

Traceability Costs for Alberta's Cow-Calf Sector

Alberta Beef Producers¹

Abstract

A review the regulatory burden of the direct costs of animal traceability was done. Four scenarios were set up to compare costs for manual and computerized RFID tag information and borrowed and owned tag reader management for cow herd sizes from 50 to 1,500 head. An estimation of the Alberta herd cost was also done based on practical combinations of model types related to variable herd sizes in the province. This review did not consider any costs for upgrading corrals or handling systems.

There is some confusion determining what is required for the traceability system and what can be charged against it. Under the Traceability Livestock Identification regulation, owners of cattle born on or after January 1, 2009 must tag all calves with a CCIA approved tag and report the birth date into the Canadian Livestock Tracking System (CLTS) prior to a) the animal leaving the birth farm or b) within 10 months, whichever comes first.

When cattle are shipped for sale a birth certificate can go with the shipment as information for prospect buyers. Cow calf producers are required to have ear tags in their stock; they are not required to scan the tags for the program, although they may wish to scan the tags for their own management concerns. The new owners (feedlots or packers) are required to scan tags as they acquire the livestock. This tag information is sent to the CLTS; packers finalize the transfer by "retiring" the tag.

In most discussions about traceability from reports from the US, Australia or other regions calf tags are scanned and reported into a system by the cow calf producer. This generates an additional step, and cost.

For the present review costs were determined for four scenarios where all calves and cows were tagged and sold into the system: a) manual reporting through the auction mart link to the CLTS, b) producer reporting using a computer linkage to the CLTS, c) borrowed wand reading tags, reporting information to the CLTS and d) owned wand reading tags, reporting information to the CLTS.

The first two scenarios are part of the direct costs for cow calf producers associated with Alberta's traceability program; the last two scenarios add another level of tag reading, whereby management information could be used by the producer for data entry to his own system. Only the first two processes will be considered a "cost" of the traceability program; the other processes are included to project a cost if the program changes to require some tag information stream from the producer to the CLTS.

The cost of conforming to the process ranged from \$6.91 per head for a 50 cow herd size on average to \$6.29 for a 1,500 cow herd (Table 19). The average provincial aggregate cost of traceability was \$6.64 per head (Table 20). Depending on the producer's management system 50 to 60 percent of the cost is

¹ Fred Hays, December 15, 2010

related to initial tag costs and retagging costs for calves and cows. The other costs are related primarily to those for administrative labour, cattle handling labour and computer-related ownership.

Cost comparisons with work done by Agriculture and Agri-food Canada¹. This review did include the cost of RFID tags and applying them to the cattle; there were no costs assessed for reading tags. Reporting of tagging events was to be done by telephone. For this scenario, an average tag cost and loss rate of 1% are used. No other initial or operational costs were applied.

For the AAFC model the low and high cost scenarios were assessed for 250 head cow herd. The low cost for 2007 was estimated at \$5.68 per head; the high cost was estimated at \$10.35 per head. Aggregate costs for all cow-calf operations in Canada were estimated as a range between these two values (\$5.68 to \$10.35). An average would be about \$8.00 per head based on 250 head herd.

The Alberta government presently provides an incentive program to offset the cost of tags up to \$3.00 each starting January 1, 2009 through to December 31, 2012. For this time period the cost of traceability and age verification to the producer can be reduced by this amount. For the average herd in Alberta the producer's cost would then be \$3.89 per cow to support the traceability and age verification program (Table 20).

The Alberta government implemented mandatory age verification of cattle and premises identification effective January 1, 2009. This means that the availability of age verified stock will be from all cattle in the province compared with only those that were available through a voluntary program. Prior to this date some producers selling age verified stock received a premium for this information. Now that the program is mandatory producers will no longer have the opportunity to expect any premium payments. The present review does not take into account any estimated financial loss to producers of having to sell through a mandatory age verification program.

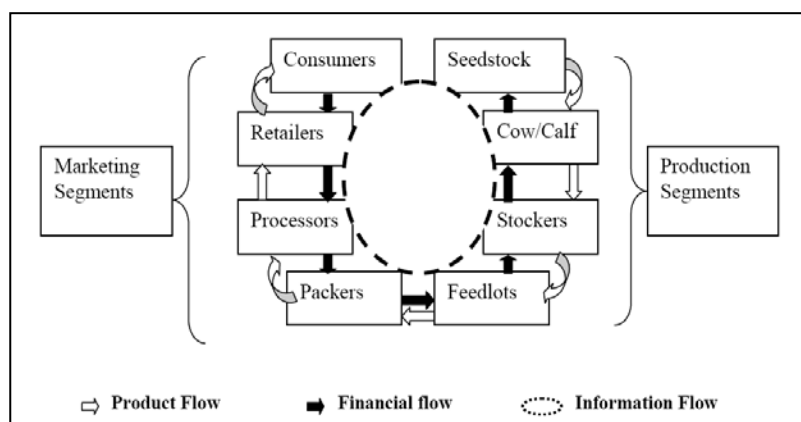


Figure 1. General Flow of Beef Livestock and information Flow In Alberta.

