Can-Trace Produce Pilot Project Report

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Pilot Project Summary Report

Submitted to: Can–Trace Steering Committee

Submission date: September 30, 2004

Introduction

The focus of the current phase of the Can-Trace initiative has been the development of whole-chain data standards for traceability. Following the announcement by Can-Trace in May 2004 of a draft standard, pilot projects in beef, pork and produce were undertaken to verify the minimum mandatory data requirements, and to provide recommendations on any modifications that should be considered prior to their adoption as a national standard. A secondary objective of the pilots was to collect information to support the development of the business case "Decision Support Tool" by identifying categories of costs and benefits of Traceability to selected firms.

Pilot teams were then formed in the May/June timeframe. Each team hired a project manager/consultant to oversee the project and co-ordinate the research. Teams met regularly via conference call to discuss the findings and ensure the work was on track. Pilot project results were reported to the Can-Trace Standards Working Group in late September.

The decision to pilot beef, pork and produce came as a result of consultations across the country with industry and government in mid 2003. Funding was not available for a similar pilot in seafood.

The pilot teams were recruited with a focus on ensuring participation and involvement of all components of the supply chain. Particular attention and effort was directed toward including, where possible, involvement from SME's.

Methodology

After the project managers were retained by the pilot teams, initial conference call meetings were held to agree on how the project would be conducted and on how the deliverables and timelines would be met. Considerable up front time was also spent identifying additional participants in order to ensure that all components of the supply chain were represented.

Appendix 1 contains a list of participating companies and the roles they played in the pilot.

The project managers then set up a series of interviews with participating pilot company members to begin the research. They were given a three-fold task:

- To gather information on current track and trace practices

- To map the Can-Trace attributes to existing participating company practices

- To undertake a series of recall scenarios designed to test whether the Can-Trace standards were sufficient to conduct a recall.

On average, pilot teams required about 6-8 weeks to do the work, with another 2-3 weeks of reports, revisions and approvals.

General Observations about Participants in the Pilot Studies

- Most firms have track and trace capability of varying degree and some kind of system for doing recalls. This variation among companies is evidence of the absence of national standards.

- Recall scope and frequency vary widely by role in the supply chain and by firm type [e.g. small, medium or large].

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- Participating companies were very co-operative at providing information; however, they were reluctant to share [or unable to extract] the kind of detailed financial information required by the Business Case report. While the Decision Support Tool developed by the Business Case study tested successfully, additional financial data would have allowed for a more robust verification.

- The use of three different consulting firms to act as project manager for each pilot [RCM Technologies – Produce; Trimark Engineering – Beef; eBiz Professionals – Pork] added considerably to the administrative challenge. However, it likely provided a broader range of experience, approaches and analysis.

Conclusions/Recommendations From the Pilot Studies

- All Pilot groups concluded that the draft Can-Trace standards provided stakeholders with sufficient information to enable the traceability of products in the supply chain.

- Pilot participants are already using most of the Can-Trace data attributes.

- Additions to the data attributes were proposed by all three pilots.

- Traceability systems that are integrated with existing company business practices are more likely to be maintained and more likely to be accurate than stand-alone traceability systems.

Beef Pilot Recommendations:

- Add Purchase Order number to mandatory list of attributes

- Remove Buyer Identifier and Vendor/Supplier Identifier from Mandatory attributes

- Co-ordinate with CCIA to ensure whole-chain Traceability

- Promote awareness of technology solutions

Produce Pilot Recommendations:

- Adopt a consistent product lot number that aligns with the GTIN

- Shipment identifiers should be used in addition to retailer/distributor purchase order number

- Add shipped quantity and unit of measure to the proposed minimum data standard

- Add pack date to the minimum standard and remove harvest date from the minimum standard

- Develop requirements for Master data

- Develop data retention guidelines

Pork Pilot Recommendations:

- Promote Lot Number as a key mandatory data attribute

- Add quantity shipped and unit of measure as a mandatory attribute

- Consider the use of a Best Before Date as a possible data component for identifying a product Lot Number

- Establish Carton Serial numbers and Pallet Number as an optional attribute

Produce Technology Report

In addition to the pilot study of the Can-Trace standards, the Produce Pilot team specifically asked for a discussion paper looking at current technology options to support implementation of whole-chain food traceability in Canada. The report suggests four pillars of Track & Trace, and examines both bar coding and RFID data collection methods. While the recommendations and conclusions focused on options for the Produce sector, the report is interesting reading for anyone looking to better understand the linkages between technology issues and Traceability.

Summary

The Standards Working Group found the Pilot studies to be invaluable in terms of:

a) confirming the general ability of the Can-Trace data standard to enable product traceability; and

b) generating helpful suggestions on further standardization of the use of several data elements across the supply chain [e.g. with respect to Lot number].

Appendix 1: Supply Chain Company List

Sector	Primary Producers	First Processor	Secondary Processor or Distributor	Retailer/Food Service
Beef	CCIA	Better Beef Abattoir Colbex*	Caravelle Martin-Brower* Levinoff Meats Metro-Richelieu	Metro-Richelieu McDonald's Restaurants Levinoff Butcher Shop*
Produce	All Season Mushroom* Oppenheimer	Oppenheimer Pro-Organics Neptune Food Service	Oppenheimer Pro-Organics Neptune Food Service Sobeys	Sobeys Thrifty's Food Services* Fairmont Hotels Neptune Food Service
Pork	Samis Farms*	Quality Meat Packers Olymel Trochu (Sunterra) Meats*	Valbella Meats Loblaws/Provigo – Distribution Centre	Sunterra West Market* Flanagan Food Service Loblaws/Provigo

* Small or Medium Enterprise

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Submitted to: Can–Trace Steering Committee

Submission date: September 27, 2004

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1. Executive Summary

RCM Technologies Canada was commissioned to support the development of standards for the produce sector under the Can-Trace Traceability and Standards initiative. This analysis examines the current tracking and tracing capabilities of the Canadian produce sector through a pilot study with a group of voluntary industry participants.

The pilot studies had three main objectives related to traceability standards:

- Developing an understanding of key handling, packaging and production processes at the participating companies and some of their supply chain partners (suppliers, carriers, customers);

- Collecting samples of paper-based documents and product labels to determine adherence to Can-Trace's proposed minimum data standard for traceability; and

- Executing several traceability simulation scenarios and studying processes used and results achieved.

The data for the pilot study was collected through site visits to the participant companies and phone conferences to collect the paper based traceability data and to perform traceability simulations. Data collection for the pilot studies and the business case was supplemented through the use of business case questionnaires.

