieties will not enter handling system of like varieties

SYSTEMS OF PRODUCT IDENTIFICATION

- Identity preservation (IP)
  - System to identify source and/or nature of crop or batch of food ingredients
  - Usually designed to meet consumers’ preferences, with differential quality premiums providing incentives for participation
  - Example: Tofu-quality soybeans
  - May require documentation (i.e., traceability) to guarantee that certain traits or qualities are maintained throughout supply chain
  - Example: Dolphin-safe tuna, fair-trade coffee

SYSTEMS OF PRODUCT IDENTIFICATION

- Major characteristics of traceability systems
  - Breadth
    - Amount of information recorded by the system
      - Example: System for the beans for a cup of coffee could contain information on:
        » Countries of origin
        » Pesticides used
        » Type of farms (e.g., huge corporate organic farms, small family-run conventional farms)
        » Labor used (e.g., harvested by children or by machines)
        » Process of decaffeination (e.g., based on chemical solvent or hot water)
SYSTEMS OF PRODUCT IDENTIFICATION

- Major characteristics of traceability systems
  - Breadth
    - Amount of information recorded by the system
    - Depends on which attributes—as determined by supply management requirements, consumer preferences, and/or food safety considerations—warrant the expense of recordkeeping
  - Depth
    - How far back or forward the system tracks
    - Most businesses have one-up, one-back traceability
      - Firms must know who their suppliers are if they pay their bills and they must know who their buyers are if they cash their checks
    - Depends on objective of the system and characteristics of interest to producers or consumers
SYSTEMS OF PRODUCT IDENTIFICATION

• Major characteristics of traceability systems
  – Breadth
  – Depth
  – Precision
    • Degree of assurance with which system can pinpoint a particular product’s movement
      – Example:
        » A precise system would trace an apple to its orchard with high assurance, while a less precise system would only trace a crate of apples to two or three orchards with lower assurance

• Degree of assurance with which system can pinpoint a particular product’s movement
  • Depends on acceptable error rate for which system is designed
    – Optimal precision level should be set so that the marginal benefit of reducing safety/quality breaches equals the marginal cost of increasing accuracy

SYSTEMS OF PRODUCT IDENTIFICATION

• Voluntary Traceability
  – Motivations:
    1. Differentiate and market foods with subtle or undetectable quality attributes
    2. Facilitate traceback for food safety and quality
    3. Improve supply-side management

• Government-Mandated Traceability
  – Motivations:
    1. Facilitate and monitor traceback to enhance food safety
    2. Enhance consumer information about food safety and quality
    3. Protect consumers from fraud and producers from unfair competition
    4. Protect domestic producers

SYSTEMS OF PRODUCT IDENTIFICATION

• Major characteristics of traceability systems
  – Breadth
  – Depth
  – Precision

  • Degree of assurance with which system can pinpoint a particular product’s movement

  Examples:
  » High precision: Trace an apple to its orchard with high assurance.
  » Lower precision: Trace a crate of apples to two or three orchards with lower assurance.
SYSTEMS OF PRODUCT IDENTIFICATION

• Motivations for Voluntary Traceability
  1. Differentiate and market foods with subtle or undetectable quality attributes
     • “Credence” attributes: Characteristics that consumers cannot discern even after consumption
       – Content attributes: Affect actual physical properties of product, but difficult for consumers to perceive
         » Examples: Amount of isoflavones in a glass of soymilk, calcium in enriched orange juice
       – Process attributes: Concerned with production process, usually cannot be detected even with specialized testing equipment
         » Examples: organic, free-range, dolphin-safe, shade-grown, earth-friendly, and fair trade products

  2. Facilitate traceback for food safety and quality
     • Traceability helps producers reduce time to identify and remove contaminated foods from production lines and/or from market, before food item reaches consumers
       » Example: Food processors using bar codes to identify time of production, line of production, and sequence

• Firms sometimes resort to third-party entities to validate claims about quality attributes
  » Examples:
    – Good Housekeeping Institute
    – American National Standards Institute (ANSI),
    – Underwriters Laboratories (UL)
    – Council of Better Business Bureaus
    – International Organization for Standardization (ISO)
    – Government Inspectors
SYSTEMS OF PRODUCT IDENTIFICATION

- Motivations of Voluntary Traceability
  1. Differentiate and market foods with subtle or undetectable quality attributes
  2. Facilitate traceback for food safety and quality
  3. Improve supply-side management
     - Traceability helps manage product flows and track retail activity
       - Examples:
         » Bar codes in packaged foods enable stores and manufacturers to collect data on retail trade patterns, and to manage inventory flows
         » Ranchers may use electronic identification eartags to track information on animals’ lineage, health data, and other characteristics to sort cattle in feed yards, conducting disease surveillance, etc.