Basic Process

The basic flow of livestock, finances and information is shown in Figure 1. Traceability information flows from the seedstock and cow/calf sector through to stockers or backgrounders, feedlots and into the packer sector.

Livestock traceability is mandatory in Canada. This process requires producers to tag their livestock with Canadian Cattle Identification Agency (CCIA) approved RFID tags that can be followed through the system.

The Legislative Framework set up to regulate traceability and age verification in Alberta is structured under the **Animal Health Act, Traceability Cattle Identification Regulation 333/2009**.

Application

This Regulation applies to

- (a) all cattle born in Alberta on or after January 1, 2009, and
- (b) all cattle that enter a feedlot, regardless of age or origin

Birth dates

A cattle owner must record the birth dates of cattle by using the actual birth date or the calving start date.

Reporting

7(1) If a cattle owner records birth dates by actual birth date, the cattle owner must report the following information to the Minister within 10 months of each calf's actual birth date, or before each calf leaves the farm of origin, whichever occurs first.

As well **Animal Health Act, Traceability Premises Identification Regulation 200/2008** defines the Premise information requirements.

Mandatory age verification

As of January 1, 2009, all cattle born after January 1, 2009 must be age verified under the Animal Health Act. Feedlots that feed more than 5,000 animals per year are also required to report all move-in and move-out information (except for animals going to slaughter or another feedlot) to the CCIA database within seven days.

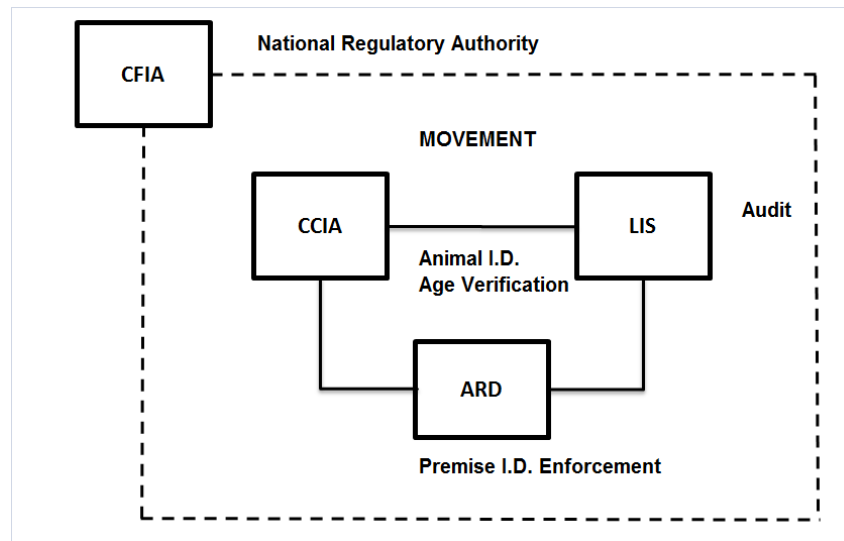


Figure 2. The Regulatory Structure for Canadian Animal Traceability.

The regulatory structure for livestock in Alberta described by Alberta Agriculture and Rural Development (ARD) is shown in Figure 2². The overall national regulatory authority is provided by the Canadian Food Inspection Agency (CFIA). Within this framework the CCIA regulates animal identification and age

verification. ARD enforces premise identification. The Livestock Identification Service (LIS) provides an audit function.

The focus of ARD, CCIA and LIS is to deliver respected collaborative traceability system for livestock in Alberta that is as follows:

- Protects the Public good through:
 - Emergency management
 - Food safety
 - Animal health
- Supports Industry Objectives for:
 - Satisfaction of Customer demands (private standards)
 - Market access opportunities
 - Industry driven business opportunities
- and Respects the Principles of:
 - Protection of privacy
 - Streamlined service delivery
 - Ownership of added value information

Alberta Animal Health Act

- Includes all domestic animals, excluding pets
- Enables full traceability
- Enables a swift response to disease issue
- Is the authority for a decisive response
- Covers diseases threatening public health (zoonoses)

Livestock Identification and Commerce Act (& Regulation)

This covers the need to record provincial movement of livestock in the province.