The pilot study yielded a number of results which can be addressed in establishing valid and reasonable traceability standards.

Our most significant finding is that no common product identifier is present throughout the entire supply chain. Product descriptions and product identifiers vary between companies, requiring the use of other identifiers to ensure accurate recall. We recommend a consistent product lot or batch identifier that aligns with the Global Trade Item Number (GTIN) be adopted by the industry.

At the grower level, it is recommended that "pack date" replace the proposed Can-Trace standard of "harvest date". Various mixing and packing operations are performed after harvesting and products may include components with multiple harvest dates. It should be noted that our recommendation potentially limits recall flow for certain potential scenarios (in-field damage, etc.).

Several changes at the initiating distributor level could simplify coordination of recalls.

- Recall notification does not include shipment identifier or shipment date. Both pieces of information are typically present and could be included, reducing the time needed to locate specific product, particularly for destinations not yet capable of working by pallet label (SSC or serial number).

- Product lot or serial numbers are not always called such. Although present, they can be identified as pallet tags, batches, etc. This variation in nomenclature leads to confusion.

- Where present, supplier lot number is not always recorded. A new lot number may be assigned within the next downstream operation, but the supplier's lot number should be present whenever one is supplied.

The traceability simulations (via mock recalls) were executed successfully, with product sources and destinations accurately identified. As the mock recalls did not actually involve the physical recall of product and notification of end customers, there was no ability to measure the actual time required to complete neither the recall, nor define the precision with which product could be identified outside of the participant companies.

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2. Background

Whole-chain food traceability, the ability to track food products from point of production to point of consumption and trace food products back through from point of consumption to point of production, is a top priority for the Canadian Agri-food Industry. Can-Trace, formed in July 2003, is a voluntary collaborative multi-tier project to design, test and promote voluntary common standards to facilitate whole-chain food product traceability for Canada.

Can-Trace has created and utilized a set of foundational ideas to guide the initiative and help determine the objectives of the entire project. Its concepts are:

- Standards created for food traceability in Canada must be internationally compatible, whole-chain in scope, capable of accommodating multiple commodities and based on the EAN.UCC standards.

- Standards must allow for cost effective tracking and tracing for the food products and should take advantage of existing infrastructure, data management and capture solutions.

- The standards development process should identify any Canada-specific requirements.

- Standards effectiveness should be evaluated through pilot testing with Agri-food stakeholder companies at various levels of the food supply chain.

- The Can-Trace initiative must be conducted in an open and transparent manner.

In addition, the business case will be developed, where the specific aspects examined are:

- Incremental costs and accrued benefits, with results stratified by company size and supply chain segment.

- Industry recommendations surrounding how costs for the implementation of traceability will be divided.

- Other issues pertaining to the cost implications for domestic product vs. imported product.

- The creation of templates for individual participants to use in assessing their benefits and costs.

Within the Can-Trace Produce Pilot Project, RCM Technologies was asked to analyze two produce supply chain scenarios at a minimum, for "one up/one down" tracking and tracing. These chains were considered representative of typical Canadian produce supply chains. The two scenarios were as follows:

Scenario 1: Grower » Packer/Shipper » Distributor

Scenario 2: Importer » Distributor » Retail/Food Service

These chains were represented adequately by the participants involved and the Scenario 2 chain was analyzed in more depth than originally specified as two separate traceability simulations were executed. Thus, three separate simulations were executed against these two scenarios.

A fourth traceability simulation, using a scenario beginning at a Hotel and tracing back to a local Grower was also executed.

2.1 Objectives
The produce pilot study was designed to support the overall Can-Trace objective of facilitating whole-chain food product traceability through the following project objectives:

- Validate the Can-Trace tracking and tracing standard for produce developed by the Standards Working Group.

- Test the tracing and recall capabilities forward and backward (one up/one down) within the food supply chain using sample products. The focus was on both the data and business process requirements as well as to examine the impact of these standards within an electronic/technology environment.

- Validate the findings and templates developed by the Business Case Working Group.

- Provide implementation experience and data to form the basis for industry implementation guidelines.

- Validate the applicability of the Can-Trace Guidelines when considering the recommendations coming from the SME Working Group.

2.2 Activities

The objective of Phase 1 of the project was to perform an assessment of the ability of paper-based systems to meet minimum data requirements. The tasks to be performed during Phase 1 were:

- Gather representative set of documents used to support traceability (bill of ladings, purchase orders, invoices, etc.)

- Gather representative set of pallet and case labels to review human-readable and bar code data.

- Perform a gap analysis comparing existing paper based information to Can-Trace minimum data requirements.

- Gather existing procedures/guidelines and associated paper based documents used for product recall events.

- Conduct paper based mock recalls.

- Document limitations, benefits and cost implications.

In performing the analysis, we have used certain basic principles of traceability and have made observations and recommendations consistent with those principles. A separate report associated with this project itemizes potential use of technology and process re-engineering to improve traceability capability.

The basic requirements for traceability are completeness and accuracy of identification for traceability, recall or containment, and the importance of timely execution of recall, containment, investigation, or corrective action. To elaborate, we believe traceability, as carried out typically using lot-control methods, is best enabled by:

1. Collecting and storing thorough and accurate data at the appropriate control points in the supply chain;

2. Maintaining or increasing the level of identification specificity at each successive step along the supply chain;

3. Carefully managing traceability through processes such as packaging, fabrication, handling, or display in order to ensure identity of product is not lost;

4. Understanding quality inspections, corrective action methods, quality investigative techniques, and safety procedures; and

5. Ensuring all recall or other traceability communications can be carried out in a timely and thorough manner.

This study, in its design around current logistics processes, concentrates primarily on adherence to the first three enablers listed. The technology report in this project discusses improvements to these three enablers and addresses the fifth enabler, timeliness, more thoroughly. The fourth enabler, quality and safety integration is understood but not specifically analyzed as part of this work.

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3. Participants

Seven companies have participated in this project initiative, and have provided key representative information and current procedures. These participants are:

Company Type	Supply Chain Role(s) for this Company
Hotel	Food Service
Food Service Distributor	Distributor
Grower/Importer/Distributor	Grower, Importer, Packer/Shipper, Distributor
Distributor	Distributor
Retailer # 1	Distributor, Retailer
Retailer # 2*	Retailer
Grower	Canadian Grower, Packer/Shipper

Reference information about the participating companies is contained in Appendix B: Participating Pilot Companies.

* Note that Retailer # 2 provided information about recall procedures and general process information, but did not provide a sample of paperwork and labels used to support traceability.