SYSTEMS OF PRODUCT IDENTIFICATION

- Motivations for Voluntary Traceability
  1. Differentiate and market foods with subtle or undetectable quality attributes
  2. Facilitate traceback for food safety and quality
  3. Improve supply-side management

- Motivations for Mandatory Traceability
  1. Facilitate and monitor traceback to enhance food safety
     - Mandatory traceability enables authorities to identify sources of food contamination/hazards and contain risks faster
       ✓ Examples:
         » Mandatory traceability for meats allows tracing back foodborne illness outbreaks, so that contaminated foods may be removed and lives saved
         » EU mandatory traceability of GM foods
SYSTEMS OF PRODUCT IDENTIFICATION

• Motivations for Mandatory Traceability
  1. Facilitate and monitor traceback to enhance food safety
  2. Enhance consumer information about food safety and quality
     • If producers are not providing as much information about safety/quality as consumers desire, mandated traceability may allow consumers to choose food products better matching their preferences
       ➢ Example: Various government agencies mandate oyster producers to document time and place of harvest

• Motivations of Mandatory Traceability
  1. Facilitate and monitor traceback to enhance food safety
  2. Enhance consumer information about food safety and quality
  3. Protect consumers from fraud and producers from unfair competition
     • By enforcing traceability, the government may assure consumers and competitors that firms claiming to sell products with credence attributes can substantiate their claims
       ➢ Example: Mandatory traceability for producers of organic foods

• Motivations of Mandatory Traceability
  1. Facilitate and monitor traceback to enhance food safety
  2. Enhance consumer information about food safety and quality
  3. Protect consumers from fraud and producers from unfair competition
  4. Protect domestic producers
     • Mandatory traceability to identify domestically produced vs. imported foods may allow domestic producers to command a premium
       ➢ Example: Country-of-Origin Labeling (COOL)
SYSTEMS OF PRODUCT IDENTIFICATION

• Examples of Mandatory Traceability
  ➢ Country-of-Origin Labeling (COOL)
  ➢ Certified Organic
  ➢ EU traceability of GMOs

  — Mandated for most products imported by the United States under section 304 of 1930 Tariff Act
  — Tariff Act exempts several agricultural products, including livestock (but not processed livestock products) and several "natural" products (e.g., some fruits, nuts, and vegetables) are included on a "J" list.

  — Farm Security and Rural Investment Act of 2002 requires retailers to identify country of origin for beef, lamb, pork, fish, shellfish, fresh and frozen fruits and vegetables, and peanuts
  — Retailers can designate U.S. as country of origin only if food is exclusively a U.S. product (e.g., for meat, animal must be born, raised, and slaughtered in the U.S.)
  — If product is not exclusively from the U.S., label must show its mixed origins
    — Example: "Product of Australia; Imported from Mexico; Raised and Slaughtered in U.S.A.; Product of U.S.A." for ground beef.
SYSTEMS OF PRODUCT IDENTIFICATION

- Examples of Mandatory Traceability
  - Country-of-Origin Labeling (COOL)
    - 2002 Farm Act
      - Retailers must ensure verifiable audit trail
      - COOL not required for foods that are ingredients of processed food items (e.g., bacon, peanut butter, orange juice)
      - Foodservice establishments exempt from COOL
      - “Unknown origin” label not allowed
        - Products without country-of-origin documentation cannot be marketed through retail outlets
        - These products will likely be channeled to food service, additional processing, or some other exempt outlet
  - Advocates: Cow-calf producers, fruit and vegetable grower/shipper associations
    - U.S. consumers would benefit from more information
    - U.S. producers would receive quality premium
  - Opponents: Cattle feeders, hog finishers, meat packers, retailers
    - U.S. consumers not interested in COOL
    - Traceability system too expensive and would raise food prices
    - Trade agreements may be violated

- Certified Organic Products
  - Products grown and processed according to USDA’s national organic standards and certified by USDA-accredited State and private certification organizations
  - Organic Foods Act of 1990 established national standards for organically produced commodities
    - Organic growers must have to be certified under USDA’s National Organic Program
    - A person may sell or label an agricultural product as organically produced only if product has been produced and handled in accordance with National Organic Program
SYSTEMS OF PRODUCT IDENTIFICATION

- Examples of Mandatory Traceability
  - Certified Organic Products
    - National organic standards
      - Address methods, practices, and substances used in producing and handling crops, livestock, and processed agricultural products
      - Example: Organically produced food cannot be produced using genetic engineering and other excluded methods, sewage sludge, or ionizing radiation

- National organic standards
  - “USDA organic” seal may be used on agricultural products that are “100 Percent Organic” or “Organic”
  - “100 Percent Organic” must contain (excluding water and salt) only organically produced ingredients
  - “Organic” must contain at least 95% organically produced ingredients
  - “Made with Organic Ingredients” must contain at least 70% organic ingredients
  - Products with less than 70% organic ingredients cannot use the term organic anywhere on the principal display panel, but may identify the specific ingredients that are organically produced on the ingredients statement on the information panel
SYSTEMS OF PRODUCT IDENTIFICATION

- Examples of Mandatory Traceability
  - Certified Organic Products

Fruits and vegetables remain the largest category of sales, accounting for 42 percent of organic food sales in 2003.