Health of Animals Act (Federal)

This Act covers radio frequency identification (RFID) tagging requirements from “Herd of Origin” to tag retirement at slaughter or death.

Objectives of Alberta’s program:

- a) To have 100% of Alberta livestock premises identified by 2010.
- b) To include a robust and reliable traceability system that delivers full confidence in source verification for all livestock species by 2012. This includes having in place 48-hour emergency response and tracking capabilities.

The beef traceability aspect is more or less operational; there is traceability occurring from the cow-calf producer through to feedlots and the packing sector.

Age verification as an extension of traceability is the association animal birth date data with an animal identification number (single tag or tag group). Alberta is the only province in Canada where this is mandatory; the other provinces have a voluntary requirement although Quebec is reviewing its legislation for a mandatory requirement. Age verification requires the animal's birth date to be included with the animal identification number. This allows meat processors the ability to age verify product, primarily for some export markets where product is required to be either under 21 months or under 30 months.

Animals may be age verified anytime after they are born and tagged with the CCIA RFID tag. Practically, It is in a producer's best interest to age verify calves before they are marketed. As a practice CCIA recommends that calves be age verified a minimum of two weeks prior to the intended marketing date. This helps to take care of any errors in information going into the system which would affect reports, allow time for computer systems that might go down and allow for high seasonal volumes which could slow down the system to get birth reports printed in a timely manner.

In Alberta the cattle Identification and age verification program have the following requirements:

All Cattle are required to be tagged with a CCIA approved RFID tag within 10 months or before the animal leaves their farm of origin, whichever comes first.

All calves born in Alberta are required to be age verified with either a) the herd calving start date or b) their exact birth date entered into the CCIA's database.

- a) Birthing Start Date Method - An approved CCIA tag must be affixed within 10 months of birth or before the animal leaves the herd of origin, whichever comes first and corresponding records must be maintained.
- b) Exact Birth Date Method – An appropriate cattle identifier must be affixed to each animal within 90 days of the birth of the animal and corresponding records must be maintained. An approved CCIA tag must be affixed within 10 months of birth or before the animal leaves the herd of origin, whichever comes first.

All records must be maintained for 10 years.

Examples of animal health, public health and food safety purposes include:

- disease eradication; control, surveillance;
- protecting animal health and public health;
- assisting in ongoing health, safety and biosecurity measures to minimize a disease outbreak or to minimize the risk of a disease spreading;
- assisting when there is an outbreak of a disease;
- identifying where animals are raised, quarantined, auctioned and slaughtered;
- eliminating animal disease barriers for domestic and export market access;
- enhancing emergency preparedness in the case of an outbreak of a disease or in the event of a natural disaster;

- detecting the presence of diseases;
- monitoring the health of animals;
- analyzing the geographical distribution of a disease;
- analyzing the epidemiology of disease outbreaks;
- conducting assessments and models to predict disease risk;
- tracking the movement of animals, products and animal by-products from premises to premises;
- identifying the premises-to-premises movement of animals, animal products and by-products.

Table 1. Distribution and Magnitude of Traceability and Age Verification Benefits (Hobbs et al., 2007)

Category & Overall Magnitude			
RISK + + +			
Benefit (can be immediate (existing) or potential (probabilities))	Distribution & Magnitude		
	Producer	Agri-food	Society
1 Livestock disease management ★	+++^	+++^	+
2 Incentive for good practice	+++^	+++^	+
3 Reputation/Consumer confidence/Credibility	+>+++^	+>+++^	-
4 Trade	+++^	+++^	+
5 Food safety & public health ★	-	-	+++
SUPPLY CHAIN (external, moving backward in value chain) +>+ +			
1 Reduce information asymmetry with respect to quality of supplies	+++	+++	-
2 Better operating atmosphere	++	++	-
3 Improved logistics & inventory management	+	++	-
4 Coordination of supplies	+	++	-
MARKET ENHANCING (moving forward in value chain) +>+ + +			
1 Enables flow of individual carcass quality information (backwards)	+++	++	-
2 Sharing animal management information	+	++	-
3 Quality verification enables product differentiation	+^	+++^	+
4 Real-time results ie.Sorting	+	++	-
5 Certainty of ownership	++	+	-
6 Connectivity	+^	+^	-
7 Trust - credibility of quality assurances	+^	+++^	+
GOVERNANCE (system administration and management) +			
1 One national system/portal	+^	+++^	+++^
2 Prevention of being locked in to proprietary tracing systems	+	+	-
3 Research to improve quality problems - on issues not previously known as requiring research	+>+++	+>+++	-
4 Collaborative Synergy	++	++	+^
NOTE: Magnitudes are based upon the responses given by industry stakeholders			
Magnitude of benefit		Definitions	
-	insignificant	Producer	Farmers and feedlots
+	small	Agri-food	Auctions, sales barns, abattoirs, packers/processors
++	medium	Society	Canadian consumers and/or government
+++	large	*	indicates benefit mainly affects government
+>+++	low current but potentially large in the future	★	Related to Health of Animals Act
^	even larger if exporting		

Other uses for a traceability system could be tied in with product marketing initiatives.

