

Figure 5–Stakeholders in the meat and poultry sector supply chain.

While supply chains for specific meat and poultry commodities vary greatly, the overarching flow of food is fairly similar (see Figure 6 as example). It usually starts with the birth of the animal, followed by maturing, slaughtering, butchering, processing, distributing, and POS. Establishments where a CTE could take place include producer facilities (farms), abattoirs, rendering plants, dead stock collection points, border posts, quarantine stations, warehouses, distribution centers, cold storage facilities, retail grocery stores, and food service operator restaurants (WOAH 2013). It is also noted that there are difficulties in tracking animals and/or their parts after slaughter, especially at nonslaughter cutting houses such as retail meat markets or food service cutting operations. There are several intermediate CTEs within this overarching supply chain that also have an impact on the traceability of the food such as shipping, receiving, comingling, and disposal.

Specialized CTE-KDE framework

- Poultry
 - CTEs
 - Egg Delivery
 - Eggs to Incubator
 - Hatched Eggs
 - Unhatched Eggs
 - Chick Delivery to Farm
 - Chick Placement

- Shipment of Feed to Farm
- Delivery of Feed to Farm
- Mature Broilers/Spent Hens
- Broiler Pickup
- Broiler Delivery
- Broiler Dead on Arrival (DOA)
- Broiler Harvest
- Minimally Processed Meat
- Shipping to Partner
- Receiving by Partner
- Nonmeat Ingredient
- Packaged Finished Product
- Shipping to Distributor
- Receiving by Distributor
- Shipping to Retailer or Food Service Operator
- Receiving by Retailer or Food Service Operator
- Retail POS
- Case Opened by Food Service Operator
- Product Disposed as Unusable Waste

- KDEs
 - Who
 - Owner of Breeder Farm
 - Owner of Hatchery
 - Owner of Broiler Farm

