



Figure 9—Stakeholders in a produce sector supply chain.

Produce

This section describes the typical supply chain for the produce sector as well as develops a specialized CTE/KDE framework for this sector.

Supply chain

As shown in Figure 9, the most likely groups of stakeholders involved in the production and distribution of fresh produce are presented.

Specialized CTE-KDE framework

Grower KDEs

- (a) Commodity
- (b) Variety
- (c) Harvest Date and Time
- (d) Product Identifier (unique code assigned to the particular product)
- (e) Harvesting Field Lot Number
- (f) Harvesting Crew Name
- (g) Harvest or Production Lot Quantity/Weight (pounds or tons)
- (h) Grower name

Packer KDEs

Harvest side:

- (a) Grower Name
- (b) Commodity
- (c) Variety
- (d) Harvest Date and Time

- (e) Product Identifier (unique code assigned to the particular product)
- (f) Harvesting Field Lot Number
- (g) Harvest/Production Lot Quantity/Weight (pounds or tons)

Packing side:

- (a) Commodity
- (b) Variety
- (c) Product Identifier (unique code assigned to the particular product)
- (d) Product/Pack Style, Size, Quality
- (e) Packing Date and Time
- (f) Packing Lot
- (g) Pallet Tags/Case Tags
- (h) Shipping Manifest
- (i) Detail Pallet Tags on Shipment
- (j) Packer Name/Facility
- (k) Packing Lot Quantity/Weight

Distributor KDEs

Packing side:

- (a) Shipping Manifest
- (b) Pallet Tags/Case Tags
- (c) Commodity
- (d) Variety
- (e) Product Identifier (unique code assigned to the particular product) (GTIN)
- (f) Product/Pack Style, Size, Quality
- (g) Detail Pallet Tags on Shipment

- (h) Packing Date and Time
- (i) Packer Name and Location
- (j) Packing Lot Quantity/Weight

Distribution side:

- (a) Commodity
- (b) Variety
- (c) Product Identifier (unique code assigned to the particular product)
- (d) Product/ Pack Style, Size, Quality
- (e) PU Number (Pick Up number or Order Number; normally the identifier number for the sale transaction from the vendor)
- (f) Customer Name
- (g) Customer PO Number
- (h) BOL
- (i) Shipping Quantity/Weight
- (j) Pallet Tags/Case Tags
- (k) Shipping Date/Time
- (l) Detail Pallet Tags on Shipment

Wholesale KDEs (the intermediary between the grower/distributor and retailer/restaurant)

Distribution side

- (a) PU Number
- (b) PO Number
- (c) BOL
- (d) Distributor Name
- (e) Commodity
- (f) Variety
- (g) Product Identifier (unique code assigned to the particular product)
- (h) Product/Pack Style, Size, Quality
- (i) Receiving Date and Time
- (j) Quality Control Information
- (k) Pallet /Case Tags

Customer side

- (a) Customer PO
- (b) Order No
- (c) Commodity
- (d) Variety
- (e) Product Identifier (unique code assigned to the particular product)
- (f) Product/Pack Style, Size, Quality
- (g) Wholesale BOL
- (h) Shipping Date and Time
- (i) Shipping Quantity/Weight
- (j) Pallet Case Tags

Repacker KDE (an entity that takes prepacked produce and repacks it into different configurations)

Repacker Side

- (a) Work Order
- (b) Input Lot Numbers (BOL, PU Numbers, and others)
- (c) Input Product/Pack Style, Size, Quality
- (d) Output Product/Pack Style, Size, Quality
- (e) Commodity
- (f) Variety

- (g) Product Identifier (unique code assigned to the particular product)
- (h) Loss Report
- (i) Pallet/Case Tags

Special considerations

- (1) Growers/packers might have direct access to POS customers through partnerships, thus that scenario does not include the need for a distribution entity or any other 3rd party in the delivery of product.
- (2) In any given transaction, there may be 2 or more entities involved but which do not receive or take possession of the product. For example, brokers may buy product from Distributor A and sell it to Customer X, but the product may ship directly from Distributor A. For tracking purposes, the events need to be considered, since different PU or PO numbers may be involved.
- (3) Repackers may run several lots from different growers/distributors in a single repack, creating a commingling situation.
- (4) A unified naming convention for a product could be very useful to homogenize product names across the distribution chain.
- (5) Homogeneous tracking information capabilities (pallet tags/case tags) may also be very useful, especially for traceability in wholesale and terminal market operations.

Seafood Supply chain

[Content for this section has been adapted from the U.S. Seafood Traceability guide (Natl. Fisheries Inst. 2011)]

Traceability for seafood products from their source to the point of consumer purchase would require the following CTEs at the processing facility:

- Product Creation (including catch/harvest)
- Product Packaging/Repackaging
- Product Processing
- Product Shipping
- Product Receipt
- Product Consumer Sale
- Product Depletion

Traceability programs are needed across the entire supply chain, from catch or harvest to processors, suppliers, importers/exporters, and distributors, and should include aquaculture farms, vessels, retailers, and food service operators so that recalls, if necessary, can be conducted efficiently and effectively to identify affected foods (Table 2 shows the role of different entities in the seafood distribution channel). Traceability elements may include shipping logistics unit information, lots, pallets, cases, and consumer items with data elements.