4. Scope of Analysis

In analyzing the participant data and the information flow along the various identified chains, it should be noted that beginning and ending points were carefully defined by the Can-Trace Steering Committee and analysis beyond these points has been limited and is specifically not included in this report.

Each chain is taken to begin at the point of identification at the time of harvest. Although information about growing conditions, methods, seed origin, etc. may be of interest to certain parties, this information is neither allowed for in the Can-Trace minimum data standard, nor studied in this project.

Likewise, each chain is taken to end at the time of unloading of product into inventories at a final retail or food service destination. Much product handling and tracking within a retail facility or food service takes place and may, potentially, be subjected to additional track and trace functions, but the cost/benefit of this activity is specifically not within the scope of this project and, therefore, analysis is limited. As a result, tracking product to individual consumers remains out of the scope of this analysis.

As the produce supply chain is characterized in Table 4.1 below, our scope of analysis includes the transactions from both local and domestic growers, through distribution, to domestic retailers.

Within this study, traceability was taken to mean the ability to both trace a given product back to its origin and track a given product to its destination. Neither tracking nor tracing was reviewed as a real-time requirement, but rather as a forensic requirement to support investigations and activities such as recall. It should be noted that traceability, as defined here, is necessary for recall activities to occur, but traceability supports other objectives such as inventory location, content analysis, etc. The traceability simulations performed within this study were mock recalls.
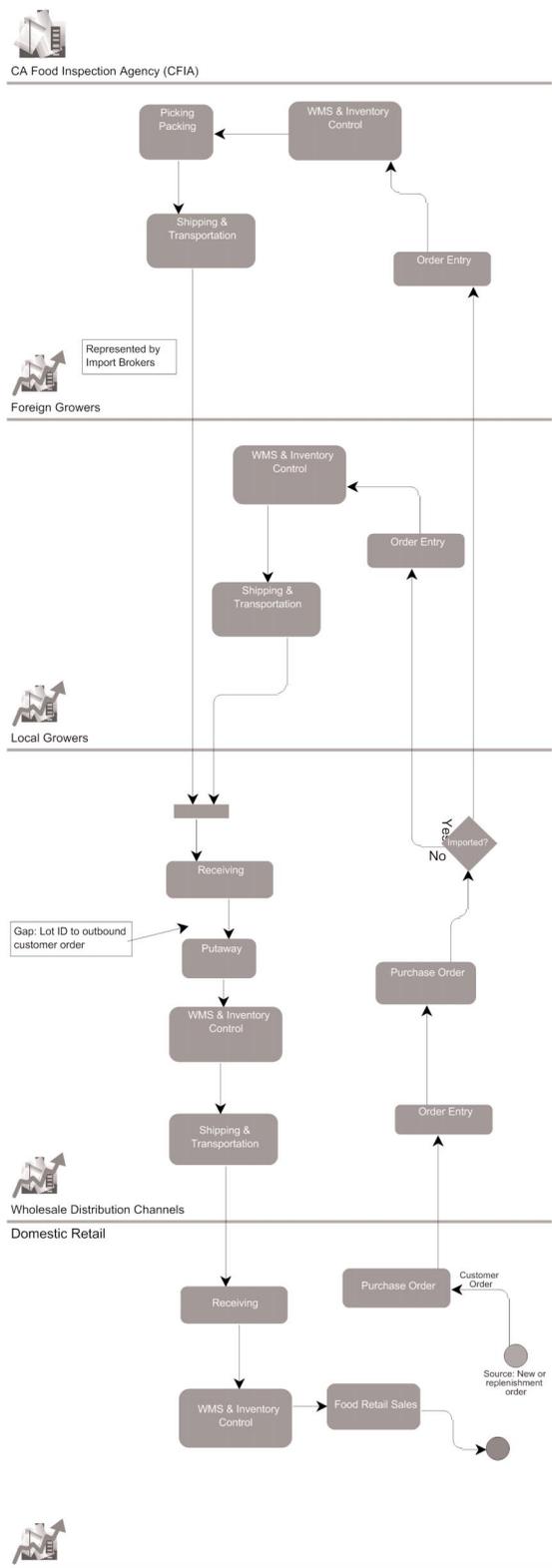
Table 4.1

5. Representation of Paper-Based Traceability Information

This section itemizes a representative set of existing paper-based information documents used at the various stages of the produce supply chain: grower, importer, packer/shipper, distributor, retail/food services.

5.1 Summary of Existing Paper-Based Documents

In an effort to understand the types of traceability information that flow from one supply chain level to another within the Canadian industry, it was necessary to take a representative cross-section at each of the identified chain levels (i.e. grower, importer, packer/shipper, distributor, retail/food services).

The following sets of tables summarize the information gathered at each level in the food supply chain. The table summaries will answer:

- Where the traceability information is gathered by each pilot company;

- What traceability information is gathered at each level by each pilot company; and

- How the traceability information is gathered at each level by each pilot company?

Traceability data elements matching the Can-Trace proposed data standard for produce are identified on the left with those in the minimum standard bracketed (<>) in the upper section. Other potential traceability elements are identified on the right.

Level: Grower

	Grower/Importer/Distributor		Grower	
Location of Information	Bulk Receiving Receipt		Waybill, Product Hold Log, Invoice, Bill of Lading	
Specific Information Gathered	• <Bin ID (product description)> • <Date of Harvest> • <Lot Number> • <Pack/Shipper ID> • <Grower ID> • Shipment Date	• Bin Weight • Carrier Name • Temperature Requirement	• <Item code> • <Description> • <Waybill # (Shipment Number)> • <Lot Code> • Pickup Date (Ship Date) • Grower Name • Receipt Date • Carrier • Buyer Name	• Package Size (Weight) • Quantity • Driver Signature • Pickup Time • Temperature • Unit of Measure • Buyer Address • Purchase Order Number • Shipper Signature • Receiver signature
How Information Gathered	At time of harvest, information is generated.			

Level: Importer

	Company: Grower/Importer/Distributor	
Location of Information	Vessel or Aircraft Bill of Lading, Growers List, Commercial Invoice, Phytosanitary Certificates, Detailed Shipping Advice, Pallet Labels	
Specific Information Gathered	• <Product Description> • <Global Trade Item Number (GTIN)> • <Grower Number>	• Booking Reference Number • Port Embarkation/Discharge Locations • Hatch/Deck Location
	• Container Number	
How Information Gathered	Entered into commercial system from specified information locations: BOL, Detailed Shipping Advice, Growers List.	

