



Can-Trace Decision Support System for Food Traceability



Agriculture and
Agri-Food Canada

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Agroalimentaire Canada

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Business Case Summary

Submitted to: Can-Trace Steering Committee

Submission date: September 27, 2004





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September 27, 2004

RCM Technologies Canada is pleased to have been a part of the second phase of the Can-Trace initiative, and more specifically to have been able to work with you and key stakeholders in industry and government to develop the business case and decision support system for whole chain traceability.

We have submitted our final report and the Business Case Decision Support System (DSS) to the Business Case Working Group. At their direction we now present the DSS and a summary of the key findings and recommendations for your consideration and approval. We welcome your comments.

A separate instruction sheet for the Decision Support System is also enclosed as part of our submission of that tool.

Thank you very much for your confidence in our project team and providing us the opportunity to participate in this critical Canadian program.

Personal regards,

A handwritten signature in black ink, appearing to read "B. Sterling".

Brian Sterling
Vice President – General Manager
RCM Technologies Canada

Highlights of the Business Case for Traceability

The full Business Case report summarizes the approach, method and results of the Can-Trace cost-benefit Decision Support System project led by RCM Technologies Canada. Also included in the formal report is evidence from several pilots validating the fact that enhanced product traceability in the Canadian food value chain can deliver net business benefits.

Our findings include the following:

- **The business case for enhancing traceability is real**

While results vary by company, recall scope reductions of fifty to ninety percent or more are possible; clear increases in operational efficiencies are achievable; and several firms related increased revenues and/or margins from market advantages enabled by enhanced traceability. The business case decision support tool can help organizations take the first step toward more comprehensive traceability.

- **Compliance provides only a fraction of overall benefits**

Benefits from traceability fall into four areas: regulatory compliance; increased demands from or access to customers and markets; reduced recall scope and risk; and increased supply chain efficiencies and effectiveness. Benefits in all four categories were observed in the pilots we studied. Potential benefits from supply chain optimization and recall scope reductions were most noteworthy.

- **Decision Support System will help clarify the business case**

The primary deliverable from this project is a flexible, broadly applicable decision support system that will enable an individual firm to examine the business benefits and costs of implementing enhanced food traceability. This toolkit is in a form that can be readily accessed and used by stakeholders. A separate instruction document for the tool accompanies this summary.

- **Lot identification is needed**

Lack of a lot identifier or similar data attribute causes recall scope and costs to be higher than if more precise identification of compromised product were possible. This was observed in all value chains. The implication on traceability business cases is that a single adjustment to track and trace practices (implementing a Lot identification standard tied to production data) would have substantial impact on reducing recall and withdrawal costs.

- **Automation is spotty and proprietary standards abound**

Bar codes (EAN.UCC 128 and others) are sometimes used by primary processors for carton identification of a batch or lot of product, but the data contained in the bar code can vary widely from one source (processor) to another. The lack of a standard set of traceability data, even though a standard data carrier is being used, results in potential misidentification of product and at least in delay to identification.

- **Some industries are not included in this phase of work**

One area warranting further investigation is the third party logistics (3PL) industry that manages the transport and storage of most foodstuffs from gate to plate. It is also clear that food chains such as grain and multi-ingredient products need to be examined in order to consider their needs when considering the business case for traceability.



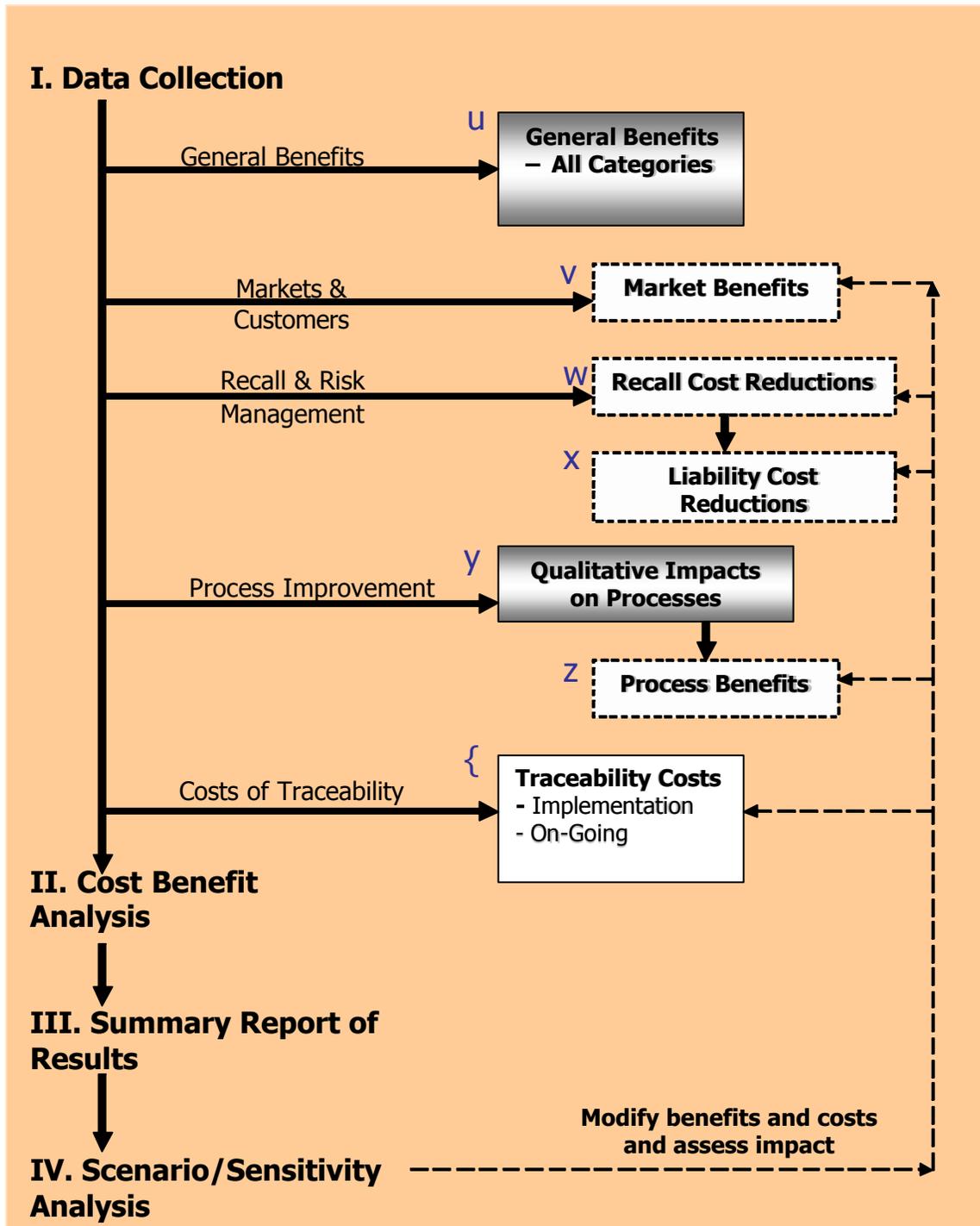
Three questions can now be posed: What strategy should be engaged to move forward? What assistance and guidance needs to be provided to help those who wish to implement enhanced traceability? What measurement process(es) will enable stakeholders to observe the results of enhanced traceability?

Recommended Actions

1. **Sector leadership is essential** – Industry associations need to open a dialogue amongst their members and other key stakeholders to establish their strategy for traceability at the sector level. Key in any strategy should be exploration of how the Decision Support System delivered with this project can assist participants. In our experience, a number of leaders need to step forward to champion developing industry strategy.
2. **Balance of benefits through the entire value chain** – An entire value chain benefits from enhanced traceability; however, while individual firms do benefit from traceability, in some cases the benefit accrues more to an upstream or downstream partner. Resistance to implementing enhanced traceability stems from believing benefits will not be achieved by the company making the investment. This issue needs to be addressed at the industry level and leads to our next recommendation.
3. **Need for a forum** – As the above comments suggest, there needs to be an impartial forum in which industry participants feel safe to engage in strategic and specific dialogue and explore the value of implementing enhanced trace and track systems and strategies for distributing benefits through the chains.
4. **Validate the business case and tool** – A project or series of projects should be conducted to test and validate the Decision Support System using company-specific data and even extended to include an entire chain of partners. We expect improvements in the use of the tool when it is populated with sector-specific language and when it is tailored for large groups of sector participants. This process can also drive implementation guidelines and build success stories from which the industry can learn further lessons about implementation. These proof-of-concept projects should be part of sectoral strategies.
5. **Communications are now critical** – Messages about the benefits of traceability need to be loud and clear for the Canadian food industry. Each food sector will want to communicate in its own fashion, yet the message needs to be consistent and clear. The deliverables from this project can provide considerable support. We recommend that communications address all participants in the food value chain, from grower/producers through to the retail level, from small to large organizations.
6. **Evolve the Decision Support System** – Additional development could include a “light” version of the current analysis tool for very small operations. In this version for example, many of the open information pieces could be pre-configured with industry averages. The existing toolkit also forms a foundation for technology implementation guidelines which can be included in future versions of the system.
7. **Address other value chains** – Neither bulk products such as grains, nor multi-ingredient products have been examined in this study; it would be logical to consider them for a business case study. We also suggest that the third party logistics and distribution industry be examined due to their role in the food supply chain.
8. **Certify the Decision Support System** – We believe the template can be used by small and medium sized businesses to help support loans for traceability investment. By working with banking organizations, we can certify the toolkit, validate it and provide significant help to a smaller firm seeking justification for financial support.
9. **Translate the Decision Support System** – The decision support system and Excel spreadsheets need to be translated into French.

The Business Case Decision Support System

The Business Case Decision Support System is an Excel based toolkit designed to help companies fully understand the benefits and costs of traceability to their organization. It is structured as illustrated below, leading users from general, qualitative questions about the benefits of traceability through a quantification of specific benefits and costs, and ultimately developing a benefit/cost summary that considers both quantitative and qualitative factors. Detailed instructions for using the DSS are included as part of our submission.





Can-Trace Decision Support System for Food Traceability

Final Report

Submitted to: Can-Trace Steering Committee

Submission date: September 28, 2004

Submitted by: RCM Technologies Canada

Authors: Dr. David Sparling, University of Guelph
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We first want to thank the companies who participated in the produce, beef and pork industry pilot studies conducted in parallel with this business case project. For reasons of confidentiality we are not permitted to name these companies or the individual managers, but you know who you are. Your input was critical to this work.

We also thank our partner Unisys Corporation for their expertise and the application of their 3D Visible Enterprise™ modeling process. Their methodology and tool enabled us to model entire supply chains and prepare validation of the economic benefits of whole-chain traceability. In particular, we thank Daniel Berroya and Jim Craig from Unisys for their enthusiastic pursuit of the answers to our questions about business benefits. Thanks also to Alan del Puerto for his encouragement of the team.

The business case Decision Support System would not exist without Mahmood Mohamed, whose expertise with Excel and financial and interpretive skills were sorely tested by the competing requirements of simplicity and breadth of applicability of the tool.

Last and certainly not least, we want to acknowledge the encouragement of the Can-Trace Business Case Working Group led by Elaine Smith, and the Can-Trace Steering Committee. Special thanks to Jane Proctor, Mike Sadiwnyk, Justin Sherwood and Paul Osland for their confidence in our team and their knowledge and insight. As well, we thank Norm Cheesman, project manager and Rowan Lalonde, special advisor for Can-Trace, for their advice and support.

RCM Technologies thanks all the participants for trusting our team with this critical first step in the whole-chain traceability initiative. We look forward to working with Can-Trace and industry stakeholders in helping the food industry take the steps needed to make whole-chain traceability a reality in Canada.



1. Highlights & Recommendations

This report summarizes the approach, method and results of the Can-Trace cost-benefit decision support system project led by RCM Technologies Canada. Also included in the report is summary evidence from several pilots validating the fact that enhanced product traceability in the Canadian food value chain can deliver net benefits that exceed the costs.

- **The business case for enhancing traceability is real** – While dependent on the company, recall scope reductions of fifty to ninety percent or more are possible; clear increases in operational efficiencies are achievable; and several firms related increased revenues and/or margins from market advantages because of enhanced traceability. The business case Decision Support System captures a wide range of possible scenarios and can help organizations understand the broader scope of the costs and benefits of traceability. The tool can help with the first step toward more comprehensive traceability.
- **Compliance is only a small part of overall benefits** – Benefits from traceability fall into four areas: regulatory compliance; increased demands from or access to customers and markets; reduced recall scope and risk; and from increased supply chain efficiencies and effectiveness. Benefits in all four categories were observed in the pilots we studied. Potential benefits from supply chain optimization and recall scope reductions were most noteworthy.
- **Developing a Decision Support System** – The primary deliverable from this project is a flexible, broadly applicable decision support system that will enable an individual firm to examine the business benefits and costs of implementing enhanced food traceability. This toolkit is in a form that can be readily accessed and used by stakeholders.
- **Lot identification is needed** – Lack of a lot identifier or similar data attribute causes recall scope and costs to be higher than if more precise identification of compromised product were possible. This was observed in all value chains. The implication on traceability business cases is that a single adjustment to track and trace practices (implementing a lot identification standard tied to production data) would have substantial impact on reducing recall and withdrawal costs.
- **Automation is spotty and proprietary standards abound** – Bar codes (EAN.UCC 128) are sometimes used by primary processors for carton identification of a batch or lot of product, but the data contained in the bar code can vary widely from one source (processor) to another. The lack of a standard set of traceability data, even though a standard carrier is being used, results in potential misidentification of product and at least delay to identification.
- **Some industries are not included** – One area warranting further investigation is the third party logistics (3PL) industry that manages the transport and storage of most foodstuffs from gate to plate. It is also clear that food chains such as grain and multi-ingredient products need to be examined in order to consider their needs when considering the business case for traceability.

Three questions now should be considered: What strategy should now be engaged by the food industry to move forward? What assistance and guidance needs to be provided to help those who wish to implement enhanced traceability of their products? What measurement process(es) will enable stakeholders to observe the results of enhanced traceability?