A review of benefits of a traceability system evaluated as distribution and magnitude throughout the agri-food chain was done by Hobbs, et al in 2007³.

Assessment of Degree of Distribution and Magnitude of Traceability Benefits

The initial reason or benefit for a traceability system involves risk to animal disease for the primary business and further down the value chain (cow-calf producer through to the packer and to product

consumers). Those areas that could be related back as support to the *Health of Animals Act and Regulations* are marked by a "★" (not part of the original report). All the other benefits fall outside any health related aspects although there may be an indirect relationship.

Livestock disease management and the incentive to provide a healthy environment are highly beneficial to those in the chain from producers through to the packers and processors. Consumers/society have a small benefit from any animal health program. The reputation to manage animal health has a low current benefit, but may have some further benefit in the future.

Traceability benefits would be large for exporting and trade. However, the fundamental reason for having this type of program is written as animal health, and not trade. Although beef trade would maintain or expand the Canadian beef business, and reduce business risk, it is not directly a health issue.

Food safety and public health are related directly back to Animal Health legislation. However, animal traceability is insignificant to the food chain from producers through to the packer. Product traceability would have a large benefit to consumers and governmental regulators. However, the greatest level of need goes back to health conditions with a packer or processor regarding biological contamination from carcass and product handling through to consumers preparing or consuming the meat products.

Other aspects of traceability to production management, and supply chain management are deemed more important to producers and processors in the future than would be recognized at present. Aspects of traceability in these areas are insignificant to consumers.

Likewise, moving product through the value chain (market enhancement) can be used positively to leverage enhanced product sales. This includes trust and credibility factors through the value chain.

Administration and management (governance) of a traceability system has a small, positive level of benefit, particularly for future endeavours.

Therefore, as a part of animal health and food safety the regulatory component of the Act does fulfill the requirement. However, the potential benefit to these attributes is much broader than portrayed. Perhaps the Cost with responding Benefits need to be better assessed. These are beyond the context of the present review.

Canadian Cattle Identification Agency (CCIA) Costs

The CCIA is a non-profit organization with the responsibility to collect identification information from producers and tabulate this information defined in the National Identification Regulations of the Federal Health of Animals Act. Its role is to ensure efficient trace back and containment of serious health and food safety issues in the Canadian cattle herd.

Initial funds for the CCIA were received through a grant from the Beef Industry Development Fund. Additional funds to be used for trials and development have been approved through Agriculture and Agri-Food Canada, the Canadian Food Inspection Agency and a number of provincial governments and private industry organizations.

Fee costs to tag manufacturers are presently \$0.60 per tag; this is not paid directly by the producer, but would be incorporated into the cost of the tag.

The producer does not pay a direct charge for use of the CCIA system.

CCIA's information system is the Canadian Livestock Tracking System (CLTS). This is the management side of tag, premise and age verification data operations. Producers sent up an account through this computer portal.

Radio Frequency Identification (RFID) Tags

The basis of traceability includes having and using a radio frequency identification (RFID) system to be tied in with the database system that collects and manages the information. The direct part includes the components of the system and operation of collecting the data. Components include tags (transponders) for each animal, a reader (transceiver), a computer (data accumulator) and management software. In some cases the data accumulator might include a scale that is tied into the system as well.

This report does not compare components of the system; these are continuously being updated and modified with differing quality and prices. To get this type of information about equipment it is best to check with suppliers such as Allflex Canada or other suppliers.

The basic set up is shown in Figure 3.