Figure 10 shows the complexity of conventional seafood distribution channels, and the interfaces between wild harvest and aquaculture, and how animals from both of these harvesting methods may be processed within the same facility into finished goods.

Specialized CTE-KDE framework

CTEs along with KDEs are:

- Product Receipt (Unique Identification of Shipment linked to Unique Product Identification, Date Received, Origin of Product)

Table 2—Role of different entities in the seafood distribution channel.

Role	Activities	Examples
Primary roles		
Hatchery/Farms/Vessels	Grow and ship, possibly harvest	Suppliers of seafood
Wild caught/Vessels	Catch and ship	Suppliers of seafood
Broker	Manage relationship between supplier and customer, but does not take possession of product	Agent
Processor	Harvest, process, repack, package, label, store, sell, ship	Seafood packer, supplier
Retail store	Receive, store, process, package/label, and display; sell to consumer	Grocery store, supermarket, grocery chains, open market
Retail, food service, distributor, or wholesaler	Receive, store, sell, ship	Retail distribution center, Food service distribution center, Import/Export warehouses
Food service operator	Storage, prepare, cook, sell to consumer	Restaurants, entertainment venues, institutions
Support roles		
Feed suppliers	Produce and ship	For hatcheries and farms
Packing material supplier	Produce and ship	Suppliers of packing material (crates, bags, boxes, labels, bins, clamshells, and others)
Ingredient supplier	Produce and ship	Breeding, spice, additive (for example, citric acid) manufacturers
Third-Party logistics service provider	Transport, store	Truck, Rail, Ship, Air
Regulatory organizations	Compliance oversight	Customs, Inspection, and Grading agencies
Service providers	Maintenance of farm sites Checking nets Chemical treatments (for example, disease treatment) Measurement of environmental data	

Adapted from NFI (2011).

- Product Ingredient (Unique Identification of ingredient along with Batch/Lot Number or Serial Number)
- Product Creation (Unique Identification of Product, Batch/Lot Number or Serial Number)
- Product Shipping (Unique Identification of Shipment linked to Unique Product Identification, Date Shipped, Shipment Destination)
- Pallet Configuration (Unique Shipment ID with Unique Product ID aggregation, Batch/Lot Number or Serial Number, Quantity)
- Consumer Unit Depletion and/or POS (Unique Product ID, Batch/Lot Number link, Date Purchased, Quantity)

Requirements for shipment traceability. The traceability KDEs required are the same for all seafood products, both variable-weight and fixed-weight, and are the same whether the seafood is refrigerated, frozen, or shelf-stable. Best practices for seafood shipments involve monitoring the following KDEs and are included in the paper-based manifest and the electronic advance shipment notice (ASN):

- Batch/Lot or Serial Numbers
- Unique Identifier (such as a GTIN in a GS1 system)
- Quantity Shipped
- Shipping Date
- Receiving Dates
- Ship From and Destination Locations

In addition, other useful information such as the following may be included as appropriate for recordkeeping:

- Stock Keeping Unit (SKU) or other supplier product identification reference
- Production Date, if product is for retail store-processing or food service use
- Catch Date or Sell-By Date or Best-By Date, if applicable
- Labeling and tracing of regulatory requirements for the producer, copacker, or product seller. For example in the United States, this may include an USDA Establishment Number

- or USDA Country-of-Origin Labelling Statement or ISO Country Number(s), if applicable
- Labeling for credence attributes such as: USDA labeling for wild-caught or farm-raised, halal or kosher certification, organic or sustainability logos

Maintaining traceability for product from live seafood providers.

Live seafood providers deliver product in various logistic units. Each logistic unit should be individually traceable. Information used to ensure traceability includes:

- Provider Identity
- Accurate farm/vessel information depending on species of the seafood received (such as FAO area and alpha code [FAO 2014])
- PO Number or Live Receiving Ticket of received seafood
- Date of Shipment and Receipt
- Carrier Name and Trailer Number
- Natl. Shellfish Sanitation Program (NSSP) Tag for Live Shell stock
- Catch Certificate (EU requirement)
- Quantity

Live animal/seafood product lots must be traceable. This is accomplished by associating the seafood Lot Identification Number and Batch/Lot Number of the output product. Note that the data described are focused on KDEs that support the sharing of CTEs.

Maintaining traceability for other product ingredients. Batters, breeding, seasonings, marinades, salt, moisture-retention agents, citric acid, packaging materials, and many other product inputs are used in the production process by suppliers. These product lots must be traceable. This is accomplished by associating each Product Lot Identification Number (such as GTIN, if used) and Batch/Lot Number of the output product it is used to produce (see the Processed Food section for additional details).

Product sourced from other suppliers should be identified by the Batch/Lot Numbers provided by the supplier (such as the GS1 GTIN, if used). The assignment of unique identifiers for each product traded (that is, all product configurations) is the