Level: Packer/Shipper

	Company: Grower/Importer/Distributor	
Location of Information	Bill of Lading	
Specific Information Gathered	• <Product Description> • <Date of Harvest> • <Pallet Number> • Customer Name • Product Country of Origin	• Customer Address • Customer PO Number • Company Order Number • Date of Packing • Time of Departure • Carrier Name • Driver/Receiver Signature • Loading Location • Load Number • Loading Operator Signature • Temperature Requirement • Cleanliness, Odour, Debris check Signature • Products on Pallet • Boxes on Pallet • Quantity of Product • Approximate Weight of Each Product (Unit and Total)
How Information Gathered	Information for packing/shipping is initiated by the customer purchase order and referenced/recorded against order and load numbers. The purchase order information is passed to the warehouse where the proper product is pulled and verified by the shipping clerk. Product knowledge and casing information originates from grower; pallet information is created and verified by the shipping clerk.	

Level: Distributor

	Company: Grower/Importer/Distributor		Retailer # 1	
Location of Information	Bill of Lading, Pallet Label, Field Pack Receipt, Bulk Receiving Receipt, Confirmation of Sale		Bill of Lading, Packing Slip, Receivers Document	
Specific Information Gathered	• <D.O. Ref. Number> • <Description (NOT incl. #/item)> • <Harvest Date> • <GTIN (finished product description)> • <Lot Number> • <Customer ID> • <Grower ID> • Customer Name • Ship Date • Case ID	• Customer Location • Invoice Number • Ship/Pack Name • Load Number • Quantity Shipped • Total Cases Shipped • Case Weight • Carrier Name • Temperature Requirements	• <UPC Number> • <Product Description> • <Pallet Number> • Date Received	• UCN Number • Number of Units Shipped • Number of Units Repacked • Appt. Number • PO Number • Item Units • SLOC Number • Pallet Size
How Information Gathered	Information created by Grower/Importer/ Distributor from variety of incoming pallet tags and/or those that have no pallet tags.		Information received from BOL and packing slip. Information is then transposed into a Retailer # 1 pallet label and receiving document.	

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	Distributor		Food Service Distributor	
Location of Information	Bill of Lading, Organic Certificates, Confirmation of Sale, Container Reference Numbers		Pallet Labels, Carrier Receipts, Bill of Lading (Delivery Summary Report), Customer Invoice	
Specific Information Gathered	• <Product Description> • <Order Number> • <Grower ID> • <Customer> • Shipment Date • Customer Name	• Shipper • Quantity • Weight • Special Instructions • Temperature Requirements • Number of Pallets • Customer Location • Invoice Number	• <Item Number> • <Item Description> • <Customer Number> • Customer Name • Ship Date	• Customer Location • Invoice Number • Purchase Order Reference • Special Instructions • Route Number • LOC • Item Brand • Pack Description • Unit Measurement • Quantity Shipped • Pallet Type Used • # of Dry Cases (and weight) • # of Refrigerated Cases (and weight) • # of Freezer Cases (and weight)
How Information Gathered	Information created for incoming products: PO, supplier's lot numbers, Distributor lot number, pallet labels. Information received from suppliers: BOL, Organic Certificates, Grower ID, Confirmation of Sale, Container Reference Numbers.		Information is initiated by the customer purchase order and referenced/recorded against order. The purchase order information is passed to the warehouse where the proper product is pulled. Product knowledge and casing information originates from grower; pallet information is created by the shipping clerk.	

Level: Retailer

	Retailer # 1	
Location of Information	Shipping/Outbound distributor orders, pallet labels	
Specific Information Gathered	• <Product Code> • <Pallet ID # (Lot Number)> • <Product Description> • <Customer Number> • Pallet Number	• IV Number • Origin Number • Number of Units Shipped • # of Products in Unit • Assignment Number • Invoice Number • Route Number
How Information Gathered	Incoming information from the distributor, from the pallet label, from the invoice.	

5.2 Summary of Pallet Label Data Elements

Pallet label data elements gathered are summarized in the following tables.

	Grower/Importer/Distributor		Grower	
Specific Information Presented	• \<Short form product description (case level description)\> • \<Lot Number\> • \<Grower ID\> • \<Date of Harvest\>	• Brand • Grade • Packhouse • Bin Number	• \<Product Description\>	• Quantity • Package Description
	• Serial Number (link to internal data system) • Grower Number		• Farm Name • Pack Date	

	Distributor		Retailer # 1	
Specific Information Presented	• \<Product Description\> • \<Lot Number\>	• Supplier Location	• \<UPC Number\> • \<Product Description\>	• UCN Number • Number of Units Shipped • Number of Units Repacked • Appt. Number • PO Number • Item Units • SLOC Number • Pallet Size • TI-HI Dimensions
	• Supplier Name • Receiving Date		• Date Received • Pallet Number	

For the situations studied, case labels were not typically used to track the movement of goods through the produce supply chain. For the participating companies, product is typically tracked by pallet and pallet identification is often equated to a production lot, so detailed labelling of cases is not prevalent.

6. Gap Analysis

A gap analysis was performed comparing the existing paper-based documents against the Can-Trace minimum data requirements for each level along the food supply chain (i.e. grower, importer, packer/shipper, distributor, retail/food services). Can-Trace has developed a set of mandatory requirements for information transfer at and between each level.

6.1 Results of Gap Analysis: Existing Paper Based Data vs. Can-Trace Minimum Data Requirements

Below are sets of tables outlining the minimum data requirements issued by Can-Trace compared to the paper-based documentation for each supply chain level.

Food Service Distributor
Level: Distributor

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Not Compliant
Batch or Production Lot Number	Compliant
Shipment Identifier	Compliant

Grower/Importer/Distributor
Level: Grower

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Compliant
Batch or Production Lot Number	Compliant
Shipment Identifier	Compliant

Level: Importer

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Not Compliant
Buyer Identifier	Compliant
Date of Harvest	Not Compliant
Batch or Production Lot Number	Compliant
Shipment Identifier	Compliant

Level: Packer/Shipper

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Compliant
Batch or Production Lot Number	Compliant
Shipment Identifier	Compliant

Distributor
Level: Distributor

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Not Compliant
Batch or Production Lot Number	Compliant
Shipment Identifier	Compliant

Retailer # 1
Level: Distributor

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Not Compliant
Batch or Production Lot Number	Not Compliant
Shipment Identifier	Compliant

Level: Retailer

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Not Compliant
Batch or Production Lot Number	Not Compliant
Shipment Identifier	Compliant

Level: Distributor

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Compliant
Batch or Production Lot Number	Compliant
Shipment Identifier	Compliant

Grower
Level: Grower

Can-Trace Minimum Requirement	Compliance
Product Identifier (Bin Label, etc.)	Compliant
Product Description	Compliant
Vendor/Supplier Identifier	Compliant
Buyer Identifier	Compliant
Date of Harvest	Compliant
Batch or Production Lot Number	Compliant
Shipment Identifier	Compliant

Note: All participants do not routinely capture date of harvest and lot number information at present.