1.1 Suggested Action Steps

- **Sector leadership is essential** – Industry associations need to open a dialogue with their members and other key stakeholders to establish their strategy for traceability at the sectoral level. Key in that strategy should be exploration of how the decision support system delivered with this project can assist the participants. In our experience, a small number of leaders need to step forward to champion developing the industry strategy.
- **Balance of benefits through the entire value chain** – The entire value chain benefits from enhanced traceability. While individual firms do benefit from traceability, in some cases the benefit accrues more to an upstream or downstream partner. Resistance to implementing enhanced traceability stems from believing that benefits do not vest to the particular company making the investment. This issue needs to be addressed at the industry level as well.
- **Validate the business case** – A project or series of projects should be established to test the Decision Support System, develop implementation guidelines and build a number of success stories from which the industry can learn further lessons about implementation. These proof-of-concept projects can be a part of sector strategies.
- **Need for a forum** – As the above comments suggest, there needs to be an impartial forum in which industry participants feel safe to engage in specific dialogue and explore the value of implementing enhanced trace and track systems and of strategies for distributing benefits through their respective value chains.
- **Communications are now critical** – Messages about the benefits of traceability need to be loud and clear for the Canadian food industry. Each food sector will want to communicate in its own fashion, yet the message needs to be consistent and clear. The deliverables from this project can provide considerable support. We recommend that communications address all participants in the food value chain, from grower/producers through to the retail level, from small (SME) to large organizations.
- **Evolve the Decision Support System** – Additional development could include a “light” version of the current analysis tool for very small operations. In this version for example, many of the open information pieces could be pre-configured with industry averages. The existing toolkit also forms a foundation for technology implementation guidelines that can be included in future versions of the system.
- **Consider other value chains** – Neither bulk products such as grains nor multi-ingredient products have been examined in this study; it would be logical to consider them in a future study. We also suggest that the third party logistics and distribution industry be examined because of their role in the food supply chain.
- **Certify the Decision Support System** – We believe the decision support system could be used by small and medium sized businesses to help with loans for traceability systems investment. By working with one or two banking organizations to certify the toolkit, it can be further validated and provide significant help to a smaller firm seeking financial support.
- **Translate the Decision Support System** – The decision support system and Excel spreadsheets need to be translated into French.

2. Executive Summary

Food safety concerns, international trade pressures, regulatory requirements and competitive market challenges have created demands upon food producers, processors, supply chain distributors and food service companies to improve their track and trace capabilities. Meeting the need for improved traceability has typically been considered another cost burden by most businesses in the food industry which has tended to lag behind other leading industries. Can-Trace commissioned RCM Technologies Canada (RCMT) to assess the business case for food traceability. This report summarizes our findings related to the costs and benefits and describes the business case decision support system that was developed in the project. This support system is a template or toolkit of specially designed questionnaires and forms, plus analysis and reporting capabilities. We use both terms, template and decision support system to mean the toolkit of analysis instruments intended to assist in building a business case for investment in enhanced traceability.

Data for the business case template was collected from the three pilot studies, although the timing of data from one pilot was too late to have an appreciable impact on the template design. The three studies encompassed the produce, pork and beef value chains. Pilot participants were helpful in supporting the project. Many participants were not comfortable releasing confidential information but they were at least able to confirm different categories of costs and benefits and discuss how they would apply to their firm. In the final analysis, the template achieves the objective set from the beginning: it is a high level decision making toolkit that encourages further investigation and answers the question of whether traceability is a net benefit or a net liability for the particular user.

As a result of the business case development team experience and the pilot study data, the business case template was developed. The template includes four functional capabilities:

1. Data collection;
2. Cost-benefit analysis;
3. Reporting, and
4. Scenario analysis;.

The inability or unwillingness of pilot study companies to release confidential information did affect the ability of the business case team to test and validate the design of the overall template against specific company data. It did not affect its development as an effective tool to allow managers to input confidential information and use it in their own analysis.

Four major categories of benefits were identified in the project.

1. Benefits related to maintaining business and achieving regulatory compliance.
2. Market benefits related to meeting market or customer requirements.
3. Risk and recall benefits derived from improvements in risk and recall management and the associated reduction in liability costs.
4. Process improvement benefits which result from using traceability as a tool to improve supply chain operations, increase product quality or reduce costs.

Many of these benefits can be estimated quantitatively using the tool. Others may be difficult to assess quantitatively but are still considered in the tool. In the pilot studies each category of benefit was observed in each pilot but not all benefits were experienced by every individual participant.

The template is also designed to measure the costs of traceability. These included hardware, software and consulting costs, training, ongoing support, labeling material, and compliance and auditing costs. Costs occur during implementation and as ongoing expenses for operating the system.

The business case template is designed to help managers understand the costs and benefits of traceability at a high level. Most businesses will use this information to make a decision on whether to take the next step toward implementing a system. For many firms, the next step will be a detailed implementation plan with a more comprehensive model of their own systems and more detailed analysis and (possibly) a simulation of operations.

Based on our experience with pilot study participants, the quality of the data entered into the template and the comprehensiveness of the analysis can be improved through the use of personnel trained in traceability and in using the template. A third party can be particularly effective in dealing with multiple levels of the supply chain and in facilitating industry-wide initiatives. They can coordinate analysis between levels, convey costs and benefits which shift up or down the chain and populate the template with values and processes appropriate to the industry.

This business case template is intended as a first step toward full chain traceability. Future enhancements include more sophisticated interfaces and web-based delivery systems. Next steps also include pilot implementations and analysis of the true costs and benefits of traceability after implementation, as well as communication of key findings and results to the broader agri-food sector.

The conclusion of all our work is that there is a net benefit from the use of enhanced track and trace solutions to Canadian food value chains. There is a clear link between more robust product identification and trace capabilities and reduced costs, increased productivity, higher quality and improved regulatory compliance. Automation of some parts of an overall solution will reduce data collection costs and errors, lower potential recall/withdrawal scope, and open their operations to faster more efficient methods of delivering product. While the proof of this finding will vary from company to company along the value chain, there is little doubt in the three industries we observed that business benefits from traceability are both possible and real. The question that now must be answered is how the business case template can help companies and supply chain partners decide to move forward with their own traceability initiatives.

RCM Technologies is excited about the opportunities for food chain traceability and is explicitly interested in helping Can-Trace and food industry stakeholders turn the potential benefits of whole chain traceability into reality.



3. Introduction

3.1 Project Objectives

The primary Can-Trace objective, and that which makes it unique to other programs in the world, is to have a single set of national traceability standards for the food value chain. The intention was to avoid developing a multitude of standard data attributes for individual products. The clear purpose for this approach, as with any standard, was to minimize the overall cost of implementing whole-chain traceability, and therefore, in this case make the Canadian supply chain more competitive.

The objective of the business case project was to develop a toolkit (initially called a 'template') to help members of various agri-food supply chains assess the impact on their business of implementing a traceability system. This really meant creating a decision support system which would include a tool to facilitate calculation of a simple cost-benefit analysis.

The business case template is a high-level analytical tool to help businesses understand the implications of traceability. The outcome may be a go/no-go decision on implementing a system. As such, it is the first step in a multi-step process which will lead to implementation. The next step will be a more in-depth process analysis and detailed planning prior to implementation.

3.2 Assumptions

One up/One down traceability – The assumption made throughout the work was the model based on an organization being able to track and trace product as it moved internally through its own operations, plus the ability to track product externally to the next partner in the value chain, and trace back to the previous supplier. Other models are possible, but this was the one we applied.

Boundaries for study – The boundaries for this project started at the Producer-Grower and ended at the receiving dock of the Retailer or Food Services firm. The exception was the beef pilots (see Section 9.)

Pilot studies were small – The size of the various pilot studies was small compared to the size of their respective industries. Still, the information gained from the studies is informative and reflects the current state of the Canadian food industry.

3.3 Project Approach

The project relied on an underlying knowledge of traceability and food value chains among the project team members in order to develop the conceptual basis for a traceability cost benefit analysis. The RCM Technologies team provided,

1. Understanding of the reasons why a food chain would implement a traceability system;
2. Familiarity with supply chain track and trace technologies, systems and data management requirements; and
3. Appreciation of the range of costs and benefits associated with traceability.

The knowledge required to complete the template was expanded and put into agri-food industry context through three pilot studies, one each in the produce, beef and pork sectors. The pilot studies were used to validate the categories and organization of benefits and costs and the use of the cost benefit template in a one up/one down traceability initiative.

3.4 Data Gathering & Instruments

The RCMT team developed an initial list of cost and benefit categories which were then used to create data collection instruments in the form of questionnaires.

Questionnaires

The data for the business case was collected using questionnaires created by the project team and delivered to the pilot study companies. Cooperation from these companies was critical to the success of the business case development. The questionnaires were developed in two stages. In the first phase a group of three separate questionnaires was designed to collect information in three areas.

1. Corporate structure and strategy – Intended for senior management
2. Processes and costs – Intended for operations staff and management
3. Information technology and operating costs – Intended for IT management and support staff

These were tested with the produce pilot companies and provided to the beef pilot companies. Feedback from managers indicated that the questionnaires were too detailed and requested confidential information which companies were unwilling to provide. To reduce the time needed to complete the questionnaires and the amount of confidential information required, the questionnaires were revised and reduced to a single questionnaire and a supporting spreadsheet.

The lack of confidential information (particularly any data related to costs) reduced the ability of the team to fully analyze the impacts of traceability across different industries but it did not affect the ability to create traceability templates that can be used to analyze sensitive corporate information.

Pilot Studies and Mock Recalls

In addition to the questionnaires, data was collected from the recall analysis completed by the pilot study consultants. The recalls occurred in two stages with initial data collection in early July and mock recalls for the beef and produce pilots were completed in the last two weeks of July. The pork industry pilot was started much later, and the information from that study was used to affirm the findings of the first two.

The project team reviewed the notes and comments from the third party consultants used in the pilot studies, and also conducted their own face-to-face meetings and conference calls to clarify information gathered by the consulting firms.

The results from the pilot studies were incorporated into the template and the cost-benefit analysis tool was tested against the findings from the pilots.

4. Traceability Costs and Benefits

4.1 Traceability Benefits

Much of the current motivation in the food industry for implementing tracking and tracing systems is in response to current or anticipated regulation. If the only objective is to meet regulatory requirements traceability costs can appear to be a significant burden. However, like other investments in process improvement, traceability can also provide significant benefits that extend far beyond simply meeting regulatory requirements. The key to achieving those benefits is first to identify them and then to develop a plan to achieve them. This means taking a different approach to traceability; from the planning stage right through to execution.

Accurately assessing benefits is challenging because they tend to be harder to identify and individual benefits vary among different markets, products and processes. However, we have found that taking the high level, systematic approach symbolized in Figure 1 can help managers zero in on potential new profit or cost saving opportunities.

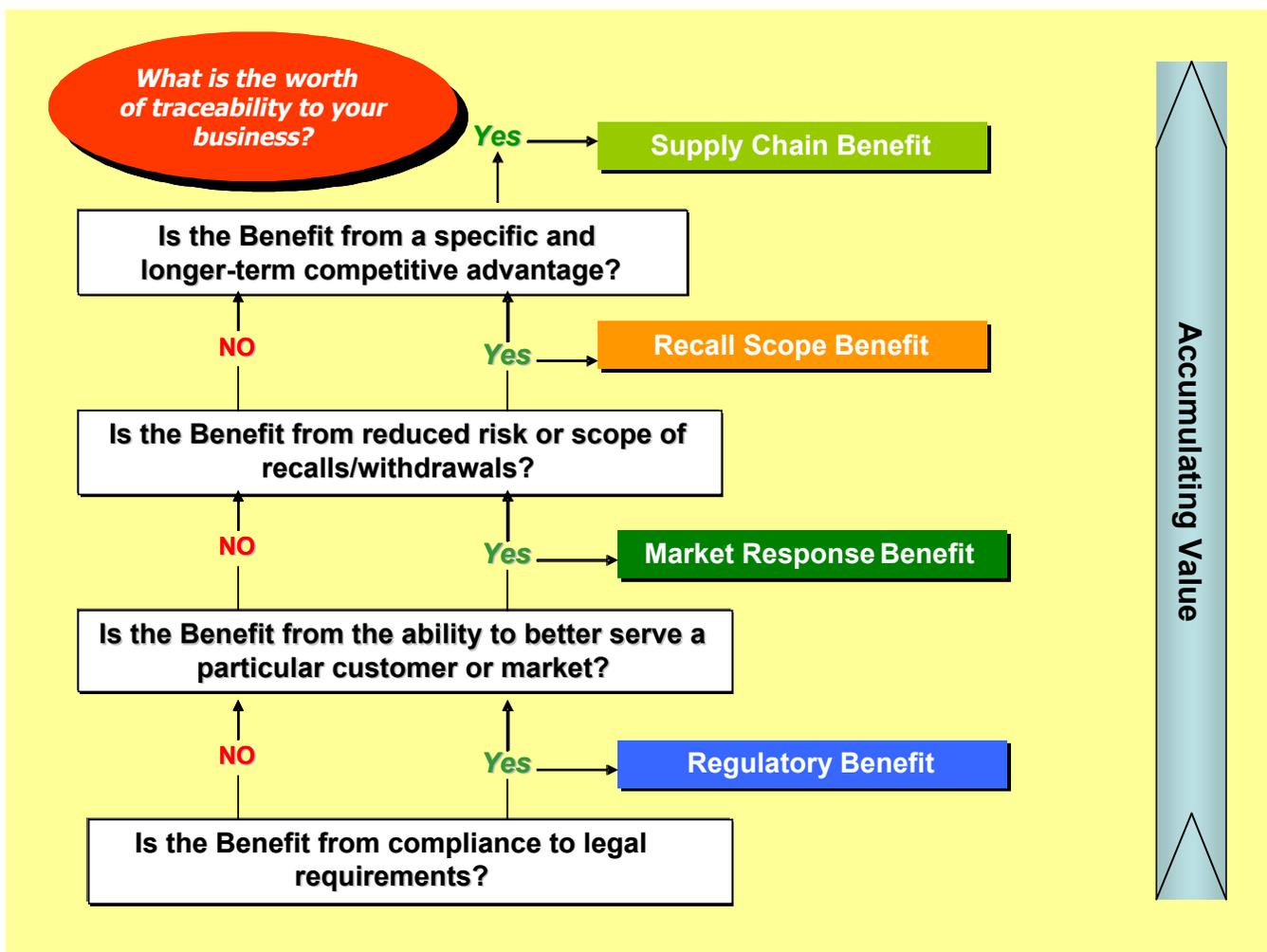


Figure 1 – Categories of Traceability Benefits

After examining areas of potential value for traceability, we observed that benefits fell into four key categories or buckets: 1) Regulatory Compliance; 2) Market and Customer Related; 3) Recall Risk and Scope Reduction; and 4) Efficiency and Quality Improvement.