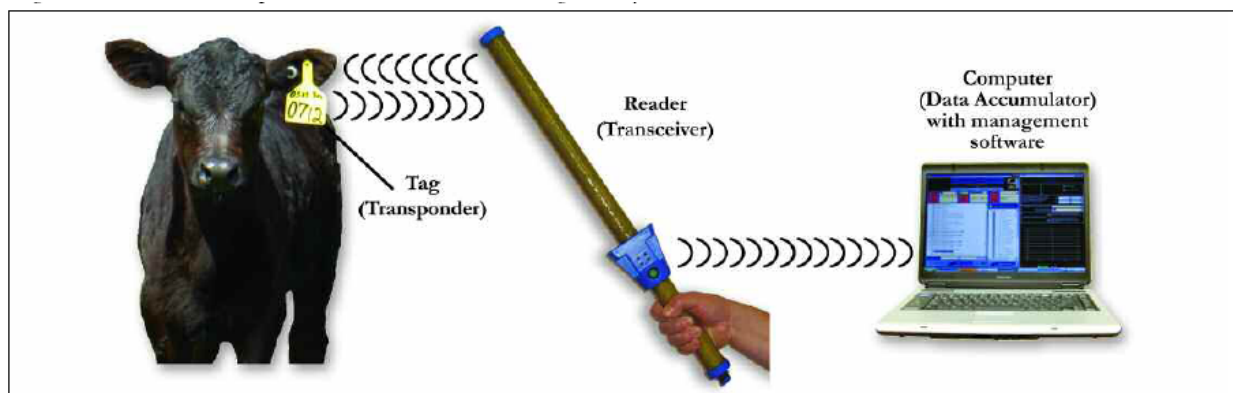


Figure 3. The Four Components of a RFID System. This includes a) the tag, b) the reader, c) a computer and d) data management software (Michigan State University Extension Bulletin, 4 2007⁴).

Key overall considerations of the system need to include a) cost to benefits of any specific part of the system, b) the comfort level that operators have with the technology, and c) component compatibility and ISO compliance. Producers need to analyze the cost of the system and the availability of alternative inputs to justify what they want and are getting.

The greatest overall cost in the direct system is the capital or fixed cost items such as readers, computers and software that have to spread over a number of animals. The other important cost is the labour input to tag animals, getting the information from each animal (usually with a reader) and administering the information by keeping records, usually on a computer and sending the information to the CCIA.

Systems can vary in their level of complexity and flexibility. In some cases installing complex systems may require that the producer either has or can get the technical support needed for operations. The

amount of materials, on-call technical support and troubleshooting assistance may be a key amount of materials, on-call technical support and troubleshooting assistance may be a key consideration in any of these system purchase decisions.

How RFID Works

Allflex EID Tags are considered passive tags because they have no battery or power source of their own. These tags are activated when they pass within the transmission field of a reader. The tag then absorbs power from the reader and returns its unique number to the reader.

Information Flow

The basic flow of information for the Canadian beef traceability program is shown in Figure 4.

Data flow begins with the RFID ear tag. Tag numbers and birth dates or birth date ranges (beginning to end of calving) can be entered into the system as a manual entry (lists taken to CCIA staff at their office or at an auction mart), or by on-line computer entry through the CCIA system. Birth certificates are produced that can be used when cattle go from one owner to the next. With this flow information is entered into the CCIA system.

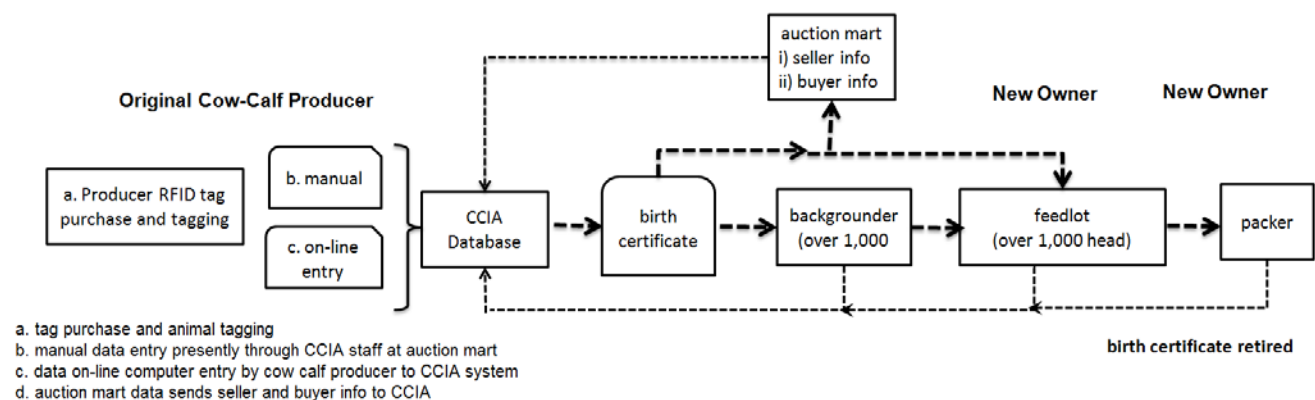


Figure 4. Basic Flow of information for Alberta's Traceability, Age Verification and Premise Identification Programs.