7. Existing Procedures for Recall Events

The purpose of this section is to outline existing sample procedures used for a recall event and the paper-based documents to communicate and execute the recall. The participating companies have provided the procedures. All participating companies have a documented procedure for recall and there is a high correlation between them so only a few are detailed here for the purpose of illustration.

The existing guidelines for recall events, provided by the participants, are outlined below.

Food Service Distributor

Recalls are implemented by the Recall Team, which is comprised of:

- Category Manager (responsible for the product being recalled)

- Marketing Manager

- VP of Sales and Marketing

- Operations Manager

- Assistant Controller

- Recall Team Leader (appointed by the Marketing Manager)

The Recall Team Leader (RTL) will be responsible for the coordination of the recall during its execution; the other members of the Recall Team (RT) will offer expertise and support when needed.

The following steps are those that are used to execute a recall by Food Service Distributor.

Steps	Details
1. Implementation of Recall	RT will review all documentation from the vendor to justify action. RT will follow documented recall procedure.
2. Classification of Recall	Two possible levels of recall: Level 1 – Health Risk Recall: Situation reasonably indicates the food product may and/or will cause a health risk. Level 2 – Market Recall: Situation requires the company to regain control of a product already at market. Reasons include: foreign objects, allergy alerts, incorrectly labelled product.
3. Issuance of Recall Control Number	In order to control and coordinate efforts for recall and quarantine.
4. Customer Notification	• Halt sales of product. • Isolation of product. • Prepare product control log.
5. Sales Department	• Prepare customer contact logs. • Contact customers. • Issue request for product pick-up.
6. Marketing Department	• Run sales reporting. • Cancel outstanding purchase orders. • Sold report sent to sales department. • Create fax notification. • Notification to Canadian Food Inspection Agency. • Post information on website. • Request course of action letter.
7. Operations Department	• Fleet to begin pick-ups. • Organize return of products. • Reconcile return product.
8. Executive Department	• Create cost analysis. • Create vendor letter. • Reconcile customer credit requests (Accounting).
9. Operations Department (final)	• Dispose of product. • Adjust inventory.
10. Executive Department (final)	• Reconcile vendor debit (Accounting). • Summary recap of events.

Grower/Importer/Distributor

Recalls are implemented by the Recall Team, which is comprised of:

- Recall Coordinator

- Recall Coordinator Backup

- Inventory Control

- Inventory Backup

- Sales Representatives (2)

- Tech Coordinator

- IT Advisor/Support/Backup

- Public Relations

The Recall Coordinator will be responsible for the coordination of the recall during its execution; the other members of the Recall Team (RT) will offer support when needed.

The following steps are those that are used to execute a recall by Grower/Importer/Distributor.

Steps	Details
1. Notification of Potential Recall	
2. Convening of Recall Team	
3. Recall Checklist Reviewed	Recall Coordinator will have a checklist detailing the procedures/responsibilities to be covered and which team member is responsible for the coverage.
4. Recall Checklist Initiated	All results are funnelled through the recall coordinator.
5. Recall Necessity and Classification	Determine if recall is necessary and classify if applicable.
6. Recall Initiation Procedure	• Creation and distribution of initial complaint. • E-mail sent to Inventory Control to hold pallets from origin code. • Confirmation of QC pallet hold sent to QC Manager via e-mail. • Hold report created. • Customer notification released by public relations. • Customer recall questionnaire released by public relations. • Fleet sent for pick-up from customer. • Supplier notification by QC Manager.
7. Recall Checklist Reviewed	
8. Summary and Review of Recall	

Distributor

Recalls are implemented by the Recall Team, which is comprised of:

- Purchasing Department

- Vice President of Sales

- Vice President of Marketing

- Operations Manager

- Warehouse Manager

- Sales Team

A recall team leader is selected from (in order of preference) the VP of Sales, the VP of Marketing, or the Purchasing Department lead.

The following steps are those that are used to execute a recall by Distributor.

Steps	Details
1. Implementation of Recall	(Purchasing to justify action if a result of grower/shipper information, sales to justify if a result of customer information)
2. Classification of Recall	Level 1 – Health Risk Recall: Situation reasonably indicates the food product may and/or will cause a health risk. Level 2 – Market Recall: Situation requires the company to regain control of a product already at market. Reasons include: foreign objects, allergy alerts, incorrectly labelled product.
3. Assign Recall Control Number	Assigned by recall team leader and embedded in all Recall documentation.
4. Customer Notification	Halt sales of product. Isolate product. Prepare product control log. Recall team leader runs all sales reports.
5. Marketing Department	Cancel outstanding purchase orders. Create fax notification. Notification to Canadian Food Inspection Agency. Post information on website. Request course of action letter.
6. Return of Product	Sales department to facilitate return of product in conjunction with Warehouse/Operations.
7. Reconciliation/credit/cost analysis	Recall team leader to co-ordinate cost analysis, vendor instructions, credit request, etc.
8. Disposal	Warehouse Manager to dispose of product and adjust inventory.
9. Recap	Recall team leader to consolidate all documentation of the recall event – copies for review to appropriate sources – vendors, CFIA, product certification bodies, etc.

Retailer # 1

Recalls are implemented and directed by the procurement department. The recall communications strategy is based on e-mail, from the procurement department to warehouses, customers and stores.

The following steps are those that are used to execute a recall by Retailer # 1.

Steps	Details
1. Reason for Recall	Determination of reason for recall, type and extent.
2. Assignment of Recall Notice	All recall activities are recorded against recall notice number.
3. E-mail Notification	Contained within the e-mail notification: • Sent to warehouses and stores. • Reason for recall. • Indication of food safety concern. • Indication of product(s) that need to be quarantined (product description, UPC and best before codes). • Code interpretation (if needed). • Product Disposition (Store): removal from shelf and return to warehouse for credit. • Product Disposition (Warehouse): place on hold and make arrangements with supplier/vendor to have removed and/or destroyed from distribution centres. • Vendor contact information. • Requested debit from the vendor and applicable handling charges. • Request for acknowledgement of e-mail.
4. Close and Review	Once all tasks have been completed and individual records from stores and warehouses have been collected.