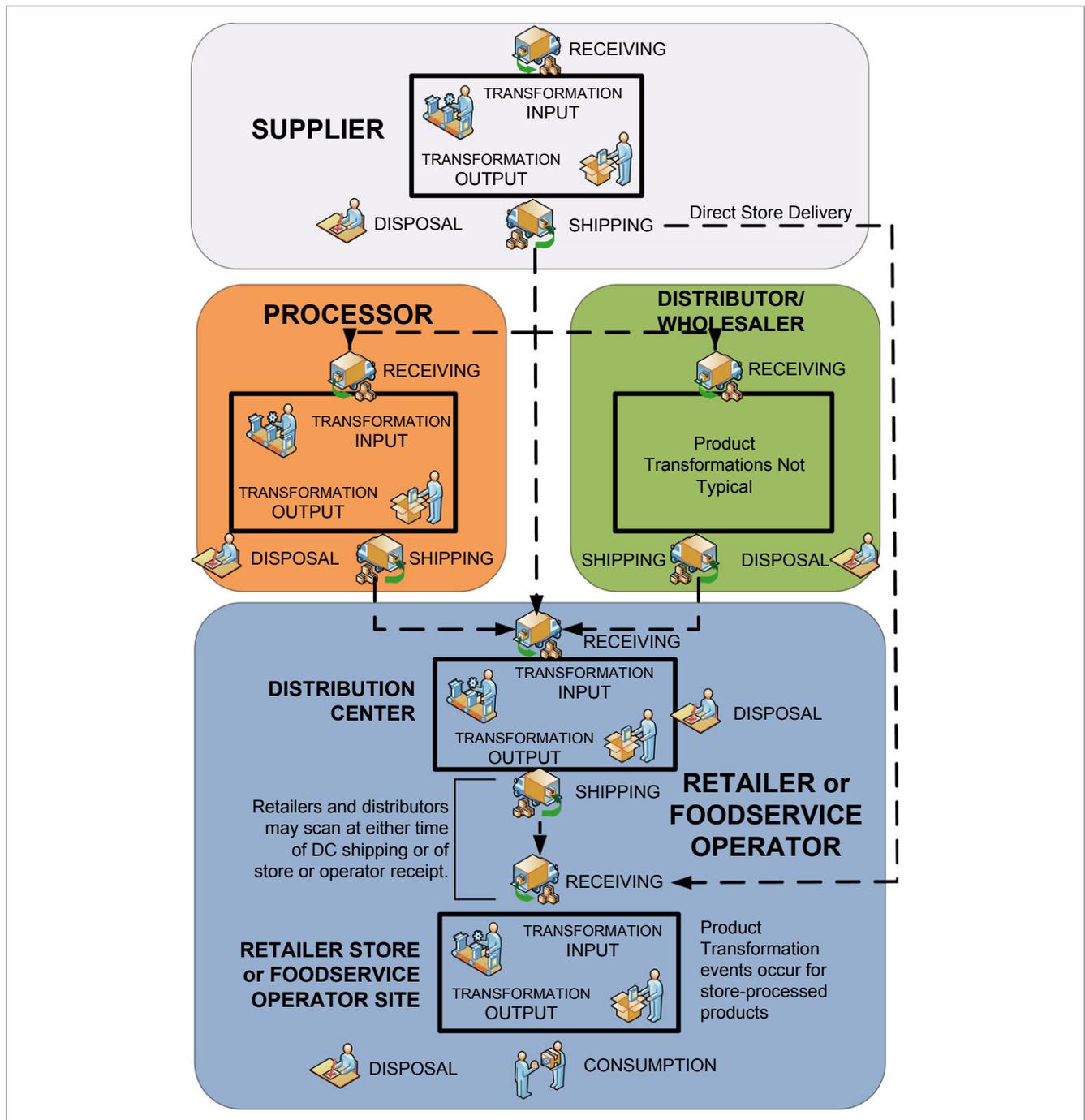


Figure 6—Critical tracking events for meat and poultry.

- Owner of Feed Mill
- Owner of Processing Plant
- Owner of Cold Storage
- Owner of Retail
- Owner of Food Service Operation
- Where
 - Location of Hatchery
 - Location of Broiler Farm
 - Location of Feed Mill
 - Location of Processing Plant
 - Location of Cold Storage
- Location of Retail DC/Store
- Location of Food Service DC/Restaurant
- When
 - Date
 - Time
- What
 - Eggs
 - Chicks
 - Feed
 - Broilers/Spent Hens

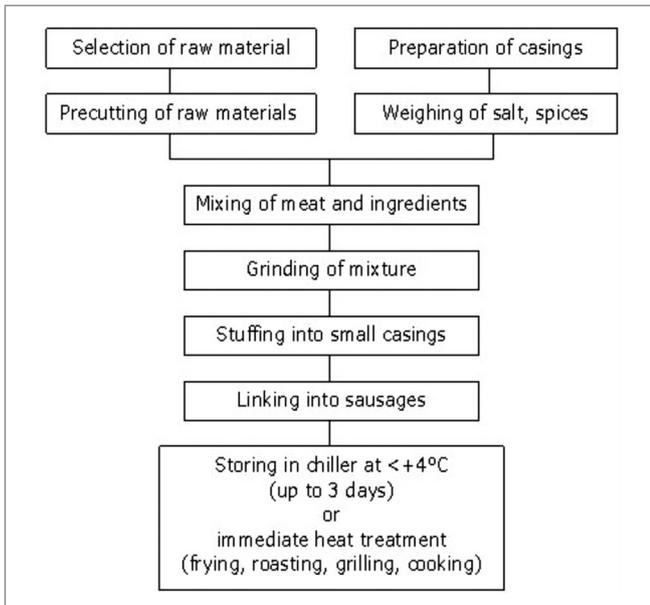


Figure 7—Example of meat/poultry processing (sausages, for example).

- Nonmeat Ingredients
- Packaging
- Processed Product
- Identifiers
 - Breeding stock
 - Flock ID
 - Product
 - Batch Number/Lot Number
 - Use-By Date
 - Sell-By Date
- Activity Types
 - Purchase Orders
 - Delivery Identification
 - Process Identification
 - Cycle Identification
 - Feed Order Number
 - Ticket Number
 - Work Order Number
 - Carrier Name
 - Trailer Number
- Beef
 - CTEs
 - Feed
 - Shipping to Processing Plant
 - Receiving by Processing Plant
 - Live Animals
 - Minimally Processed Meat
 - Nonmeat Ingredients
 - Packaged Finished Product
 - Shipping to Distributor
 - Receiving by Distributor
 - Shipping to Retailer/Food Service Operator
 - Receiving by Retailer/Food Service Operator
 - Retail POS

- Case Opened by Food Service Operator
- Product Disposal as Unusable Waste
- KDEs
 - Who
 - Owner of Feed Lot
 - Owner of Processing Plant
 - Owner of Cold Storage
 - Owner of Distributor
 - Owner of Retailer Store
 - Owner of Food Service Operation
 - Where
 - Location of Feed Lot
 - Location of Processing Plant
 - Location of Cold Storage
 - Location of Distributor
 - Location of Retail Distribution Center (DC)/Store
 - Location of Food Service Distribution Center (DC)/Restaurant
 - When
 - Date
 - Time
 - What
 - Cattle
 - Feed
 - Nonmeat Ingredients
 - Packaging
 - Processed Product
 - Identifiers
 - Animal Identification
 - Animal Batch
 - Product
 - Batch Number/Lot Number
 - Use-By Date
 - Sell-By Date
 - Activity Types
 - Purchase Order
 - BOL
 - Feed Order
 - Cycle Identification
 - Ticket Number
 - Work Order Number
 - Carrier Name
 - Trailer Number
- Pork
 - CTEs
 - Feed
 - Hogs
 - Shipping to Processing Plant
 - Receiving by Processing Plant
 - Minimally Processed Meat
 - Nonmeat Ingredients
 - Packaged Finished Product
 - Shipping to Distributor