For example, when a cow-calf producer sells his calves to a backgrounder the data is entered into the CCIA system, usually directly by the new owner. As of March 1, 2010, feedlots feeding more than 1,000 head per year are required to report animal movements into the feedlot to the Canadian Livestock Tracking System (CLTS) within seven days. Information reported includes:

- feedlot premises number
- individual RFID ear tag number of each animal entering the lot
- the date of entry into the feedlot.

If the backgrounder sells stock to a feedlot, the birth certificates are to follow the cattle. New owners scan the ear tags with a wand or panel reader to obtain individual identification information.

Cattle ID numbers are sent into the system by the new owner. When the finished stock is purchased by the packer birth certificates move with the cattle; cattle numbers are retired by the packer through the CCIA system.

Alberta Agriculture and Rural Development are also working on a system to have the auction mart read in tags and readout tags. At present, this is in a testing mode. In this case, information would flow from the seller (e.g., cow calf producer) through to the buyer or the new owner with animal and premise identification. Age verification information would also flow with the animal. In the auction mart situation the information would not be required to move from the new owner because it would already be complete. However, any duplication would be handled by the CCIA system.

Cow-Calf Traceability and Age Verification

Assumptions

A spreadsheet model for determining traceability costs was derived from Dhuyvetter and Blasi⁵. Four versions were used:

- A. Manual system, hand prepared documents/ Birthing Start Date Method
- B. Manual system, computerized documents/ Birthing Start Date Method
- C. Electronic reader/ borrowed, computerized documents
- D. Electronic reader/ owned, computerized documents

Basic requirements to meet present traceability and age verification needs in Alberta are defined as the “Birthing Start Date Method”. This includes tagging calves with an RFID tag and submitting the tag numbers to CCIA. The reporting needed includes the start and end numbers for the herd at the start of calving with the starting calving date.

Submission of this information can be done through the CCIA field offices throughout the provinces or through CCIA clerks who work from Alberta auction marts on sale days. Otherwise, ear tag information can be submitted to the CCIA office using a spreadsheet system with a computer or other animal management software that is formatted for the CCIA database.

Other business management information can also be sent through the system, such as vaccination types and dates, breeding information or other types of management data although this is not needed for the traceability and age verification process.

Data collection and data management for each animal can be gathered using an RFID tag reader. However, this also is not required for basic traceability information flow. This process, however, was included as part of the review.

Cost items were determined using information from the literature. No independent studies were done to determine times to carry out functions. Producers were asked about times needed to undertake certain functions although a rigorous study was not done. In some cases, these estimates or assumptions made may be different than those from specific farm or ranch situations. However, they

are ballpark values with the ability to change them if new data or reports present something different than determined in the present work.

A list of the cost centre categories used is as follows:

Electronic tags for calves	Farm cost to obtain borrowed reader
Lost Tags calves	Farm cost to learn reader
Tags for cows (one-time purchase amortized)	Labour per year retagging
Lost Tags Cows	Incremental Administration Costs
Wand/stick reader purchased, amortized	Reading Costs Out
Laptop computer and Software, amortized	Internet access costs
Computer Database Software, amortized	Subscriptions/upgrade fees for computer]
Incremental Ops Costs-tagging costs	Animal Shrinkage
	Auction Mart retagging, feeders cost

Changes to handling equipment that might be required, if any, were not considered in the present review.

Also, the Alberta government implemented mandatory age verification of cattle and premises identification effective January 1, 2009. This means that the availability of age verified stock will be from all cattle in the province compared with only those that were available through a voluntary program. Prior to this date some producers selling age verified stock received a premium for this information. Now that the program is mandatory producers will no longer have the opportunity to expect any premium payments. The present review does not take into account any estimated financial loss to producers of having to sell through a mandatory age verification program.

Estimation of the Costs of Traceability

A. Data Entry Information to Database

In Alberta it is the animal owner's responsibility to enter data information into the CCIA system. The Cow Calf producer has two or three options.

The Manual Scenario (A) for traceability is shown in Figure 5.

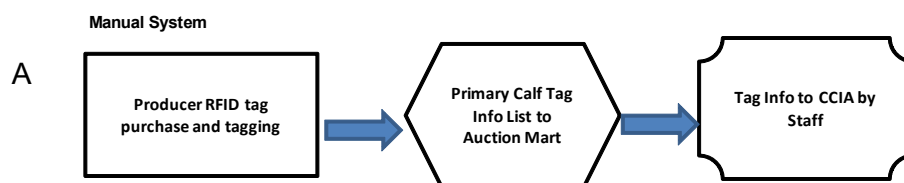


Figure 5. RFID Tagging and Information Flow using the Manual System (A).