8. Traceability Simulations

The purpose of this section is to outline the traceability simulation scenarios and to discuss the results of the recalls executed.

8.1 Traceability Simulation Scenarios

8.1.1 Importer to Packer/Shipper to Distributor to Retail Outlets

In this scenario, shipments of imported apples from Grower/Importer/Distributor to Retailer # 1 were identified with a mock recall initiated by Grower/Importer/Distributor. Retailer # 1 staff performed a simulated recall, identifying product locations based on lot information provided by Grower/Importer/Distributor.

8.1.2 Importer to Distributor to Retail Outlets

In this scenario, shipments of imported kiwi from Grower/Importer/Distributor to Distributor were identified with a mock recall initiated by Grower/Importer/Distributor. Distributor staff performed a simulated product recall, simulating the reclaim of product from customer retail locations based on lot information provided by Grower/Importer/Distributor.

8.1.3 Importer to Distributor to Food Service Outlets

In this scenario, shipments of imported kiwi from Grower/Importer/Distributor to Food Service Distributor were identified with a mock recall initiated by Grower/Importer/Distributor. Food Service Distributor staff performed a simulated product recall, simulating the reclaim of product from customer food service outlets based on lot information provided by Grower/Importer/Distributor.

8.1.4 Grower to Distributor to Food Service Outlet

In this scenario, shipments of domestic mushrooms from Grower to Food Service Distributor to Hotel were recalled based on a simulation of tainted product identified at Hotel. Product was traced back through Food Service Distributor to Grower where each identified and simulated the recall of other potentially affected product.

8.2 Results of Traceability Simulations

8.2.1 Importer to Packer/Shipper to Distributor to Retail Outlets

(Includes Importer to Supplier)

On July 19th, 2004 and July 20th, 2004 two actual shipments including 49 cartons of imported apples were made from Grower/Importer/Distributor to a Retailer # 1 Distribution Center. On July 20th, 2004, one actual shipment including 49 cartons of that same product was made from Grower/Importer/Distributor to a second Retailer # 1 Distribution Center. Detail from these shipments was used to initiate a simulated product receipt in a Retailer # 1 simulation computer system. This computer system is a representative copy of Retailer # 1 actual production computer system, which was not involved in this recall scenario.

The simulated recall scenario was the identification of glass or another sharp object. In the scenario simulated at Retailer # 1, the glass contamination was determined to possibly effect three shipments. One of these shipments was recalled in the Retailer # 1 simulation.

(Additionally,Grower/Importer/Distributor demonstrated the ability to trace this potential product contamination to its source and, simulating a specific hatch on a vessel as the source of contamination, identify all other product received by Grower/Importer/Distributor from that same vessel hatch. All such product was

then identified to its shipment destination from Grower/Importer/Distributor. This would facilitate a broader recall, if necessary, of all products from that vessel hatch.)

On July 26th, Grower/Importer/Distributor initiated a mock product recall for these apples using two Recall Notifications, one for each shipment destination. Affected product was identified by:

- *<Product label>,*
- Retailer # 1 purchase order number,
- *<Pallet label>,*
- Grower number,
- Pack date,
- Size,
- Cool Store location, and
- Packhouse.

In the simulation, the recall was initiated due to a detection of Glass/Sharp Objects. Grower/Importer/Distributor requested that consignees hold and discontinue selling existing stocks and return them to Grower/Importer/Distributor or arrange for Grower/Importer/Distributor to pick them up. A recall authorization number, unique to each destination, was assigned for reference. If product had been redistributed or sold, Grower/Importer/Distributor requested that these customers be notified and supplied a Grower/Importer/Distributor contact which could be offered for them to contact. A recall notification questionnaire was attached to the recall notice for requested completion by Retailer # 1.

On the printed order information provided by Grower/Importer/Distributor for these shipments all data elements of the Can-Trace minimum requirements are present (where Date of Harvest is replaced by Pack Date). The order number serves as a unique shipment identifier.

One specific shipment receipt was used as the example for the simulated receipt, shipment and recall at Retailer # 1. On the receipt information provided by Retailer # 1, certain data elements of the Can-Trace minimum requirements are not present. Missing are: Date of Harvest and Shipment Identifier. A unique identifier of lot number, supplied by Grower/Importer/Distributor, was entered at the time of receipt to be used for tracking purposes.

Six separate shipments to Retailer # 1 retail locations were simulated. On the shipment information provided by Retailer # 1 (shipment to Retailer # 1 retail customers), all data elements of the Can-Trace minimum requirements are present, excepting Date of Harvest.

In the simulation of the recall within Retailer # 1 (Distribution Center to retail customers) the following took place:

- Affected recalled product remaining at the Retailer # 1 Distribution Center was quickly located using the various identification numbers (listed previously) supplied on the recall notice.

- A recall notice was communicated to all Retailer # 1 retail locations within a local area communicating the recall detailed information. Lot identification information was communicated as well as product and product lookup codes.

- The six stores known to have received recalled product were listed specifically. All other stores were asked to check their product to ensure it was safe. Instructions were given to pull only affected inventory and contact the shipping warehouse for credit and instructions on disposal. Credits were placed in effect for two weeks.

No product recall (simulated or actual) from these stores took place and there was no review of the stores' systems to determine if recalled product could be located.

Outcome

Within the defined scope and boundaries of this mock recall scenario, this scenario was executed successfully. It was demonstrated that affected product was identified and could be recalled from retail and distribution locations. It should be noted that, by asking in the Retailer # 1 recall notice that non-identified retailers check stocks for recalled product, a certain amount of unnecessary labour (investigation, handling, communicating, etc.) is incurred in order to compensate for potential uncertainty within the Retailer # 1 distribution system. With the recall having been initiated using a specific lot number, this additional labour is not required as that lot number can be traced to the specific store to which it was shipped. This labour savings could be significant – in this case five of six final retail destinations could be spared any activity relating to the recall.

8.2.2 Importer to Distributor to Retail Outlets

On July 20th, 2004 an actual shipment including 60 cases of imported kiwis was made from Grower/Importer/ Distributor to a Distributor Distribution Center. This shipment was received on that same day and 11 cases were shipped over the next week to five separate retail stores by six separate shipments.

On July 26th, Grower/Importer/Distributor initiated a mock product recall for the kiwi using a Recall Notification. Affected product was identified by:

- *<Product label>*,
- Distributor purchase order number,
- *<Pallet label>*,
- Grower number,
- Pack date,
- Size,
- Cool Store location, and
- Packhouse.