The process of assessing benefits begins with an area with which most managers are most familiar, mandatory regulation. It then drills up searching for other market incentives, impacts on recalls and finally opportunities for improvements in efficiency and quality. The key to truly understanding the whole business case is to identify and enumerate the benefits at every level and compare the complete package of benefits to the cost of implementing the system. The different categories of benefits are discussed in more detail in the following sections.

4.1.1 Meeting Regulatory Requirements

During our investigations many organizations acknowledged that the significant motivator for adopting traceability is meeting regulations. Regulations or anticipated regulations are being spurred by factors ranging from Bovine Spongiform Encephalopathy (BSE) and Avian Influenza to the new bio-security regulations for food importation into the United States and new E.U. requirements for traceability. These have predictably sensitized most food organizations to the need for more responsive and robust food traceability systems and processes.

The predominant sentiment seems to be “Eventually traceability may be mandatory and it will simply cost my business and my customers more money.” When regulations are imposed, traceability becomes a market entry requirement; without it a firm cannot ship product into the regulated market.

Managers can compare the value of being in regulated markets with alternative markets and measure the difference in revenue and contribution to gross margin or profits. If there are few unregulated market alternatives then traceability may be essential to the survival of the business. However, even in such cases, it is important to continue the business case analysis through the next levels of value assessment, since they identify benefits which will cover the costs of implementing traceability.

4.1.2 Addressing Customer & Market Needs

Even in markets without traceability regulations, traceability can still be a customer requirement. Customer requirements and the motivations behind those requirements can vary significantly. Retail organizations like Wal-Mart are imposing Radio Frequency Identification (RFID) systems on their suppliers in the search for process efficiencies and ultimately reduced cost. Other customers and markets require traceability as an assurance of product attributes, particularly for attributes which are not visible, often referred to as credence attributes.

Credence attributes fall into two broad categories: content and process. Non-visible content attributes are tracked because the products appear to be the same as others on the market, but their composition is different and the difference is important for customers. Process attributes are tracked because products are produced using different processes and the process matters to selected customers. Organic food products are an excellent example where using traceability helps track process attributes. The premium value for organic products lies in the process by which they are produced. Traceability is needed to assure buyer and consumers that the products are actually produced under organic processes. Animal welfare and fair trade coffee are other examples of process attributes. Genetically modified (GM) crops are examples of products differentiated on both content and process basis. Non-GM products can attract a premium if exported into selected markets. Traceability assures consumers that the products do not contain any GM crops. In the future, functional food products and GM crops that provide health benefits will be traced so that their full value may be realized.

The benefit assessment for content or process attributes will include looking at current or future product sales volumes and margins and comparing them to the values for other market alternatives not requiring traceability.

In our studies, RCM Technologies found one produce company which was able to claim a significantly higher price for its product because it could accurately and consistently identify the quadrant of land from which its product



was harvested. The particular quadrant of land (due to environmental factors) and seed genetics produced a highly desirable group of attributes which lessened the need for blending at the processor level. The company used its ability to identify the product to attract export customers. This enabled the company to not only open itself to new markets, thus expanding its revenue potential, but to claim a higher price (margin) for its product. The interesting aspect in this one case was that traceability was initially designed so that the product would not run the risk of being rejected by regulatory requirements in the receiving country (Japan, in this case). The company turned a regulatory compliance issue into a market benefit, significantly raising the value it had assigned to traceability. It creatively used the ability to trace its product back to a specific plot of land as a competitive advantage to become identified as a high quality supplier.

4.1.3 Recall & Risk Management

Governments impose traceability on companies as a risk management tool to protect public health or animal health. However, traceability also acts as an effective means of reducing the risk exposure of firms. The most obvious benefit comes from the ability to accurately identify problem lots, their location and source, important factors during a recall situation. An effective traceability system can reduce the potential scope of a food recall, the volume of product which must be withdrawn in order to be sure to capture compromised product. In our examination of the food industry full traceability can cut the scope of the recall substantially, and we observed instances where the scope of recall could be lowered as much as ninety percent.

Increasing recall speed and reducing product risks should decrease risk to consumers. This can ultimately decrease liability claims by consumers, a fact that can eventually be reflected in lower liability costs and lower insurance premiums.

A whole chain traceability system can reduce the time required to withdraw recalled product. In the case of a potentially hazardous product, this will ultimately reduce a firm's exposure to liability claims by recalling product before it is sold to the public and possibly consumed.

Traceability can affect recall frequency in two ways. First, accurately identifying only recall product and reducing the scope of individual recalls will reduce the number of locations and organizations experiencing the recall. We observed one example where a recall included six retail locations under current levels of traceability when, in fact, the affected product actually only went to a single location. Under enhanced traceability the other retail locations would not have experienced that particular recall. Second, by maintaining accurate information on products it is possible to move older products more effectively through the chain and thereby reducing the risk of bacterial contamination.

The benefit of improved risk management can be assessed by first considering the improvement in recall costs through reductions in frequency, scope and severity, and then considering the impacts on liability claim costs and potential reductions in insurance premiums.

4.1.4 Process Improvements – Efficiency and Quality

An enhanced traceability system is another tool that managers use to increase the efficiency and effectiveness of business processes, and thus improve the quality and cost of their products. Organizations we observed appeared to have difficulty contemplating improvements in efficiency and quality by adding traceability. Many mentally separate traceability from other supply chain related activities and do not view it as an integral component of their management systems. Few consider that being able to track and locate products accurately can reduce out of date product losses, identify problem processes or suppliers and improve logistics and warehouse operations. This is curious when one reflects on the value traceability brings to such diverse industries as pharmaceuticals, automotive, aerospace and electronics.

The first step in identifying efficiency gains is to break business processes into a small number (ten or fewer) of key ones that can be analyzed in more detail. Once the key processes are identified we ask the following questions.

1. Do I have full control of the product lot and its identity through this process and am I able to maintain identity throughout the process?
2. Could the tracking information be used to:
 - adjust processes on a real-time basis to improve yield or quality?
 - identify product approaching its due date so that it can be used or sold quickly?
 - optimize inventory management to reduce overall inventory requirements?
 - compare supplier performance, packaging or shipping alternatives and identify improvement opportunities?
 - increase quality or efficiency in some other manner?
3. How much would potential improvements contribute to the bottom line?

For example, one processor was able to identify potential yield improvements using the information from a traceability system to make process adjustments on a real-time basis. In order to accomplish this, a significant investment in new process equipment and changes to internal processes were required. In this case, the investment had an estimated payback of less than one year because of the increase in product yield and the ability to trace the variation in yield on an individual unit basis. Being able to trace to this level of specificity would also allow the processor to trace yield back to different suppliers which, in turn, would allow them to preferentially buy from producers with higher yielding product. The process yield improvements were significant enough to warrant the investment.

4.1.5 Qualitative Benefit Assessment

To complete the assessment of the real value of traceability, it is necessary to consider benefits which are not easily measured in dollar terms. Working through the benefit hierarchy shown in Figure 1 it is possible to estimate real values for many, but not all, factors. Others may be important to the firm yet it may be extremely difficult for managers to put accurate estimates on the real value of those benefits to the firm. For example, traceability may affect the reputation of the firm, providing a market advantage, and the perceived risk reduction may be extremely important to the firm. Such benefits are often termed intangibles, but we avoid using this term since improved reputation and reduced risks are very tangible benefits for the organizations affected. They are tangible, just not easily measured. We refer to such benefits as qualitative benefits. One way to assess the importance of such benefits is to ask managers to answer the following questions and apply a five point (Likkert) weighting scale.

- How important is this benefit to the organization?
- How much will implementing traceability affect this benefit?

4.2 Traceability Costs

There are two issues related to costs - what they are and who bears them. The RCMT team identified several key categories of costs. Costs may be incurred during implementation or on an ongoing basis. Costs incurred at one level may be passed on to different levels or may benefit other levels. For example, label costs may be borne at the producer and processor level but the investment will benefit all other levels using them.

Table 1 – Summary of Traceability Costs

Cost Category	Implementation	Annual Recurring
Hardware - Computer & Tracking	One time	Annual
Hardware & other Capital Expenses	One time	Annual
Software	One time	Annual
Consulting Services – Integration & Support	One time	Annual
Education & Training	One time	Annual
Other Personnel Costs	One time	Annual
On-going maintenance & support	- - -	Annual
Label Supplies	One time	Annual
Policy Development, Compliance & Auditing	One time	Annual
Other Costs	One time	Annual

Traceability costs can vary widely depending on the nature of the firm and its products, its role in the supply chain in which it operates, its main activities and current track and trace technologies and capabilities.

4.3 The Cost-Benefit Assessment

The ultimate objective of the business case decision support system is to help make decisions about traceability with fuller understanding of what traceability can mean to the organization. This means comparing the benefits from implementing traceability to the costs of putting the system in place. The final assessment of the real value of full chain traceability will result in a cost benefit analysis where the costs in Table 1 are compared to the benefits described above and summarized in Table 2. The challenge for managers is to compare the quantitative measures and then, if the result is still a net cost, to decide if the qualitative benefits contribute enough to be worth the investment.

Table 2 - Summary of Benefit Categories

Benefits – Quantifiable	Benefits - Qualitative
Market Benefits – Regulatory Compliance	Perceived position as an industry leader and an early adopter of leading technologies and processes
Market & Customer Requirements	Impact on reputation with customers, suppliers, consumers, governments or the public in general
Recall & Risk Management	Perception related to reduced risks
Process Improvement - Quality and Efficiency	Improved customer service/response time
Total \$ Benefits	List of other perceived benefits and a weighting of importance

A closing challenge for full chain traceability is the distribution of costs and benefits. Changes at one partner can dramatically affect costs or benefits at other partners. For example, recall costs are typically borne by manufacturing or processing firms and not by distributors or retailers further along the chain. However, accurate tracing through those organizations can dramatically reduce the recall costs passed back to the processor. In many instances the benefits will outweigh the costs for the entire chain, but not at every level. In this case a redistribution of the benefits may be necessary to secure participation of all chain members. Without an adjustment it may be impossible to implement the system throughout the chain.

The business case decision support system captures a wide range of possible scenarios and can help organizations understand the broader scope of the costs and benefits of traceability. It is the first step in moving a company and value chain toward full traceability. The next is to bring supply chain members together to discuss the impacts on their value chains and plan an overall strategy toward effective whole-chain implementation of traceability.



5. Business Case Template – Supporting Traceability Decisions

The key objective of this project was to create a Decision Support System (DSS) to help agri-food managers make informed decisions about traceability. This was often referred to as a template or toolkit, and is designed to help managers collect and organize information, to provide analytical instruments to organize the process of the analysis into a meaningful format and to help make decisions.

Although the desired output of this project has been termed a business case template, it is in reality a traceability decision support system. In order to remain consistent with terminology used to date, we continue to use the term 'template' to describe the traceability DSS.

5.1 Required capabilities

The project team identified the following required capabilities for the template.

1. Easy to use – A key characteristic was the ability to guide users in collecting and analyzing the important factors in their decision.
2. Flexible and adaptable – The template must be suitable for use by businesses at different levels of the supply chain from farmer through to retailer and across a variety of different industries. It must be able to accommodate different processes and results.
3. What-if capabilities – The template needed to allow users to make changes to key parameters and assess the impact of those changes on their businesses and their decision to implement traceability.
4. Reporting capabilities – Although the need to operate at different levels in different industries precludes the development of a single standard report, the template must have the ability to highlight key costs and benefits as well as important non-quantifiable factors.

5.2 Scope and Limitations

The role of the business case template is as a high-level decision support system. Its purpose is to help managers understand the implications of traceability. It is only the first step in the process leading to an implementation. The outcome may be a go/no-go decision on implementing a system, or a decision to obtain more data and complete additional analysis in a selected area. If the outcome of the business case analysis appears favourable to members of a company (or supply chain), the next logical step would be to complete a more in-depth process analysis and detailed plan designed to support an implementation.

Because the DSS is a high-level tool, it will not provide a detailed implementation plan or detailed analysis of costs and benefits of every process, market or decision involved in the process.

5.3 Business Case Template Functional Structure

As a decision support tool, the business case template has four main functional areas:

1. Front end data collection
2. Cost-benefit module
3. Scenario and sensitivity analysis capabilities
4. Reports

These are described in more detail below. As Figure 2 illustrates, the user is guided through the tool and the relationships between the different areas. In the figure, each text box on the flowchart represents a separate data input worksheet. Qualitative inputs are represented as shaded boxes, quantitative benefits as dotted boxes and quantitative costs as a clear box.

5.4 Data collection

The first step is data collection. As can be seen in Figure 2, the process begins with a series of questions which collect qualitative information about potential benefits from traceability. The questions are primarily designed to get the user thinking about the different possible benefits that might accrue from traceability and how they will affect the firm's business. The remaining data collection worksheets accumulate and organize quantitative information concerning the costs and benefits of traceability. Each benefit area has its own worksheet in the tool we designed.

Data collection is organized into the following sections.