- Receiving by Distributor
- Shipping to Retailer/Food Service Operator
- Receiving by Retailer/Food Service Operator
- Retail POS
- Case Opened by Food Service Operator
- Product Disposed as Unusable Waste
- KDEs
 - Who
 - Owner of Finishing House
 - Owner of Processing Plant
 - Owner of Cold Storage
 - Owner of Distributor
 - Owner of Retailer Store
 - Owner of Food Service Operation
 - Where
 - Location of Finishing house
 - Location of Processing Plant
 - Location of Cold Storage
 - Location of Distributor
 - Location of Retailer
 - Location of Food Service Operator
 - When
 - Date
 - Time
 - What
 - Hogs
 - Feed
 - Nonmeat Ingredients
 - Packaging
 - Processed Product
 - Identifiers
 - Product
 - Batch Number/Lot Number
 - Animal Identifier
 - Use-By Date
 - Sell-By Date
 - Activity Types
 - Purchase Order
 - BOL
 - Feed Order
 - Cycle Identifier
 - Ticket Identifier
 - Work Order
 - Production Date
 - Trailer Number
 - Carrier Name

For simplicity of implementation and to maintain a focus on the more critical, immediate gaps in tracing capability closer to the consumer, the CTEs/KDEs identified above are those of primary importance subsequent to the feeding lot. In addition to these CTEs/KDEs, some other information may be collected, and may include number of dead animals, and medication for all poultry, beef and pork operations, vaccination information for the beef and

pork chains, the nursery, cow/calf operation, stocker operation, and sale barns.

Processed Foods

This section describes the typical supply chain of processed foods as well as develops a specialized CTE/KDE framework for this sector. It must be noted that several other sectors like the dairy, meat/poultry, and bakery sectors, overlap at some point with the processed food sector when they are used as input ingredients to create a finished processed food product.

Supply chain

Processed foods have increasing challenges in the traceability arena these days. The global trade of foods and ingredients has become a diverse and complex operation (See Figure 8). Consumers continue to look for innovation in food products along with good nutritional value and ethical ingredients, as well as continuing to desire traditional products. To satisfy customer demand and maintain market share, processed food manufacturers seek competitively priced ingredients from developing countries; and, global trade allows sourcing of ingredients from all over the world.

However, due to the diversity of agricultural operations and practices, quality assurance systems, and country regulations, the processed food sector faces challenges in identifying domestic and international ingredient sources, ensuring the safety of those ingredients and foods, and tracing products when addressing foodborne illness situations (for example, investigation, recall) or managing their supply chains.

The vast harvest-to-table food system includes agricultural production and harvesting, aquaculture, wild seafood harvesting, holding and storing of raw materials, food manufacturing (formulation, food processing, and packaging), transportation and distribution, retailing, food service, and food preparation in the home (Floros and others 2010). A processed food product might consist of an agricultural commodity (for example, coffee, corn, grain, oil, rice, sugar, tea, or wheat), fresh produce (vegetable or fruit), protein (for example, meat, dairy, or seafood), seasonings (spices, for example), food colors, vitamins/minerals, processing aids, or other components (Floros and others 2010). In addition, a processed food product may include ingredients from countries thousands of miles away.

The supply chain of the processed food sector starts with the raw materials. The raw materials may include silo materials, raw ingredients, processing aids, and packaging materials. Silo materials may include raw agricultural products such as wheat, rice, and other grain products. Raw ingredients may include colorings, emulsifiers, salt, spices, sugar, vitamins, and other ingredients, which may be sourced in bags, boxes, or totes. Processing aids and packaging materials may be shipped as pallets, boxes, or totes. After inspection for quality assurance and other recordkeeping processes, are stored in a warehouse, and follow the FIFO or FEFO for production.

When manufacturing begins, the prep room/kitchen orders the material as specified for certain recipes and formulations, and the raw materials are transferred in designated amounts to the manufacturing floor. After processing, which may include premixing, emulsifying, heat treatment, or cooling, the product is packaged using specified packaging and shipped to internal or offsite storage. Distribution channels for processed foods may include transportation to a warehouse, retailer, or food service site, school, restaurant, vending machine, or other business operation.