In the simulation, Grower/Importer/Distributor requested that consignees hold and discontinue selling existing stocks and return them to Grower/Importer/Distributor or arrange for Grower/Importer/Distributor to pick them up. A recall authorization number was assigned for reference. If product had been redistributed or sold, Grower/Importer/Distributor requested that these customers be notified and supplied a Grower/Importer/ Distributor contact which could be offered for them to contact. A recall notification questionnaire was attached to the recall notice for requested completion by Distributor.

On the printed order information provided by Grower/Importer/Distributor for this shipment all data elements of the Can-Trace minimum requirements are present (where Date of Harvest is replaced by Pack Date). For Grower/Importer/Distributor's business process, the order number serves as a unique shipment identifier.

On the inventory status screen supplied by Distributor (resultant from the receipt), all elements of the Can-Trace minimum data elements are present with the exception of Date of Harvest. A unique lot number is assigned by Distributor at the time of receipt and is tracked out to each shipment.

On the inventory status screen supplied by Distributor (resultant from the six shipments from this lot of product), all data elements of the Can-Trace minimum requirements are present, excepting Date of Harvest.

In the simulation of the recall within Distributor (Distributor to Retailers) the following took place:

- Affected recalled product remaining at Distributor was quickly located using the various identification numbers (listed previously) supplied on the recall notice.

- The five stores known to have received recalled product were listed specifically, along with contact information, as requested on the Recall Notification questionnaire provided by Grower/Importer/Distributor.

No product recall (simulated or actual) from affected stores took place and there was no review of the stores' systems to determine if recalled product could be located.

Outcome

Within the defined scope and boundaries of this mock recall scenario, this scenario was executed successfully. It was demonstrated that affected product was identified and could be recalled from retail and distribution.

8.2.3 Importer to Distributor to Food Service Outlets

On July 16th, 2004 an actual shipment including 96 cases of imported kiwis was made from Grower/Importer/Distributor to Food Service Distributor. This shipment was received on that same day. 217 cases of this product were shipped to 123 separate food service outlets between July 15th and the date of recall and Food Service Distributor, lacking a specific lot traceability system and wishing to err on the side of safety, simulated their recall for these 217 cases against these shipping destinations.

On July 26th, Grower/Importer/Distributor initiated a mock product recall for the kiwi using a Recall Notification. Affected product was identified by:

- Product label,

- Food Service Distributor purchase order number,

- Pallet label,

- Grower numbers,

- Pack date,

- Size,

- Cool Store location, and

- Packhouse.

In the simulation, Grower/Importer/Distributor requested that consignees hold and discontinue selling existing stocks and return them to Grower/Importer/Distributor or arrange for Grower/Importer/Distributor to pick them up. A recall authorization number was assigned for reference. If product had been redistributed or sold, Grower/Importer/Distributor requested that these customers be notified and supplied a Grower/Importer/Distributor contact which could be offered for them to contact. A recall notification questionnaire was attached to the recall notice for requested completion by Distributor.

On the printed order information provided by Grower/Importer/Distributor for this shipment all data elements of the Can-Trace minimum requirements are present (where Date of Harvest is replaced by Pack Date). In this company's process, the order number serves as a unique shipment identifier.

Using their computerized inventory system, Food Service Distributor was able to determine that no amount of recalled product was likely to remain on-hand at the time of the recall and, thus, pulled a report of all shipments of this product from the receipt date through the recall date. Food Service Distributor identified each potentially-affected shipping destination. Their recall procedure would then call for each destination to be notified by telephone with product disposition to be determined at each location and product pickup arranged. This communication step was not executed in the simulation. Finally, a full accounting of Food Service Distributor customer impact and other labour and administration elements would be made.

No product recall (simulated or actual) from affected food service outlets took place and there was no review of the outlets' systems to determine if recalled product could be located.

Outcome

Within the defined scope and boundaries of this mock recall scenario, this scenario was executed successfully. It was demonstrated that affected product was identified and could be recalled from food service outlets and distribution. A broad-enough recall was initiated to ensure the affected product would not remain in the supply chain after the recall. It should be noted that some unaffected product would be recalled in this scenario, as lot number information was not used to narrow the scope of recall.

8.2.4 Hotel to Food Service Distributor to Grower

On August 16th, 2004 a simulation of a reported incident was begun by Hotel communicating with Food Service Distributor that 6 cases of mushrooms were found to have a nail and pieces of glass in them. Food Service Distributor identified two incoming shipments that could have supplied the product in question and traced the source to Grower. Food Service Distributor asked Grower to investigate the claim and report back findings.

On the same day, Grower began a documented Customer Complaints and Investigations procedure. Grower successfully identified the code for the potential product problem based on Food Service Distributor purchase order information and traced back successfully to the farm from which the mushrooms had been harvested. The suspected harvest date was also determined. The farm was notified that Grower was recalling their product and was asked to discontinue selling and shipping the product until further notice. The Canadian Food Inspection Agency (CFIA) was also notified of the mock recall. A simulation of the return of the affected product was carried out. Lastly, a notification of the termination of the recall was issued to CFIA and the results of the mock recall were communicated internally at Grower and to Food Service Distributor.

No product recall (simulated or actual) from affected food service outlets took place.

Outcome

Within the defined scope and boundaries of this mock recall scenario, this scenario was executed successfully. It was demonstrated that affected product was identified and could be traced to source and subsequently recalled from distribution.

8.3 Usage of Can-Trace Minimum Data Standards during Traceability Simulations

A certain amount of communication surrounding the mock recalls and actual recalls takes place unofficially through phone calls and e-mails. Where more official written communication samples were gathered it can be noted that data elements provided for the purpose of recalled product identification did include some, but not all, of the Can-Trace proposed minimum standards. The tables below identify data elements used and not used for the recall communications.

Grower/Importer/Distributor

Can-Trace Standard Elements used	Can-Trace Minimum Standard Elements not used	Other data elements used
Product Description (termed product label) Vendor Identifier (descriptive, not numeric) Buyer Identifier (descriptive, not numeric) Batch or Production Lot number (termed pallet label – serial number)	Product Identifier, Date of Harvest, Shipment Identifier	Buyer's Purchase Order Number, Shipped Quantity, Carton Label (including grower number), Pack Date, Product Size, Cool Store location, Packhouse, Recall Authorization Number

Retailer # 1

Can-Trace Standard Elements used	Can-Trace Minimum Standard Elements not used	Other data elements used
Product Identifier (product number and product look-up code), Product Description, Vendor Identifier (descriptive, not numeric), Buyer Identifier, Batch or Production Lot Number	Date of Harvest, Shipment Identifier	Shipped Quantity

9. Paper-Based Document Limitations, Opportunities & Implications

The purpose of this section is to identify the paper-based documentation limitations with respect to traceability currently used in the produce supply chains studied, based on the information presented in the previous two sections.