1. Qualitative assessment of the benefits of traceability – A series of questions on traceability benefits and their impact on the organization. For each possible benefit the user is asked two questions. Answers are weighted on a five point scale.
 - How much will traceability add to this benefit?
 - How important is this benefit to the organization?
2. Market requirements for traceability and impacts – This section examines anticipated market requirements for traceability and the impact of implementing or not implementing traceability on key markets and the impact on revenue and margins.
 - a. Current markets may be impacted by traceability in two ways. First, if traceability becomes a market requirement and the firm does not comply then the firm may be forced to sell its product in alternate markets, if they exist. Thus, not implementing traceability will mean lower revenues and lower margins. The template examines market size and margins within two scenarios; first where traceability is implemented and second where traceability is maintained at its current level. This allows for the consideration of market gains in current markets as well as losses due to sub-market levels of traceability.
 - b. Future markets – There may be markets which the firm cannot access currently, due to a lack of track and trace capabilities. The template allows users to consider the implications of entering new markets.

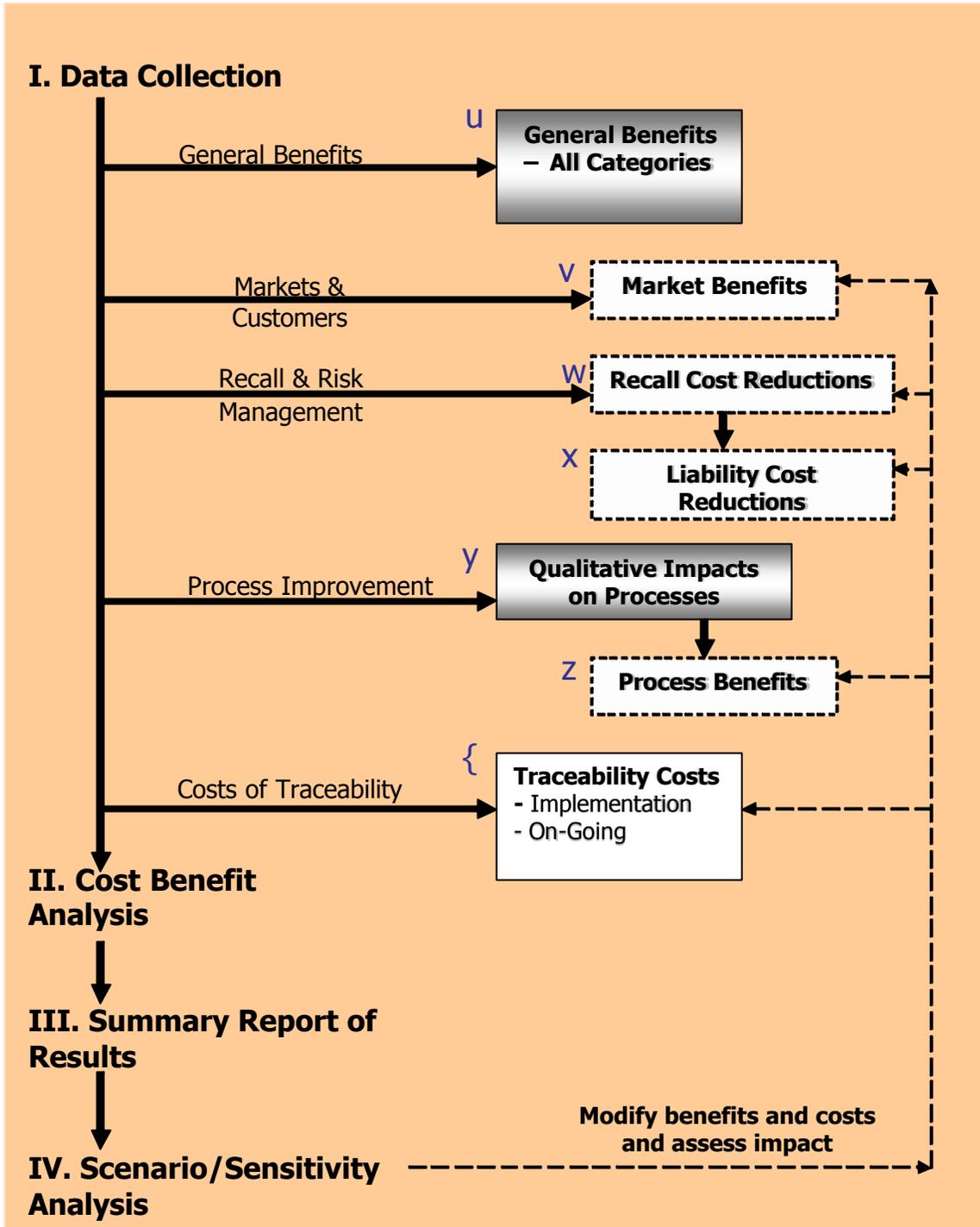


Figure 2 – Business Case Template Flowchart

3. Recalls – Traceability impacts recalls (and withdrawals) in two areas: frequency and severity.
 - a. Frequency – Improved data on product movement, age and location can reduce the likelihood (frequency) of a recall or withdrawal.
 - b. Severity of a recall is affected by the scope of the recall, the amount of product which must be recalled in order to collect the product under recall. The speed of recall can also reduce the severity of the recall by pulling product back before it reaches consumers, reducing liability claims.

The recall worksheet in the template collects data on past recall experience, projected recall probabilities and expected costs for different recall categories. The module allows the user to consider up to four categories of recalls.

4. Liability Costs – Traceability can provide benefits in two areas related to liability for product problems, as reduced liability costs and as reductions in liability insurance.

The user is guided through the different sections and completes quantitative data input. Once that is completed the business case decision support system can complete its cost benefit analysis.

5. Process benefits are typically the most difficult for users to identify and so the impacts are captured in two ways. First the major processes are examined with respect to each possible benefit category identified above. Users are asked to select the impact of traceability on each category ranging from nil to major impact. As was the case with the general benefit areas, the main objective here is to help users begin to think about all of the possible impacts of traceability on their processes. From here users move to quantifying the benefits in each category.
6. Process improvements – Process impacts can occur in several categories and can be realized on implementation or an ongoing basis.
 - a. Inventory reduction
 - b. Spoilage/out of date costs
 - c. Yield improvements
 - d. Quality improvements
 - e. Other categories defined by the user
7. Cost Analysis – The components of cost (see Section 4.2) are examined and current costs and investment estimates are both applied to summarize the total upfront and ongoing costs to implement enhanced trace and track processes or systems.

5.5 Cost-Benefit Analysis

The cost-benefit analysis uses the information input in the first phase and organizes it in a summary cost-benefit worksheet module. The module presents costs and benefits in three sections.

1. Qualitative impacts on the organization
2. Quantitative benefits are organized into four areas
 - a. Regulatory compliance
 - b. Market and customer opportunities



- c. Recall and liability improvements
 - d. Process improvements and supply chain efficiencies.
3. Quantitative costs of traceability systems and processes.

The quantitative analysis uses a net present value (NPV) calculation to assess both costs and benefits over a five year horizon. The discount rate can be set by the individual using the tool.

Initial results indicate that market benefits tend to be considered in general terms across most major markets and not identified with any specific market opportunities. There is nearly universal recognition that enhanced traceability will be required in many markets in the future.

5.6 Reporting

The cost benefit report provides a summary of the cost benefit analysis including both the qualitative factors and the quantitative aspects. It also identifies costs or benefits which are incurred at that level but charged to a supply chain partner. Once users have considered the report, they may elect to change selected variables to determine the impact of the change on the decision.

5.7 Scenario/Sensitivity Analysis

There are two types of situations where analysis of the impact of changing variables is valuable. If there is a single overall approach to traceability then a single template model is used and changes are made to that model. Within a given scenario it is important for the user to understand the variables which most significantly impact the cost/benefit results. The template identifies the most significant variables and allows the user to determine the sensitivity of the results to the factors and to observe the impact of making changes in key variables. This is provided as the single traceability case model.

If there are two entirely different traceability scenarios, the best approach is to complete the cost benefit analysis for each scenario and compare the results. A two scenario option has been provided with a summary report that links to both sheets and compares the results. The template documentation will contain instructions for analyzing both situations.

5.8 Documentation

The template is supported by user documentation that leads the user through the steps shown in Figure 2 providing instructions and explanations where necessary. This documentation is provided separately from this report and accompanies the business case decision support system. However, in the early application of this toolkit, we recommend the support of an advisor experienced with both the analysis instrument and the supply chain processes being examined.

6. Using the template

The business case template is designed as a decision support tool to assess the impact of traceability on benefits, costs and operations in a supply chain.

Implementing traceability is best considered a collaborative supply chain undertaking. We recommend that the process begin with participants meeting to agree on the data to be captured, stored and shared along the supply chain. Can-Trace is finalizing the data attribute standards and they will form the basis for agri-food traceability data management. This will establish a starting position from which food industry stakeholders can then determine their timetables and implementation approaches.

Once participants have agreed on traceability data standards and management they can analyze the impact of traceability on their organizations using the business case template. This can be done on an individual company basis, but there will be a strong need for discussion of the distribution of costs and benefits along the chain to ensure that traceability makes business sense for all parties. The pilot studies indicated a high likelihood that specific firms or value chain participants may achieve benefits with relatively low cost, while others may receive fewer benefits and need to absorb more or higher costs.

Although the template is designed as a stand-alone analytical tool, for most users it will be easier to use and provide more useful information if they are guided by a trained advisor. In this situation, the guide adds value by helping the user work through the analysis and by probing more deeply for complete responses to questions dealing with costs or benefits and their distribution through the chain. For many firms, a day or two would be all that is needed to complete the template, particularly if the firm organized most data prior to the arrival of the advisor. If more thorough investigation is needed, a third party can help with some of the workload, while providing the advantages noted above.

As discussed in Section 10, the current design of the business case analysis instrument was intentionally simplified to maximize the breadth of organizations that could use it. It is based on Excel spreadsheets because it was agreed that this format provided the optimum opportunity for others to use and improve the design. As delivered, this is an initial version of what can become a much more robust and rigorous analytical support tool and implementation guide.

More information on the use of the decision support tool is included in Appendix C.



7. Pilot Studies

Pilot studies were completed in three industries: produce, beef and pork. The primary objective of the pilot studies was to support the development of traceability standards under the Can-Trace Standards Committee. The pilot studies were also used to collect information to support the creation of the business case template by identifying specific costs and benefits of traceability in the selected firms. The information from the pilot studies was supposed to validate the business case template. Questionnaires were used to collect initial data and responses to the questionnaires provided insight into both the processes and issues at various levels of the chain. Business case team members followed up on data collected to probe about specific costs and benefits by making visits or calls to the various participants.

A significant issue emerged early in the development process. In most instances companies were unwilling or unable to provide confidential corporate information. This created a need to change the questionnaires, but firms still found the questionnaire process time consuming and many remained unwilling to provide details related to internal company operations. There are two implications of the experience with the pilot firms.

- The amount of questioning and probing required and level of uncertainty among managers answering the questions highlighted the advantages of using a consultant to help a company or members of supply chain complete the questionnaire. This approach can significantly relieve frustration and/or lack of consistency across organizations in a supply chain. It would also enable the consulting firm to maintain the level of trust and compliance from the participants that was so obviously needed during the pilot studies.
- Although confidential information is a concern for firms who participated in the public studies, this is not the case for an internal analysis. Thus it was important during the pilots to ensure that the categories or “buckets” of costs were identified, but identifying the exact (and confidential) values was less important.

7.1 General Observations across the Pilot Studies

Several factors became apparent during data collection which had an impact on final form of the business case template.

1. Many firms have track and trace capability and some kind of system for doing recalls and withdrawals. For most that we observed, establishing traceability is really about getting control over a single process or area where identity is lost. Helping firms identify where identity is lost and what specific changes are needed to maintain identity can help them more accurately assess the costs and implications of implementing traceability.
2. Recall frequency and scope vary widely by firm type and function. Retail and distributors manage numerous products and so are subject to recalls much more frequently than manufacturing firms and processors. However, recall related costs are generally passed back through the chain to the manufacturer of the product or even the producer.
3. Lack of a lot identifier or similar data element causes recall scope and costs to exceed the barest minimum that would occur if more precise identification of compromised product were possible. This was observed in all value chains. The implication on business cases for traceability is that a single adjustment to traceability practices (instituting a standard lot identification) can have substantial positive effect on traceability costs.
4. Recall benefits are apparent in reduction of scope, which can be quite significant. Recalls are relatively infrequent in most, but not all, of the companies studied. Still, the recall data collected from the pilot firms indicated significant opportunities for reductions in scope, in some cases by more than 90%. In some instances, the benefits from reduction in recall scope at one level will actually benefit other members of the supply chain, notably the manufacturers and processors.

5. Improvements in efficiency and quality attributable to traceability are more difficult for companies to identify. Many managers initially dismissed the possibility of such improvements yet after further questions and reflection did identify areas where real-time information provided in a traceability system can improve efficiency and quality. In part this is due to a predominant focus on food safety and, more particularly, recall management. Guiding managers to focus on a limited set of key processes helps them to shift thinking to identify benefit opportunities. However, identifying opportunities does not generally occur without determined probing. The template is designed to help in this regard but this is where using third party advisors can pay off. Like any other tool, the business case template is better employed by someone familiar with the tool and the situation.
6. The data collected and analysis performed will differ depending on whether the main processes in the firm are primarily feeding/growing, distribution/sales or disassembly/form change. Firms with activities in the last category face the most significant challenges in terms of traceability and consequently the greatest costs. Usually there are a very limited number of processes which result in form changes and our template will allow organizations to focus on the implications of maintaining identity in those specific activities.

Table 3 below summarizes the types of potential benefits identified in the pilot studies. Data from the pork pilot is incomplete so only some benefits have been identified at this time.