For this scenario the producer purchases RFID tags and tags his animals. Tag information listing tag numbers is kept on a form with birth dates or birth date ranges. This list is presented to the CCIA staff person when the cattle are sold at the auction mart. The producer's information including producer's

name and address, animal tag numbers and sales date is entered into the CCIA system by CCIA staff, usually at the auction mart. Primary cow-calf data entry is made at the same time livestock is sold.

B. Personal Computer (PC) Administration Method

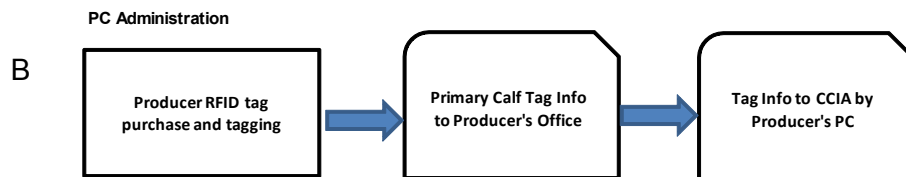


Figure 6. RFID Tagging and Information Flow using the Producer's Personal Computer Administration System (B).

Again, the producer tags his animals. The producer sends the tag and other management data to the CCIA system using his office computer system via the internet. With this process there are additional costs compared with the Manual System for administration using a purchased computer, software, internet costs, and time accounted for office labour (paid and not paid) to contact and send the information. Computers, software and internet costs were allocated, in part, to the traceability function because these would also be used by the producer for other business management functions. Also an extra labour cost was allocated for this administration (Figure 6).

The next system incorporates an ear tag reader into the program (C).

For this scenario the producer reads the ear tags with an RFID reader borrowed from a supplier such as

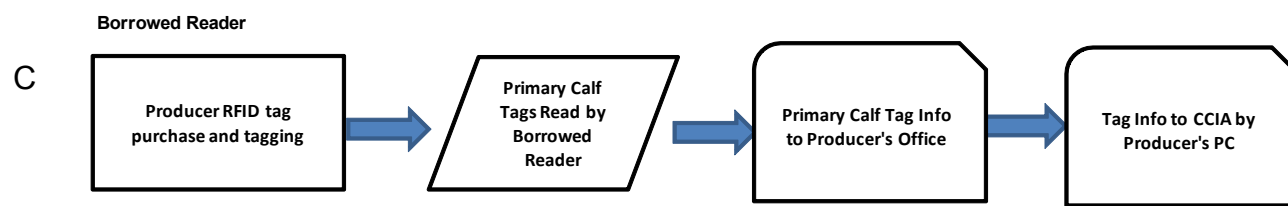


Figure 7. RFID Tagging, Information Collection using a Borrowed Tag Reader, and Information Flow using the Producer's PC Administration System (C).

a veterinary clinic or Alberta Agriculture when the animals are sold. The tag information is down-loaded from the RFID reader to the producer's computer; this information is sent to the CCIA database over the internet. In addition to ear tagging, costs are allocated to reading the tags with the reader (running the cattle through a chute to get the numbers) and administration costs for using the computer to send down-loaded information to CCIA (Figure 7).

The last scenario is similar to (C) other than the tag reader is purchased by the producer. All the other steps are similar (Figure 8). This is classified as program (D).

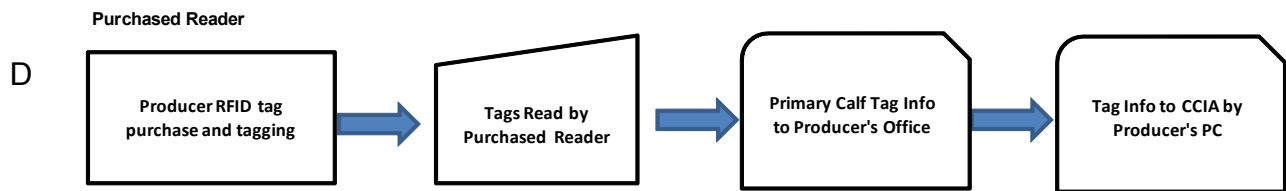


Figure 8. RFID Tagging, Information Collection using a Purchased Tag Reader, and Information Flow using the Producer's PC Administration System (D).

Labour Needs for Traceability

Cow herd size has an effect on the time for processing and tagging. An estimation of processing time to tag calves and cows was based on work from Kansas⁶. This is shown in Figures 9 and 10.

Figure 9. Comparison of Labour Needs for Cow-Calf Herds by Size (derived from KSU, MF-266, 2009)

40 cow herd. The lessor time for the larger herds is developed because of efficiencies of scale. Total times for the 40 cow herd was about 320 hours per years; total time for the 250 cow herd was about 1,100 hours per year.