The recommendations for increased traceability are also discussed in light of the noted limitations.

9.1 Paper-Based Document Limitations

Whole supply chain:

- No common identifier of product is present consistently throughout the supply chain. Product descriptions at the various companies vary and other identifiers and free-form notes are required to ensure recall is accurate.

Grower operations:

- Harvest date is not present and it has been discussed with participants that harvest date should be replaced by pack date in the Can-Trace proposed minimum data standard. Grower operations typically cannot identify product back to Date of Harvest due to mixing, sorting, etc. taking place during or previous to pack operations. It should be noted that this potentially limits recall effectiveness for certain potential scenarios (in-field damage, etc.).

Distributor:

- Recall notification did not include shipment identifier or shipment date. Both pieces of information are typically present and could be included. These allow for specific identification of received product and should reduce the time spent locating product, particularly for destinations not yet capable of working by pallet label (serial number).

- Not all product carries pack date identification.

- Product lot or serial numbers are not always identified as such. Although present, they can be identified as pallet tags, etc. This can lead to confusion.

- Where present, supplier lot number is not always recorded. A new lot number may be assigned within the next operation, but the supplier's lot number should be recorded whenever one is supplied. The supplier's lot number should be linked to any new lot number created at the next operation.

9.2 Observations and Recommendations Identified from Gap Analysis and Traceability Simulations

Observations

1. Date of Harvest was not perceived as a significant data element for traceability by any participating company.

2. Shipment Identifier is not currently used to communicate recall information. Buyer's purchase order number is used for this purpose as it is deemed to usually (but not always) uniquely identify the shipment. Purchase orders in their current format do not enable full traceability in some companies.

3. Shipment date and receipt date are not in the proposed minimum data standards and are not used in recall communications.

4. Shipped quantity is used in recall communications, but is not in the proposed Can-Trace data standard.

5. A product identifier (numeric) is not used in recall communications.

6. Master data elements, such as supplier phone numbers, traceability contact names, customer phone numbers, e-mail addresses, etc. are used during recalls and other traceability exercises but are not specified in the standard.

7. Automation of data gathering and management would facilitate faster recall processes for organizations that do not currently have such support.

Recommendations

1. Shipment Identifier should augment or replace buyer's purchase order number in recall communications, as Shipment Identifier is defined to be unique. With the possible use of backorders, multiple products, multiple receiving locations, and multiple receiving dates on one purchase order, PO number cannot be guaranteed unique to a shipment.

2. Ship Date, when known, should always accompany Shipment Identifier. It serves to further specify the transaction containing recalled product. Although this is not in regular practice with the participants included in this study, other industries with traceability implemented have found unique shipment identifiers to be superior to purchase order numbers in isolating shipments and, thus, the use of shipment identifier is recommended as a best practice.

3. Shipped Quantity and Unit of Measure should be added to the proposed minimum data standard.

4. Harvest Date should be removed from the minimum data standard and made one of the optional data elements.

5. Pack Date should be added to the minimum data standard.

6. A universal product identifier (numeric) can support the proposed minimum data standard. The Global Trade Item Number (GTIN) is recommended as the standard format for carrying data. For Produce, supplier GTIN's may need to be rolled up (or linked) to an internal product number in a many-to-one relationship.

7. A review of minimum required master data associated with the communicated data elements should be performed. At a minimum, company traceability contact information should be required. The use of Global Location Numbers (GLN) and their underlying master data elements is recommended as best practice. (Master data elements would include contact information such as company name, contact name, address, phone, cell, fax, e-mail, etc.)

8. Data retention guidelines should be developed and distributed in support of the standard. Legal requirements and product shelf-life should be among the determining factors for retention guidelines.

Appendix A: Glossary of Terms

Appt.: Appointment Number.

Advanced Shipment Notice (ASN): A communication (normally via electronics means, EDI) of the contents, ship date and time of an expected shipment. When received ahead of the incoming shipment, this communication helps with a number of planning and data communication tasks.

Bill of Lading (BOL): A document that establishes the terms of a contract between a shipper and a transportation company. It serves as a document of title, a contract of carriage and a receipt for goods.

Commercial Invoice: Represents a complete record of the transaction between exporter and importer with regard to the goods sold. Also reports the content of the shipment and serves as the basis for all other documents about the shipment.

Cool Store location: A physical location in which product is stored at cooled temperature for preservation.

DOT: Department of Transportation.

Dry Case: Cargo that is not liquid and normally does not require temperature control.

Global Trade Item Number (GTIN): A unique 14-digit numeric identifier of a trade item within the global EAN.UCC code of standards.

IV Number: Invoice Number.

Packing Slip: Itemized list of commodities with marks/numbers but no cost values indicated.

Pallet: A platform with or without sides, on which a number of packages or pieces may be loaded to facilitate handling by a lift truck.

Phytosanitary Certificate: A certificate issued by Agriculture Canada to satisfy import regulations of foreign countries; indicates that a Canadian shipment has been inspected and found free from harmful pests and plant diseases.

Shipping Advice: A notice sent to a local or foreign buyer advising that shipment has gone forward and containing details of packing, routing, etc. A copy of the invoice is often enclosed and, if desired, a copy of the bill of lading.

SLOC Number: Selection Location.

TI-HI Dimensions: The configuration of the number of cases in a pallet layer (Ti) and the number of layers on a pallet (Hi).

UCN Number: Unique Component Identification Number.

UPC Number: (Universal Product Code) The standard bar code symbol for retail food packages in the USA and Canada.

Appendix B: Participating Pilot Companies

Company Type	Supply Chain Role(s) for this Company	Participant Name
Hotel	Food Service	Fairmont Hotels and Resorts
Food Service Distributor	Distributor	Neptune Food Service
Grower/Importer/Distributor	Grower, Importer, Packer/Shipper, Distributor	The Oppenheimer Group
Distributor	Distributor	Pro Organics
Retailer # 1	Distributor, Retailer	Sobeys
Retailer # 2	Retailer	Thrifty Foods
Grower	Canadian Grower, Packer/Shipper	All Season Mushrooms