Table 3 - Summary of Pilot Study Benefit Experience

Pilot	Benefits – Regulatory Compliance Benefits	Benefits – Customer Requirements	Risk Management – Recall Scope/ Recall Time	Benefits from Efficiency/Quality
Produce	Not Identified	Yes	Significant	Not identified
Beef	Yes	Yes	Significant	Yes
Pork	Yes	Yes	Significant	Incomplete

8. Produce Pilot Study

8.1 Background

The produce pilot study included participants from growers through to retail and food service. The Canadian Produce Marketing Association (CPMA) identified traceability as a significant issue for the produce sector. A 2001 CPMA survey found that less than thirty percent of suppliers put bar codes on their pallets of boxes shipped. Those that did often used their own system, with no supplier ID and they used a variety of formats. The low adoption of traceability technologies and the lack of a common data standard would dramatically reduce the ability of stakeholders to respond to a food safety recall.

The issue of produce traceability is becoming increasingly important as the industry undergoes significant changes. Concentration at both the retail and distribution levels means that more products are flowing through a limited number of logistics locations and then flowing out to many retail locations. This magnifies the consequences of an untraceable recall. Rising produce movement (both domestic and import), increases supply chain complexity and the importance of traceability. In addition, new opportunities like organic produce, require traceability systems to assure consumers that they are actually receiving products which are produced under organic standards.

From a produce firm perspective, industry wide standards reduce the risks associated with investments in traceability systems. When companies make an investment they are assured that the system will capture, store and communicate data relevant to supply chain partners. To assist Can-Trace in setting and verifying standards 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.

8.2 Identity Preservation through the Supply Chain

There are two areas of the produce supply chain where identity of the product can be lost. Where product is not field-packed and is subjected to storage and/or sorting operations prior to packing, traceability back to growth date and field of origin can be lost. When product is withdrawn from its case packaging and used by food service or displayed in retail product from multiple origins, it is typically blended together and unique identification can be lost. Also, as first-in, first-out handling principles cannot be guaranteed in these situations, identification can be further jeopardized.

8.3 Benefits Perceived By Participants

Participants acknowledged that the scope of recall can be reduced by implementing enhanced traceability systems. This leads to lower recall costs not only within the individual participant, but across the supply chain as a whole. There are costs associated with automating some business processes, but the overall benefits from automation (especially relating to speed and accuracy in data collection and management) should offset these.

The costs of recall are not necessarily borne by the level accruing the costs. The costs tended to be pushed back

down the chain and there are frequently negotiations over the costs and who will pay them. Reduced scope of recall can, thus, reduce both recall and related financial management activities associated with the recalls.

Improved response to food safety concerns was identified as a key benefit of traceability. Other perceived benefits included:

- faster responsiveness to changing customer demand;
- improved corporate reputation, or at least minimize negative impacts;
- increased product quality through better access to quality data;
- reduced liability;
- improved customer and government audit support and;
- reduced lost sales due to reduction in scope of recall.

8.4 Costs of Adding Traceability

In many cases the firms participating in the produce pilot study have much of the technology they require to implement traceability; so the technology costs and challenges for them may not be as significant as the industry generally perceives them to be. Participants showed some concern over the potential for increased labour costs associated with collecting traceability data. Automated systems can reduce the cost of collecting and managing data, as well as significantly reduce or eliminate errors in the information.

As some traceability benefits can only be achieved when an entire product supply chain is adequately traceable, a high degree of collaboration and industry planning will be required to oversee the delivery of whole-chain benefits. This notion will in turn lead to the whole question of cost-benefit allocation and balancing where in the value chain costs exceed the benefits and where benefits exceed costs.

8.5 Validating the Business Case Template Using the Produce Pilot Study

We have applied the model using the data from one of the participants. In Appendix 1, we have also illustrated how the next step of analysis can be taken using the 3D Visible Enterprise. Although the results are somewhat generalized since complete cost data was not available it is apparent that there may be significant benefits from traceability. It is also obvious that moving to the next level of modeling can provide a much more comprehensive and thorough examination of the impacts across the entire chain and a detailed implementation plan.

9. Beef Pilot Study

9.1 Background

The beef pilot study included participants from primary processing through to retail and food service; no producers were included in this pilot, however CCIA was an observer and did help with mock recall data validation. The pilot began in late June and was concluded in August.

The three scenarios followed for this sector's pilots were:

- **Scenario 1:** Defective beef product identified at retailer.

Trace back: Retailer -> Distributor -> Two Secondary Processors -> Two Primary Processors -> Regulator (ear tag data to CCIA)

- **Scenario 2:** Defective beef product identified at retailer.

Trace back: Retailer -> Wholesaler -> 1st Processor -> Regulator (ear tag data to CCIA)

- **Scenario 3:** Defective beef product identified by Primary Processor.

Trace: 1st Processor -> Wholesaler -> Retailers (multiple sites)

Various players in the beef industry including producers, processors and distributors may initiate recalls. Government agencies may also request a recall. When a recall is initiated, the federal regulatory agency, the Canadian Food Inspection Agency (CFIA), must be contacted using a specified notification procedure. The CFIA oversees recall activities by registered establishments to ensure the necessary recall steps are taken. If a company refuses to recall product that the Health Protection Branch of Health Canada evaluates as a health hazard and the CFIA has the legal authority to intervene. Enforcement actions can be taken during and after a recall.

9.2 Identity Preservation through the Supply Chain

There are two areas of the beef supply chain where identity of product and/or ownership can be lost. One is at the producer side; the other is at the processor/abattoir. Cattle are fitted with ear tags at the farm level very early in their life. These tags are purchased by the producer/farmer and recorded with CCIA, but then the data is not universally tracked as the animals move through sale barns, transport or feedlots. The observed variance from 'perfect' tracking (based on the pilots) was around seven or eight percent. More robust tracking of the devices would lower the scope and cost of withdrawals or recalls; plus it would raise the level of consumer confidence in the ability to trace back suspect beef back to its source.

At the producer level the challenge is to create a system which easily allows handlers to capture and report the data (perhaps to a central agency like the Canadian Cattle Identification Agency) and at the same time recover the cost of the identification tag once the animal is killed and processed. Such a system is in place now, but due to the varying capabilities of the members of the supply chain at the farming and live handling level, the system is less than perfect.

The second challenge for beef traceability is at processing. For many firms maintaining identity through slaughter to packaged beef cuts is not yet complete. Once the beef is packed into boxes it can be tracked forward through the chain (generally using bar codes and case identification), but currently it is not possible to match packaged beef output to incoming live animals. The gap in identity occurs between where the animal is killed and the carcass cut into primal and sub-primal pieces. Filling this gap could reduce the scope of recalls substantially, and perhaps provide a way to improve yield on the kill floor.

9.3 Benefits Perceived by Participants

Processors can greatly reduce the costs of withdrawals and recalls by closing the window of production as tightly as possible. One extreme argument would be to narrow the identification to the single steer or side of beef. While theoretically possible, the more practical approach is to reduce the window of identification to smaller lots than currently applied – typically a shift of production lasting one or more hours.

With the recent experiences of the beef industry around BSE, participants viewed meeting future regulatory requirements as the main motivating factor for traceability and one which would give the industry greater credibility and provide export market advantages in the future. At this point, they arguably did not feel that there was a significant market-customer requirement for traceability, with the exception of selected export markets, like Japan. Potential reductions in recall scope by maintaining identity through processing are large; on the order of 90-95% for two participants that were observed. However, as recalls were a rare event for these firms, the expected annual monetary advantage was small.

Firms also identified efficiency gains in data collection and management and in processing yield improvements through real-time adjustments to processes using the tracking data.

9.4 Costs of Adding Traceability

Costs of adding traceability for a beef processor include costs of rugged tracking technologies to accompany a carcass from slaughter to cut-up. This will involve tracking technologies attached to hanging hooks as well as readers and tags on trays of meat as the carcass is disassembled. In addition to tracking technologies, process changes may be required to separate lots to avoid potential cross mixing of lots. RFID is being investigated across the industry as one tool that may deliver on the promise of that technology.

It is not simply enough to track individual animals for issues like bacterial contamination. Lots must be treated individually and clean-out must be completed between lots in order to reduce recall scope.

9.5 Validating the Business Case Template Using the Beef Pilot Study

The business case for traceability in the beef industry can be made based on two key factors. The most important currently relates to BSE and the ability of the industry to regain and then maintain export markets. This factor, relating to regulatory compliance, can more than justify the investment needed in the industry at this time to implement full traceability.

In addition, valid support for enhancing traceability comes from reductions in recall scope, reductions in data collection costs and improvements in efficiency in the beef supply chain. The business case template was useful in identifying these potential areas of benefits; however the lack of specific data from the participants did not enable the team to develop comprehensive industry benefit figures.

10. Pork Pilot Study

10.1 Background

The pork pilot was initiated late in the second phase of Can-Trace. The timing of the pilot study for pork made using meaningful data from the various participants difficult. We were able to confirm that the scenarios used for the mock recalls did not introduce any new areas of cost or benefit; however there was (as with the other product pilots) little specific data with which to validate the template.

Within the Can-Trace Pork Pilot Project, there were two supply chain scenarios analyzed for one up/one down tracking and tracing. These chains were:

- **Scenario 1:** Farm » Abattoir/Primary Processor » Distributor – Retail & Foodservice
- **Scenario 2:** Farm » Abattoir/Primary Processor » Further Processor » Distributor – Retail & Foodservice

10.2 Identity Preservation through the Supply Chain

One of the findings of the pork assessment was that the Canadian Food Inspection Agency (CFIA) is investigating several ways in which pork producers could uniquely identify hogs. At the present time the only lot identity for hogs is the barn number (usually tattooed on the animal) and the day they are shipped to the abattoir or other processor. While this enables trace back to a particular batch of hogs and a specific producer or barn, it does not limit the scope of a recall to the actual compromised product. It is also more difficult to capture the data as it must be entered manually on the processing floor.

In addition, there is a potential loss of identity when hogs are moved through brokers before shipment to a final destination. Brokers and third party logistics companies generally do not have the identity track and trace systems in place to assure direct traceability. Most systems used by these firms are for tracking financial transactions and ownership, not individual animal identification.

Bar codes (EAN.UCC 128) are used by most processors for carton identification of a batch or lot of product, but the data contained in the bar code can vary widely from one source (processor) to another. The lack of a standard set of traceability data, even though the global identifier is being used, results in potential misidentification of product; or at least in delay to identification. It is also important to note that bar codes to carry product information are by no means universally used.

All of these issues contribute to increasing the scope and potential severity of a pork recall. The introduction of common traceability standards and unique animal identifier can help significantly reduce the cost of recalling large batches of animals. In some scenarios it can be argued that the scope reduction is at least 90%, if product from only a single animal is compromised. The observed "overage" during the mock recalls was about ten to twelve percent more cases of product than actually affected.

10.3 Benefits Perceived by Participants

The perception of the benefits from introducing more universal traceability standards and unique animal identification has penetrated across the pork supply chain. The main areas of interest are in reducing the scope and severity of product recalls and withdrawals, plus increasing market share in export markets. The building of reliable and robust traceability is seen as mandatory for companies wishing to grow export revenues, particularly in the Asian market.

10.4 Costs of Adding Traceability

The cost of improving traceability for the pork value chain could be significant for some stakeholders. Costs of adding traceability at the farm will include costs of rugged tracking technologies to accompany an animal from the ship point to slaughter. Then there is the cost of retrieving any temporary identification from the carcass, such as RFID tags.

The main costs for maintaining identity integrity are likely to be highest at the processor since that is currently where a gap in identity occurs. Tracking technologies within the slaughterhouse are being individually investigated, such as attaching RFID to hanging hooks as well as readers and tags on trays of meat as the carcass is cut.

In addition to tracking technologies, process changes can be used to avoid mixing information from multiple lots; this would require training staff in new methods of production.

10.5 Validating the Business Case Template Using the Pork Pilot Study

The business case in favour of traceability falls mainly into two areas: the reduction of scope of recalls, and the increase in market share in export markets. Time spent gathering information and coordinating the recall process with supply chain partners did not appear to be a significant barrier during the mock recall scenarios used.

While it seems apparent that an increase in yield and productivity can be achieved through the automation of traceability processes, the track and trace processes were not studied for their impact on operational efficiency increases. As in the beef pilots, we suspect that there is potential for raising the yield on the cutting floor if better yielding hogs can be traced back to specific suppliers and grow conditions.

11. Conclusions & Future Considerations

The business case template developed in this project is a decision support system designed to help supply chain members understand the implications of traceability for their firms. It captures the benefits of traceability and compares them to the costs of implementing the system and allows consideration of both quantitative and qualitative benefits. The template is designed to be used as a first step in the process of moving to enhanced traceability.

Step One: Understand the Value of Traceability – By truly understanding the potential costs and benefits of traceability, firms can decide whether to move ahead on implementation or wait. The decision support system developed during this project can be a key tool to help.

Step Two: Create a Plan and Investigate the Benefits – If the decision is made to enhance traceability, the next step is to construct a detailed plan and a more accurate assessment of the implications of traceability (upon costs and business process) at a much deeper level of detail. The results of the business case template feed into this planning process. The detailed plan can be targeted at achieving and maximizing benefits identified in the template.

Step Three: Conduct a Pilot and See how it Works – As mentioned, it is clear from an implementation perspective that the analysis process will be more accurate and comprehensive if the user is coached and advised through the process.

This can be achieved using an outside consultant or by training users. One reason for seeking third party advice is we found that users do not fully consider all potential benefits that may be derived from the enhanced management information that traceability provides. Second, employing a third party to assist with analysis of one or several levels of a supply chain can provide a more comprehensive picture of what is required to implement and manage a traceability system and what benefits the system might provide to the chain. Third, from a cost management perspective, using an advisor to deliver the analysis enables most firms to continue to focus attention on their operational issues and is simply a more efficient use of scarce resources.

Step Four: Continue to Evolve and Improve – The business case template developed under this project is a Microsoft Excel-based tool meant for use on individual computers. This was done for two reasons. It helps smaller firms use the modeling tool with little or no investment. It also addresses the privacy concerns expressed by pilot study participants.

Step Five: Address the Balance – RCM Technologies identified that the benefits of implementing traceability are whole-chain wide and the costs are also distributed throughout the value chain. In using the business case template it is important for chain members to understand where costs and benefits occur and develop strategies which maximize total benefits and minimize incremental whole-chain costs. How those costs and benefits accrue to individual firms needs to be addressed by the sector.