SYSTEMS OF PRODUCT IDENTIFICATION

- Examples of Mandatory Traceability
  - Certified Organic Products


Million acres

1992 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07

Sources: Agricultural Marketing Service, USDA.

SYSTEMS OF PRODUCT IDENTIFICATION

- Examples of Mandatory Traceability
  - Certified Organic Products


U.S. total

Number of certified

SYSTEMS OF PRODUCT IDENTIFICATION

• Examples of Mandatory Traceability
  ➢ EU traceability of GMOs
    o All food and feed which consist of, contain, or are produced from GMOs have to be labelled as such
    o Business operators must transmit and retain information about products that contain or are produced from GMOs at each stage of the placing on the market
      - Operators must have systems and procedures to identify to/from whom products are made available
      - Operators must retain the information for 5 years

• Examples of Mandatory Traceability
  ➢ GMOs intended for food, feed or for processing
    - Operators may either transmit the information or a declaration that product shall only be used as food or feed or for processing, together with the identity of the GMO(s) that ‘have been used’ to constitute original mixture from which product arose
    - Food and feed produced from GMO(s)
      - Operators must inform the next operator in the chain that product is produced from GMO(s)

PRODUCT DIFFERENTIATION

• Commodity Goods
  - Output from different producers is the same in the eyes of consumers
    - Corn
    - Soybeans
    - Wheat

• Differentiated Goods
  - A producer’s or group of producer’s output is perceived by consumers to be unique
    - Branded products, niche markets
      - Beer
      - Wine
      - Parma ham
      - Napa Valley wine
PRODUCT DIFFERENTIATION

• Commodity Goods
  – Producers are price takers
  – Perfectly competitive markets

• Differentiated Goods
  – Producers may have some control over prices
  – Less than perfectly competitive markets
  • Monopoly
  • Oligopoly
  • Monopolistic competition
  • “Workable” competition

PRODUCT DIFFERENTIATION

• Commodity Goods
  – Production efficiency essential to stay in business
    • Usually expand to exploit economies of scale
  – Long-run prices equal minimum average total costs

• Differentiated Goods
  – Production efficiency not crucial
  – Long-run prices above minimum average total costs

PRODUCT DIFFERENTIATION

• Commodity Goods
  – Output from different producers can be commingled
    • Economies of scale in commercialization can be exploited
  – Not possible to obtain excess profits

• Differentiated Goods
  – Output from different producers or group of producers cannot be commingled without losing “differentiation” attribute
  – Potential to obtain excess profits
PRODUCT DIFFERENTIATION

• Criteria for Successful Differentiation of an Agricultural Product
  – Market channel must be able to transmit price signals from consumers to producers
  – Product must achieve a scale of production sufficiently large to justify the costs of creating and maintaining the differentiated image among consumers
  – Imitation of the product must be prevented
  – Method of supply control must not violate laws against price fixing

PRODUCT DIFFERENTIATION

• Differentiated products
  – Without supply “control”
    • Organic produce
    • Non-GM grain
    • Tofu-quality soybeans
  – With supply “control”
    • Parma Ham
    • Brunello di Montalcino wine
    • Vidalia onions

PRODUCT DIFFERENTIATION

• Differentiated products with supply control
  – Very different approaches in US and EU
    • European Union
      – Heavy promotion through specially designed legislation to grant producers intellectual property rights
        » Designation of origin
        » Traditional methods
PRODUCT DIFFERENTIATION

Agriculture and food

Quality products of the type PDO, PGI and TSG

Traditionally, there is an enormous range of goods, values, and services that can be divided into different categories. However, products can be differentiated into different categories depending on their inherent characteristics and the way they are produced, processed, and prepared. This involves the use of traditional knowledge and practices passed on through generations.

PDO (Protected Designation of Origin) refers to a specific geographical area where the production, processing, and preparation of a product occur. The PDO label guarantees that the product meets certain quality standards and is produced in a specific region.

PGI (Protected Geographical Indication) refers to a product that is produced in a specific geographical area and is known for its unique characteristics.

TSG (Traditional Specialty Guaranteed) refers to a product that is produced in a specific geographical area and is known for its unique characteristics.

Why have European producers developed PDO and PGI?

- To ensure the uniqueness and authenticity of the product
- To protect the product's reputation and quality
- To inform consumers about the specific characteristics of the product
PRODUCT DIFFERENTIATION

Differentiated products with supply control

• Very different approaches in US and EU
  • United States
    – Little promotion
    – Few successful examples (e.g., Vidalia onions)
    based on “certification marks” together with
    “marketing orders”