We have seen opportunities for companies or value chain members to reduce the costs of traceability through collaborative projects such as the implementation of information portals and data exchanges. These technologies can simplify implementation for less sophisticated users and for smaller enterprises (SMEs), as well as lower the costs of ownership. Industry approaches to implementation through the use of common templates and consulting services can reduce costs, increase consistency of analysis and simplify analysis and implementation.

This business case project delivers a template to help agri-food organizations assess the anticipated impact of traceability on their organizations and supply chains. The information used by individual firms to complete the

template will be based primarily on management forecasts and perceptions of potential costs and benefits. It will be important for later projects to test the accuracy of management perceptions so that future business cases may be based on more accurate information of the true costs and benefits of traceability over an extended period of time.

RCM Technologies Canada would like to thank Can-Trace for trusting us with this critical first step in the whole-chain traceability initiative.



Appendix A – Verification & Next Level Simulation of the Supply Chain

In order to more fully explore or analyze the cost-benefit of enhanced traceability and further examine the business processes affected by changes to track and trace activities, we applied the Unisys 3D Visible Enterprise™ method to the entire produce supply chain. This appendix is intended to show a narrow glimpse into that method and is illustrative only.

This appendix does not contain comprehensive information generated from the analysis; however it displays some of the primary capabilities of that methodology. More complete analysis would require specific data from participants across the value chain, which we were not provided in this project.

If process modeling and/or simulation is warranted or desired, the 3D Visible Enterprise™ approach can be very useful. It does require experienced consulting assistance and in-depth examination of business processes and accompanying financial data.

Key Assumptions

The following key assumptions comprise the basis of the modeling, simulation and findings:

1. Quantified benefit from strategic improvement opportunities;
2. Quantified benefit from the process and operational efficiencies accruing from a comparison or delta of activity based costing (ABC) between the current and future scenarios (future with the assumption that track and trace have been enabled); and
3. Costs of enabling a track and trace capability or “portal” across the relevant supply chain processes;
4. One participant provided the primary data and ratios for the supply chain analysis illustrated.

This documentation addresses the deliverable of Unisys of providing RCMT the process scenarios, simulation of cost benefit impacts, simulation and finding reports given the available survey, research and interview materials. Because only one participant’s information was used to fill the example show here, the outcomes are very conservative and not reflective of the entire supply chain.

These assumptions and findings are intended to be used for providing the parameters and metrics for the project’s development of cost-benefit analysis and business case tools around the track and trace initiative.

‘Swim Lanes’ and Value Chain

The model simulates exchanges (one up/one down) of costs and value and transaction volumes, expressed in cases and processed recalls, and are grouped into 1) Traceability Related Supply Chain processes and 2) Recall processes. The value chain assumes these two groups of processes and interaction across the following industry segments (please see Business Interaction Model for details) with the following transaction volume and value parameters used throughout the value chain:

Suppliers

- Local or domestic suppliers
- Foreign and imported suppliers or produce

Wholesale Distribution Channels

- One participant as a case in point and basis for extrapolation to industry level
- Generic Wholesale Distribution Channels

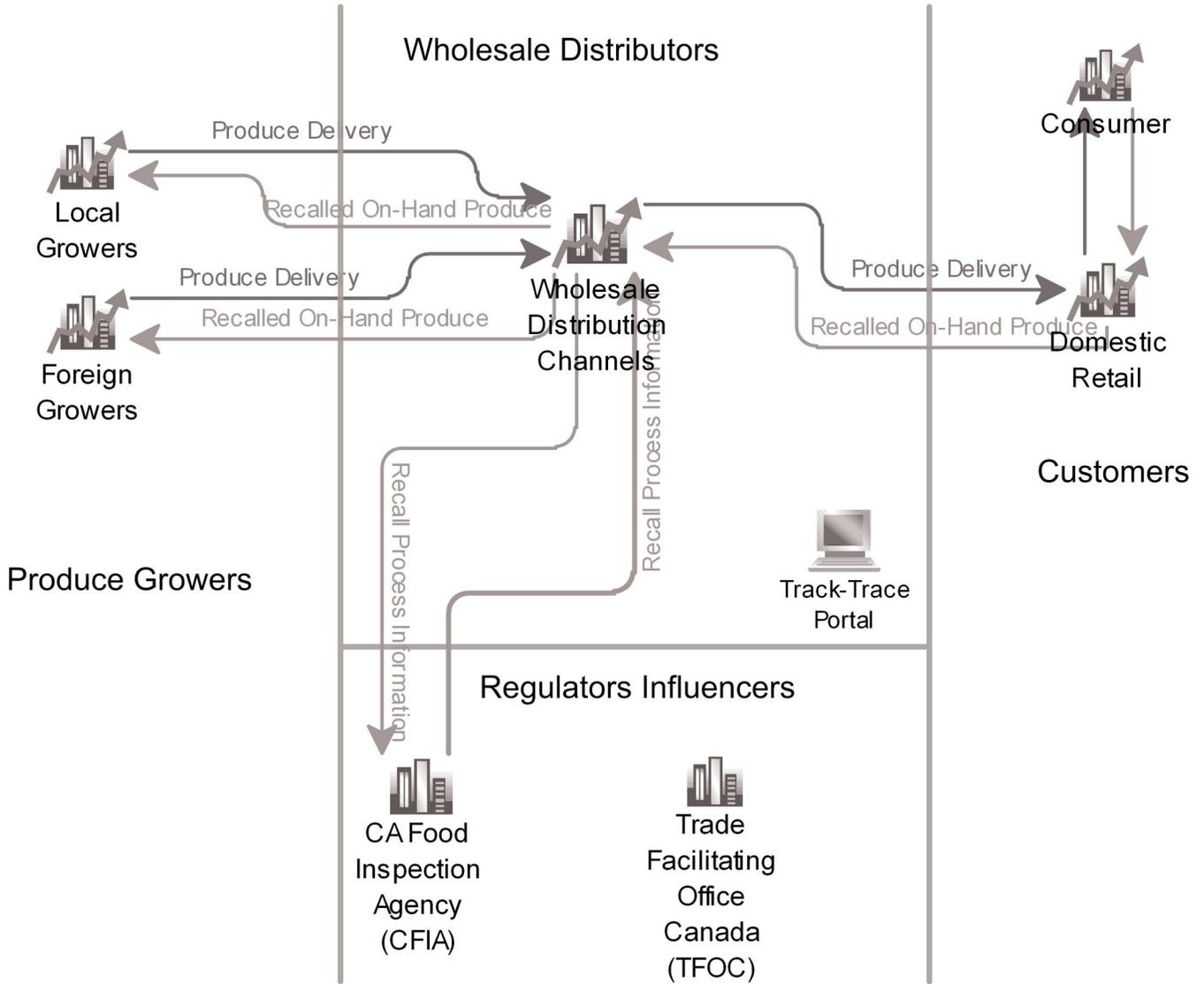
Regulators and Influencers

- Canadian Food Inspection Agency (CFIA)
- Trade Facilitating Office Canada (TFOC)

Customer or Retail Market

- Domestic Retailers
- Local Consumers

Produce Business Interaction Model



Generic Processes

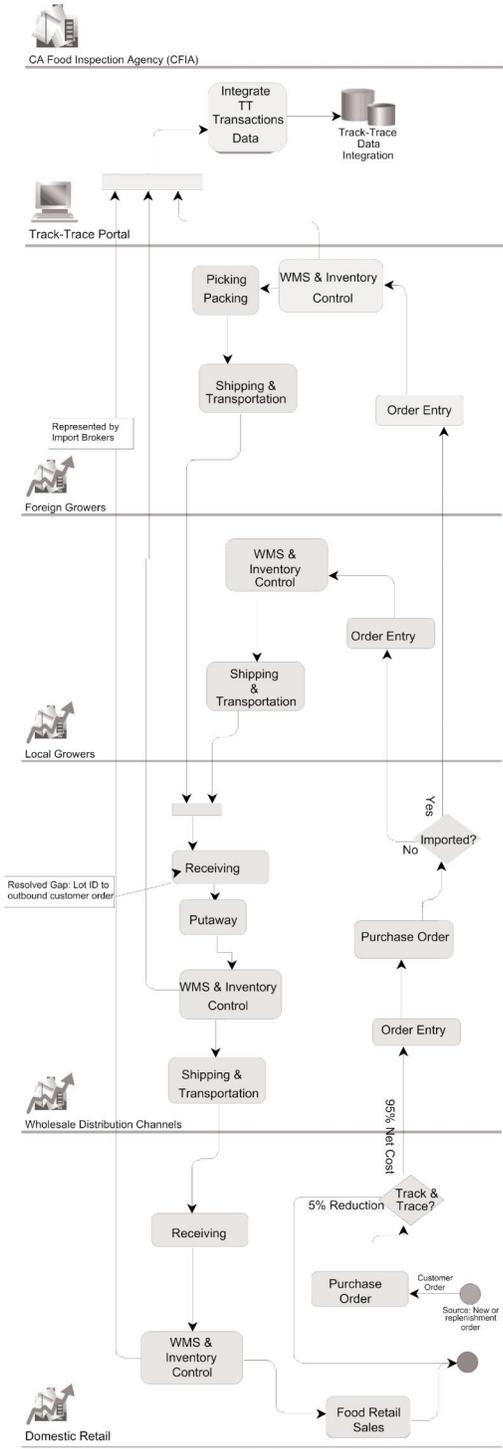
The following generic processes have been identified for the cost benefit simulation and are grouped into two process workflow/swim lanes models – 1) the Traceability Related Supply Chain and 2) Recall Process models.



Traceability Related Supply Chain Processes

This model constitutes a series of Supply Chain processes that involves industry segments represented by "swim lanes". The "swim lanes" include Canadian Food Inspection Agency (CFIA), foreign growers, local or domestic growers, wholesale distribution channels, domestic retail market. Traceability generic processes based on a future scenario that flows through the swim lanes are illustrated in the process entry model in the figure below.

Traceability Supply Chain Future Scenario



Simulation Process Cost and Volume

Traceability Related Supply Chain Processes Volume and Cost Assumptions

The table below shows the industry level data provided for the costs and volume of the Traceability Supply Chain models. It uses one of the participant produce company's average annual revenue ratio and estimated average cost per case to derive and roll up the volume figures across the main sources of produce supply. For details of the computation please see the attached Computation and Assumptions excel sheet. This is a very rough estimate and would require further validation before being considered a reasonable accurate average of the industry. Nevertheless it is instructive.

Annual Produce Gross Revenue	\$6,000,000,000	% Ratio
Import	\$3,500,000,000	58.33%
Domestic	\$2,500,000,000	41.67%
Correlation using Participant's Figures	Ratio	Respondent Avg. Cost/case
Annual Revenue Ratio	13.33%	23
Volume of Cases		
Import		84,402,500
Domestic		60,287,500
Total Case		144,690,000
Traceability/SCM Optimization Estimate - 2.50%		\$3,617,250





Recall Processes Volume and Cost Assumptions

Recall Cost and Volume for recall related supply chain:

The table below indicates the estimate of total yearly recalled produce product in volume in cases/unit, and corresponding dollar value. This data provided the costs and volume parameters of the Recall/Supply chain processes and cost savings simulations of the 3D Visible Enterprise™ models.

Distribution of Recalled Cases per Segment	Distribution %	Class 1 (Lev 1) Volume	Class 1 (Lev 1) Distrib. Value	Class 2 (Lev 2) Volume	Class 2 (Lev 2) Distrib. Value	Total Volume
Domestic Retail	40.0%	10,418	\$243,000	26,044	\$607,500	36,462
Wholesale Distributors	20.0%	5,209	\$121,500	13,022	\$303,750	18,231
Local Growers	16.6%	4,341	\$101,250	10,852	\$253,125	15,192
Importers	23.3%	6,077	\$141,750	15,192	\$354,375	21,269
Total Recalled Cases Per Year	100%	26,044	\$607,500	65,111	\$1,518,750	91,155

Note also that the Distribution % provides for the linear increase or decrease of volume of recall in case units (as well as the volume of recall information processed for the table below) as the recall processes goes up or down the swim lanes. It is further assumed that the increase as the process goes up the Domestic Retail is at least double (40% vs. 20%) the origin of recall request, i.e., Wholesale Distributors.

Annual Recall Transactions Processed

The table below represents the estimates used for the total yearly recall cases/transactions managed by the Canadian Food Inspection Agency.

Note: a single recall managed by the CFIA will spawn multiple recall cases/transactions downstream in the supply chain that will need to be managed by individual participants.

Recalls Processed			
Degradation of Recalled Cases per Segment	Class 1 (Lev 1)	Class 2 (Lev 2)	Total
Domestic Retail	60	150	210
Wholesale Distributors	30	75	105
Local Growers	25	63	88
Importers	35	88	123
Total Recall Cases Per Year	150	375	525

Gap Resolution and Solutions Enablement Costs

The following gaps are identified in current processes with traceability and recall (track back) data and process requirements. These are used to identify future scenerios, and enabling recommendations at a higher level that could lead to realization of benefit opportunities, as well as traceability supply chain and recall process efficiency cost benefits.

Trace and Trace Portal Enablement	
Gaps	Recommendations
Non-compliance with Track and Trace Data and disparate existing legacies	Data and application integration processes and enabling solution – will provide for the database, application, portal access and integration environment for existing legacies and track and trace data requirement's implementation.
Recall processing take time and longer cycles increasing recall costs	Case and workflow processes and enabling solution – will automate the management of recall instances and cases, as well as associated workflow processes from filing to approval of closure.
Non-standard identification; manual based systems and lack of ID capture	Standard code implementation and enabling solution (e.g., RF and RFID) – To provide for bar coding and standard code (GTIN, COOL, SSCC) implementation on a mid-market scale. HW includes scanners, barcode printers, barcode SW, barcode readers, and integration into existing backend systems. It is further assumed that as mid-market solution, estimated number of users would be around 100 users. Does not include retail or point of sale components.





Benefits

Hard Benefits Findings

Track and Trace Hard Benefit Opportunities		Upfront	Annual
Market Recovery Improvement	<p>"...Would lead to improved customer confidence in our ability to control goods and look after their (customers') best interests."</p> <p>Six billion produce market, a major level 1 contamination, may have an approximately .018% market loss over the year immediately following an event. This may be equivalent to \$1.08M revenue losses. Traceability will at minimum recover at least 50% of these losses, or 500,000 for the first year and roughly 1/5th rate of recovery for the long-term effects. Loss may exceed .018%.</p>	\$500,000	\$100,000
Market and Revenue Growth	<p>Six billion produce dollar market, a major "level one" contamination may reverse the market growth of 8% over the year immediately following an event. This is equivalent to .0018% of \$4.8B revenue losses. Traceability is estimated to recover at least 45% of this losses, or \$40M for the first year. Order of magnitude TBD.</p>	\$864,000	\$200,000
Recall Direct Costs Reduction	<p>In event of a major produce segment (e.g. vegetables) Level 1 contamination scenario (market size in 2003 is \$2.7B) and assuming a recall cost of .018%, this would amount to net revenue loss of \$2.1M. Based on estimate direct recall cost savings of 40%.</p>	\$850,000	\$85,000
Recall Opportunity Costs Reduction	<p>Comparison of the current and future traceability scenario cost grid comparison reports – TBD.</p>		
Liability Insurance Cost Reduction	<p>Traceability will provide companies the opportunity to engage their insurance provider to reduce the cost liability insurance. Each participating company will need to examine their cost and compute annual savings.</p>	TBD	
Inventory Turnover Improvement	<p>Traceability will provide improved inventory visibility. Leveraging traceability companies will be able to reduce the cost of inventory and shrinkage. Each participating company will need to examine their cost and compute annual savings.</p>		
Total		\$2,214,500	\$385,000

“Soft” Benefits Findings

Track and Trace "Soft Benefit Opportunities	
Regulatory & Legislative Compliance	Improved CFIA recall procedure management: Reduces the investigation time of inquires from customers and consumers. The system decreased consumer inquires by phone and the time answering inquires was reduced. Reduction in time needed for product history investigation.
National Security	Helps to reduce illegal/contaminated or "black market" products from being introduced into the market. Protects company market share and builds consumer confidence and brand identity.
Litigation Risks Mitigation	TBD
Enhanced Customer Confidence	Improved CFIA recall procedure management.
Resolution of Track Trace Data Gaps	Provides for the analyzed track and trace data requirement's compliance and implementation.

Costs

Track and Trace “Portal” Solution

The table below represents the technology required to enable a medium size company to implement a reasonable track and trace solution. The cost assumes a company has installed a mid-market ERP solution, or has comparable capabilities, and the expense would be additional add-on modules to an existing infrastructure.

Track and Trace Portal Enablement	Implementation Cost Of Ownership (ICO)	Annual Recurring Costs
Track and Trace Integration	\$364,000	\$35,000
Recall Workflow and Case Management	\$125,000	\$21,250
Barcoding Solution	\$60,000	\$19,200
Total Enablement Cost	\$549,000	\$75,450





Simulation Cost and Benefit Summary

The following table presents comparative data and net benefits as result of comparing benefits to the cost of enabling track and trace, and traceability capabilities in the produce industry.

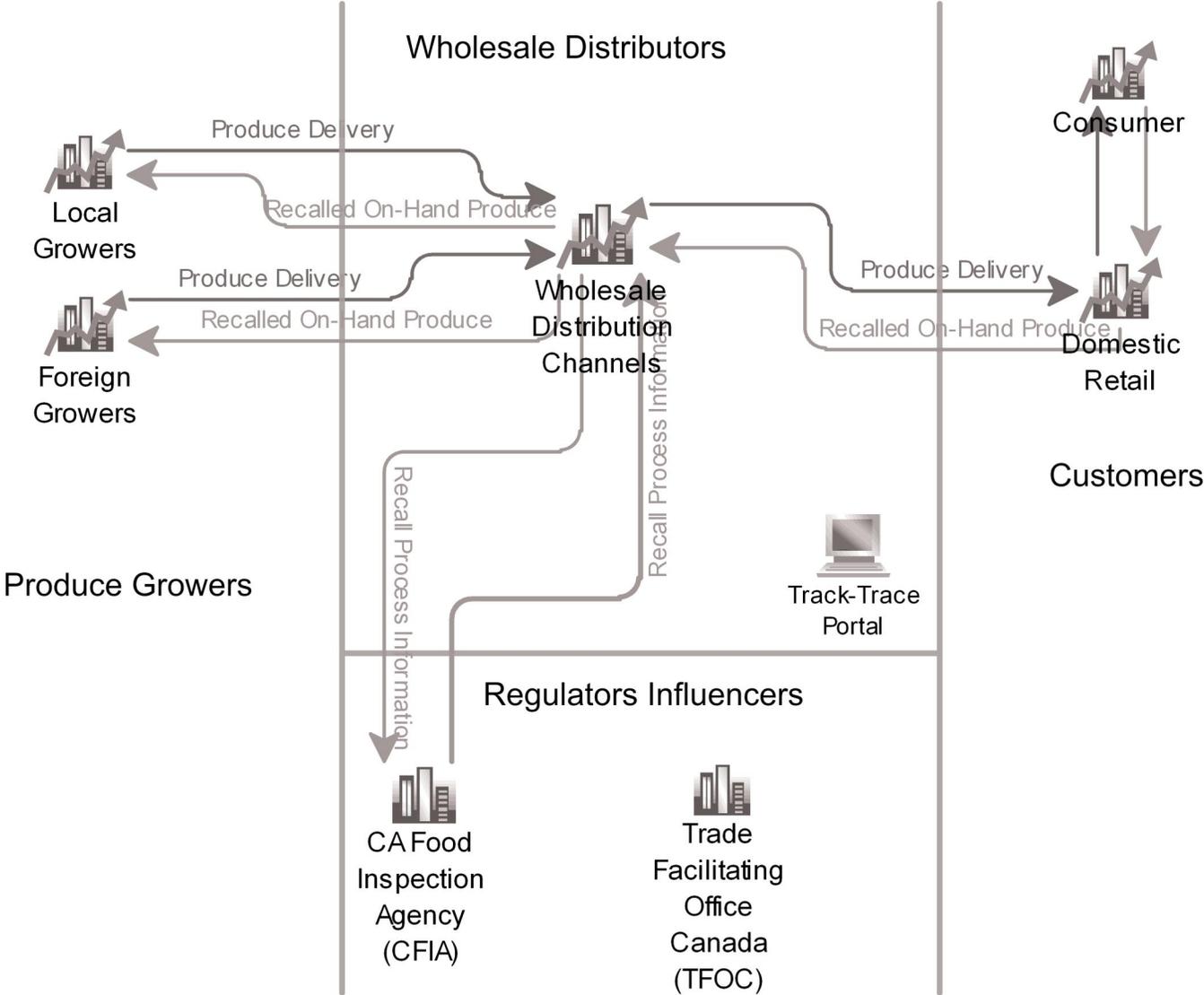
Items	Roll-Ups			Totals
Total Strategic Opportunity Benefits	\$2,214,500			\$2,214,500
Traceability Process Cost Delta Summary				\$4,557,737
Industry Segments	Current	Future	Delta (Cost Savings)	
Produce Traceability and Recall Current (Produce Traceability Current)	\$117,206,138	\$112,648,401	\$4,557,737	
Domestic Retail	\$26,297,407	\$25,320,750	\$976,657	
Wholesale Distribution Channels	\$43,226,139	\$41,251,120	\$1,975,019	
Foreign Growers	\$30,189,570	\$28,496,695	\$1,692,875	
Local Growers	\$17,493,022	\$16,928,730	\$564,292	
Recall Delta Summary				
Industry Segments	Current	Future	Delta (Cost Savings)	
Produce Traceability and Recall Future (Produce Recall Future Scenario)	\$605,095	\$368,064	\$237,031	\$237,031
Foreign Growers	\$139,009	\$71,409	\$67,599	
Local Growers	\$58,763	\$46,015	\$12,748	
Wholesale Distribution Channels	\$11,249	\$7,667	\$3,582	
Domestic Retail	\$395,122	\$242,415	\$152,706	
CA Food Inspection Agency (CFIA)	\$950	\$556	\$393	

Total Process Cost Benefits				\$7,009,268
	Track and Trace Solution Cost			
	Total Cost / entity		# of Entities	
Trace and Trace Portal Solution	\$549,000		8	\$4,392,000
Net Benefit				\$2,617,268

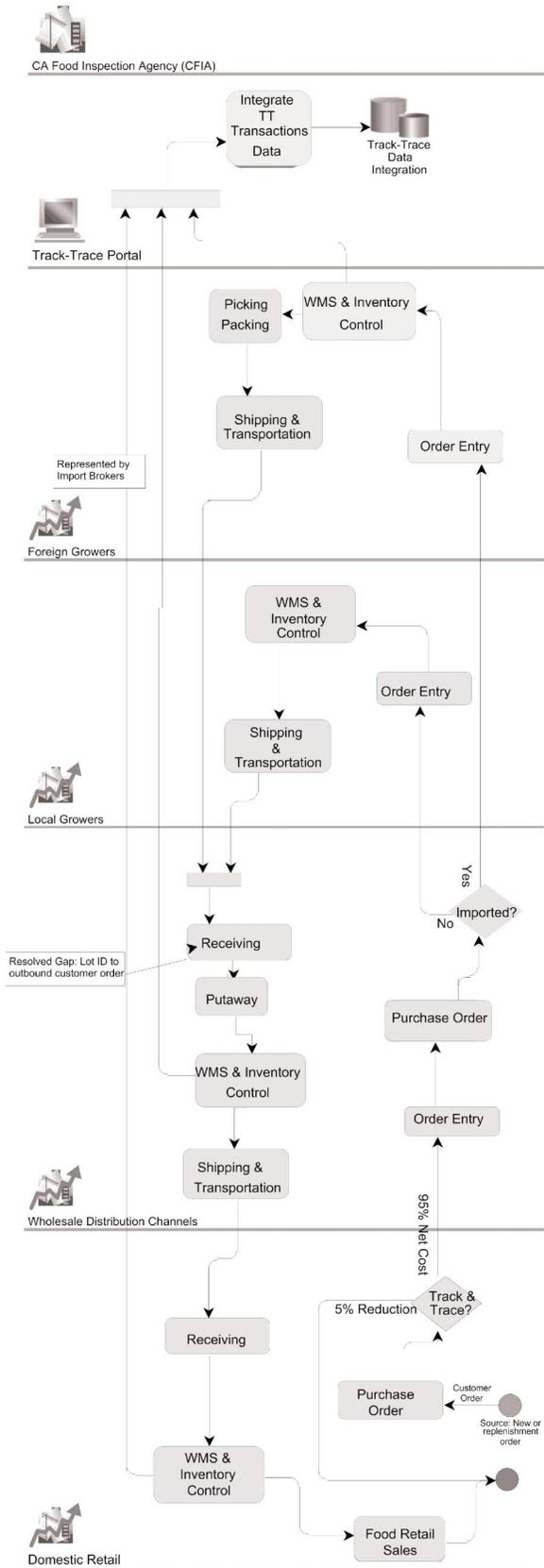
Note: Net benefits of traceability will increase as the number of entries/companies increase.



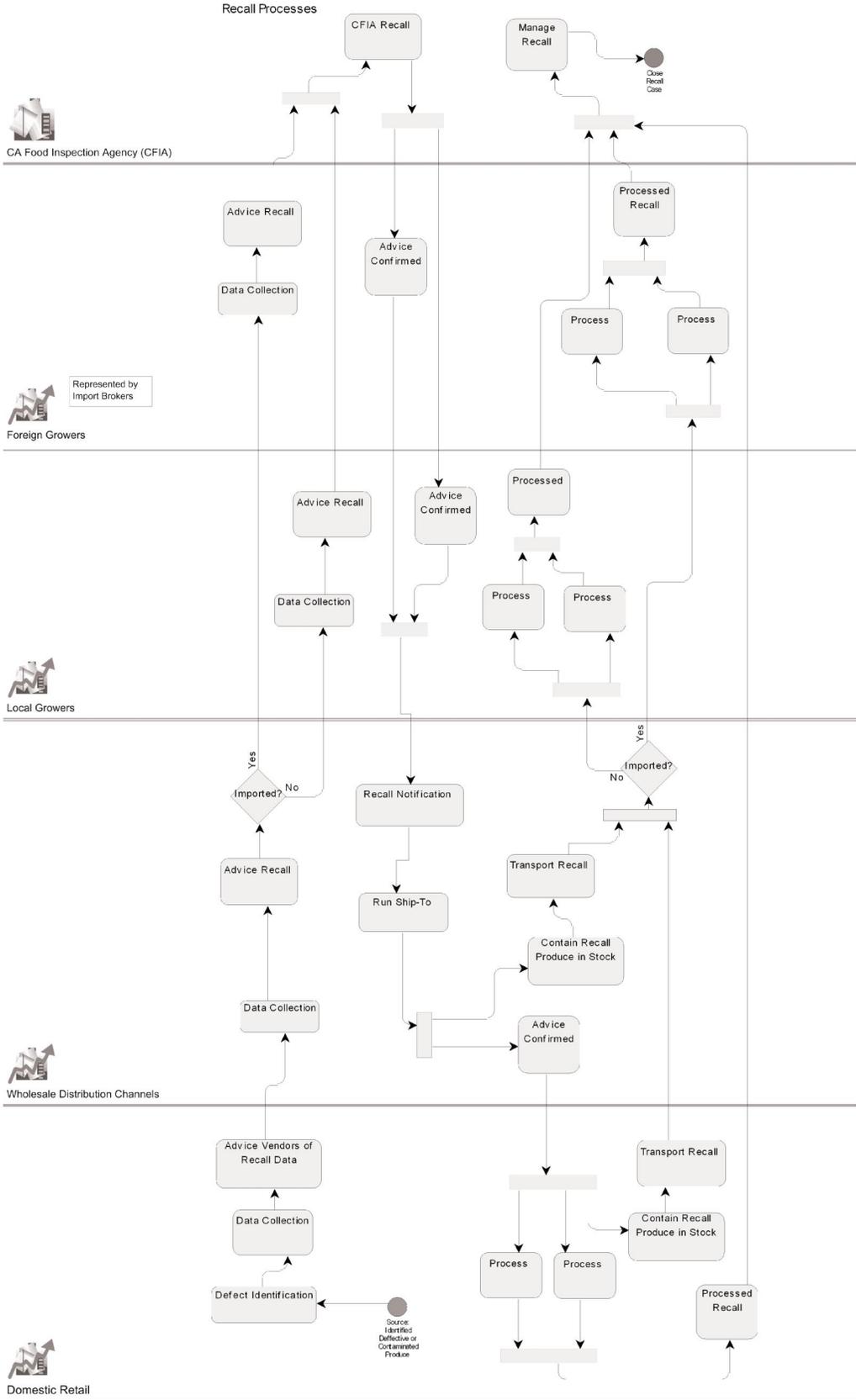
Business Interaction (Value Chain) Model



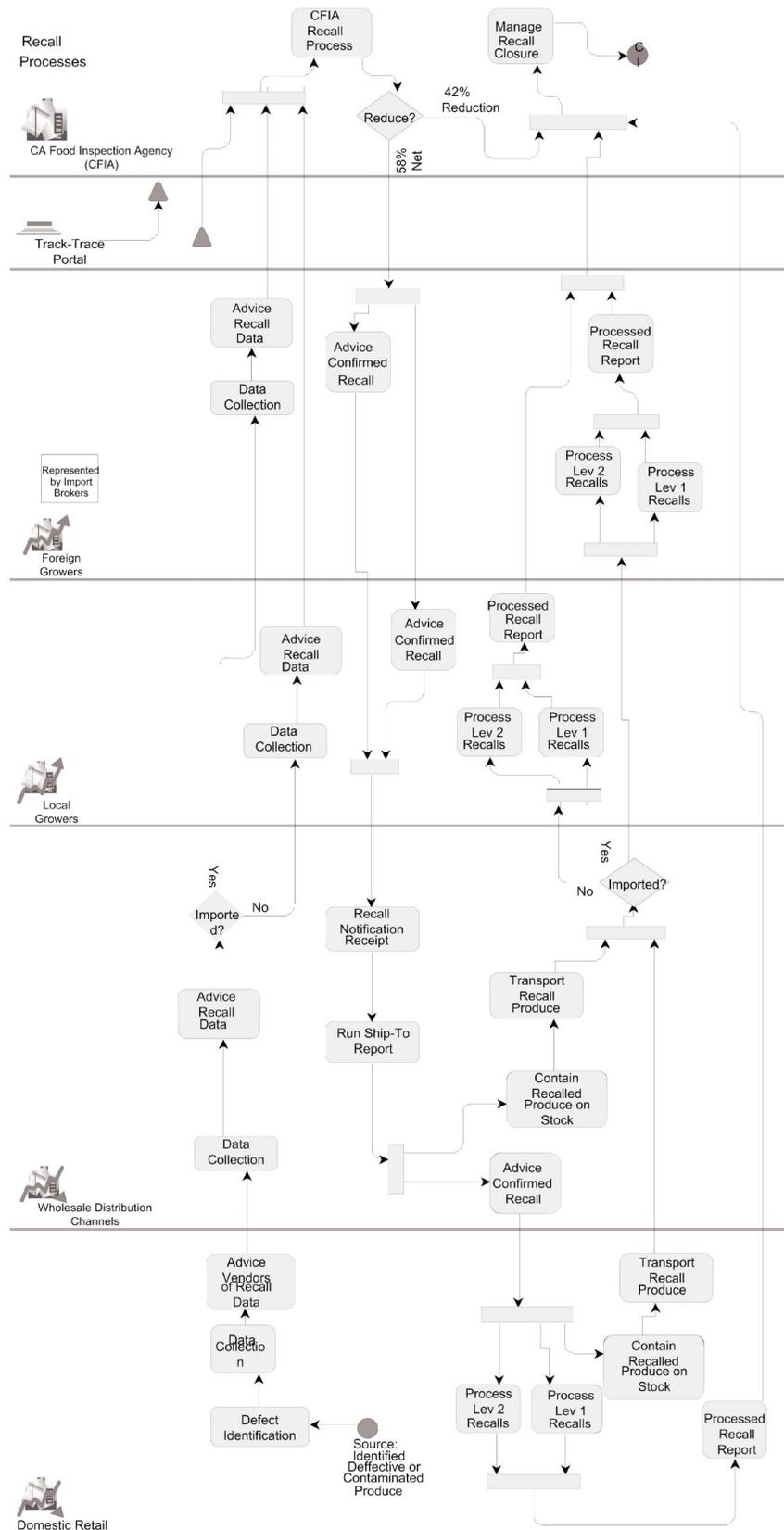
Traceability Work Flow – Future Scenario



Recall Work Flow – Current Scenario



Recall Work Flow – Future Scenario



Appendix B – Financial Analysis Explanation

For the purpose of this section, cost-benefit model refers to the methodology and calculations underlying the business case template. This section should be read in the context of Section 3.1 in the main report.

The cost-benefit model performs a five-year net present value (NPV) on the incremental cash flow before tax and interest, or benefits less costs, resulting from a company's implementation of traceability technology. As the model is intended to be robust and cover a wide range of possible company sizes, industries, and situations some simplifying assumptions were made.

Benefits

For the various benefit areas in the model (see Section 3.1), an annual level of benefit is projected from Year 2 by comparing the projected future state of a company if it implemented traceability technology versus remaining at status quo. The model values the benefits at nil in Year 1, at the full amount in Year 2, and at the Year 2 level for the remaining projection period (Years 3 to 5).

The above is a simplifying and generally conservative approach. Most traceability implementations should take 2 to 6 months to implement, so a company would start to enjoy some benefits from Year 1. In Year 2 the model may slightly overstate the benefit as a company may still be going through the learning curve of its implementation. For Years 3 to 5, the model's assumption of constant benefit is conservative since we project traceability requirements from governments, customers, and consumers will likely continue to increase.

Costs

Per Section 3.2, costs may be incurred during implementation and on an ongoing basis costs. The model assumes the implementation costs will be at 'time zero' and the ongoing costs will commence from Year 1. This is a conservative assumption since implementations take 2 to 6 months to complete.

Taxation and Discounting

The user is given the option to select their own discount rate to apply on the net benefits to perform the net present value calculation. The 'Net benefits' refers to benefits less costs before taxation (the model does not apply tax to the bottom line incremental cash flow). Therefore, the discount rate to be used must be a discount rate before taxes.

Appendix C – Business Case Decision Support System Instructions

The Can-Trace Business Case decision support tool is designed to help you build your business case for traceability. The 'template' is a Microsoft Excel based decision support system to enable you to better understand the impact of traceability on your business and assess the costs and benefits of traceability to your organization at a high level.

Its main purpose is to provide a framework and thought process to help you organize information you collect as you plan for traceability, and assist in interpreting the results.

What the Business Case Template will do:

- It will ask questions about possible impacts of traceability and their importance to the firm to help you organize your thoughts on all of the ways that traceability might affect your organization.
- It will allow you to systematically enter data on the different categories of costs and benefits.
- It will organize the information that you input into a summary comparing the benefits to the cost of implementing traceability.
- It will allow you to make changes to certain variables and determine the impact of the changes on your benefit/cost analysis.

What the Business Case Template will not do:

- It will not provide the estimated costs or individual benefits for your organization, as these are very specific to each organization.
- It will not provide you with a detailed implementation plan. This is the next step once you make an initial decision to proceed toward traceability.
- It will not tell you what the costs and benefits are for your partners, but they can use it to develop their own business case.

Before you start

Before you begin your analysis you should be in agreement within your firm and with your suppliers and customers on the standard data to be used in the system. The Can-Trace standards have been created to standardize traceability data management and are recommended as a basis for food traceability. Agreeing on the use of those standards will create a common approach to traceability data throughout the chain. Using those standards will also prepare your firm to work with other firms or value chains in the future.

Getting organized

There are a few thoughts that will help you work through the process.

1. **Where are you now?** – You need to begin by assessing your current level of traceability. Where and how are you maintaining identity and where are you losing it? Are you using a paper based system, electronic but only at a partial level, or do you have a more complete traceability system?
2. **Understanding the costs of traceability** – You should begin the process by understanding where traceability gaps exist in your firm and what steps must be taken to fill those gaps. Use this information to develop an approximate cost for implementing traceability.





3. **Market information** – Company revenue and gross margin by Key Market and Major Customer – You will need your revenue and gross margins for your existing key markets and major customers and as well for potential new markets that you can enter if you have a traceability system.
4. **Recalls and risk management** – You will need to understand how frequently recalls occur in your firm. In the template you will be able to analyze recalls in up to four different categories. It is important for you to decide how many categories of recalls your firm experiences and estimate the average frequency and cost of each type of recall to your firm. If your firm has experienced liability claims or lawsuits you should estimate the frequency and cost.
5. **Key processes** – You will be analyzing processes at a very high level, so you will need to break down your operations into 5 to 15 key processes or groups of processes so that you can consider the possible impact on each process.

The nature of the data – Since this is a high-level analysis, much of the data requested will be average annual values to be used over a five year horizon. In other words, if you are asked for annual revenue, pick a value that you think reasonably estimates the five year average value. You can later adjust the values to see what happens if you are wrong.

Using the Template

You are now ready to start entering data in the Business Case Template.

Input

The Template consists of numbered worksheets plus the Cost Benefit Summary worksheet that summarizes the results of your analysis. Work in order through the worksheets from 1 to 8. You will be entering data into the template in two ways. The data entry cells have been colour-coded so that you can see whether you are supposed to type an answer or select from a list.

- Bright yellow - Type in responses as words or numbers as applicable
- Light yellow - Select the closest choice from a drop down menu

Currency Figure Inputs

A consistent 'scale' must be used for all inputs involving DOLLAR (\$) figures in all worksheets. We recommend a scale using thousands (\$000's).

For example, if the actual dollar answer to a question is \$1 million (\$1,000,000), then the entry using a scale of \$000's would be \$1,000. All NON-DOLLAR entries must be entered in actual scale used. For example, a non-dollar answer of two hundred (200) would be entered as such 200.

Instructions

Each worksheet will have objectives and instructions which are in blue text.

Completing the Worksheets

1. **Intro** – This worksheet captures the company name, potential implementation dates, the current traceability status and proposed level.
 - a. Traceability implementation dates are only there for your records. They do not affect the model.

- b. The levels of traceability on the drop down menu are guides. Pick the one that is closest to your current level and the one closest to the level which you are considering implementing. It is important that there is a difference between current and proposed levels.
2. **General** – This worksheet helps you look at the potential benefits of traceability in a general way. You don't have to put numbers on the benefits yet. It is designed to help you think about all the possible types of benefits and how much they might be realized if you implement traceability.
3. **Market** – This worksheet will look at your major markets and assess what might happen to revenue and margins in two cases, first where you don't implement traceability and second, where you implement the proposed level of traceability.
 - a. Start by entering your key markets and their revenue and margins.
 - b. If you are reasonably comfortable with your assessments of future revenue and margins with and without traceability you can complete the worksheet and move to Worksheet 4.
 - c. If you want a more in-depth look at where markets are going move to Worksheet 3b. There you can identify whether your current traceability will meet regulatory and market requirements two years from now.
 - d. Go back and complete the rest of Worksheet 3 including identifying potential new markets and their revenue and margins.
4. **Recalls** – You can enter up to four different categories of recalls. Change the names of the categories in row 7. Enter data about your past experience and your anticipated recall experience and costs. An important point is how much traceability will reduce the scope of your recall, the amount of product that you have to recall to capture the product that is under investigation.
5. **Liability** – This worksheet looks at past and potential liability claims or lawsuits. If these are not an issue for your firm you may move to Worksheet 6. Otherwise, estimate how likely you are to experience a claim or lawsuit and how much one might cost your firm. You may want to consider how lack of enhanced traceability may impact future insurance premiums, or even the ability to retain insurance.
6. **Key Processes** – Worksheets 6 and 7 both deal with process impacts due to traceability. Worksheet 6 looks at your main processes and asks you to qualitatively assess the impact of traceability on each process in terms of inventory, spoilage, yield, time and quality. You can select the level of impact from a menu. This worksheet is an aid in identifying where impacts might occur and how big they will be. The next worksheet asks you to quantify those benefits in broad terms.

At the bottom of the worksheet you can see a graph that summarizes the impact of traceability on that benefit.
7. **Process Improvements** – This worksheet requires you to estimate the impact of traceability in several key process improvement areas. These are broad estimates of savings, where some will be one-time and others will be average annual recurring benefits.
8. **Costs** – This worksheet looks at several key categories of costs of implementing and operating a traceability system. Costs are grouped into main categories and can be estimated as occurring during implementation or recurring on an annual basis.



Cost-Benefit Summary Worksheet

The final worksheet takes your data input and summarizes it into a cost-benefit worksheet. The top table shows the quantified benefits and costs on an annual basis. The second table highlights the qualitative benefits that you identified on Worksheet 2. Finally there is a graph that compares the net present value of the benefits of implementing traceability with the costs.

In reviewing the summary it is important to review the values and see if they seem reasonable for your organization's situation.

Scenario or Sensitivity Analysis

If you have two major traceability alternatives you should prepare a separate template for each alternative. This could be the case if you were considering bar code versus radio frequency identification technologies (RFID). You can then compare the scenarios.

If you are considering only one major implementation route but you wish to see the impact of changes you can make changes to values in your worksheets and determine the impact of those changes on the summary sheet.

Appendix D – Glossary of Terms

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.

DSS: Decision Support System (“the template” for validating the business case for traceability)

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.