These values were used to estimate the times for tagging and retagging calves and cows. Tagging times for cow herd size was extended from total labour needs (Figure 10). It was assumed that tagging time for a 250 calf herd was an incremental 30 seconds or half a minute per head (US NAIS, 2009⁷); for the 40 cow herd with 40 calves this was just about an incremental one minute per head for each calf.

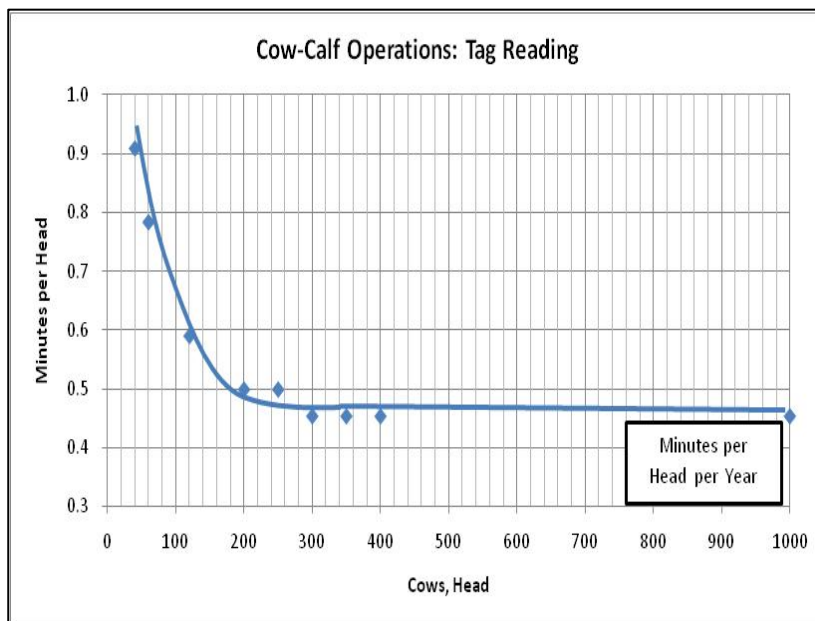


Figure 10. Comparison of Labour Needs for Cow-Calf Herd Tag Reading (derived from Figure 9).

Again, the difference is related to variable efficiencies of scale; the smaller herds would require more time per head to set corral the herd, set up any tagging, retagging, tag reading or other functions. This information was used in the traceability scenario for different cow herd sizes.

Animal Shrinkage

Animal management will differ depending on the producer and the system used. Some producers will tag calves during the

calving period; others will tag before shipping to market. Calf tagging was considered to be an incremental job to others that normally would be done with the herd. Retagging RFID tags can involve an additional step. Tagging smaller herds does not necessarily present any major problems or management input. The few calves that have lost tags can be readily separated and retagged. Larger herds may require more movement and herd stress.

For the program it is necessary for all cattle to have the RFID ear tag in place. This inspection and tagging can take place at the farm, auction mart or feedlot. To reduce handling and improve any cattle movement calves can be put through a chute to inspect and replace tags as required. For a 100 head loadout this means putting them through a chute or penning off some stock to ensure the five to 10 head missing tags are found and retagged. This is an additional management step to not having a traceability program.

Table 2. Estimated Type 1 Body Shrink from Handling Cattle

Item	Activity	% Shrink
1	Ease cattle to scale	0.0%
2	Separate to Retag ⁱ	0.2%
3	30 minute round up	1.0%
4	Load, haul less 100 miles, unload, weigh	2.5%
5	Sort and/or wait extra hour before weighing	1.0%
6	12 or more hours without feed or water	2.5%
7	Haul additional 500 or more miles	2.0%
8	Weigh on trailer, short haul	-1.0%
9	Weigh on trailer, long haul	-1.5%

There is a cost in moving livestock around; it could be determined by some aspect of body weight loss or the metabolic cost of exercise and excitement. An extensive review will not be made in the present study; however, it is assessed and given some weight to the cost of traceability.

Shrink is the weight that cattle lose during penning, sorting, weighing, standing, transporting, held without feed or water or any change in the environment that causes stress⁸. There are two types of shrinkⁱⁱ. The first type is loss of fill or excretory shrink. This shrink is the loss of contents in the rumen, digestive tract and bladder. It occurs when cattle experience any type of change and is usually recovered quickly once the cattle are provided with feed, water and rest. The second type of shrink is tissue shrink. Cattle compensate for the loss of moisture in internal organs by drawing water and nutrients from carcass tissue. The recovery from excessive tissue shrink can take over 30 days. Cattle movement dealing with body shrinkage is primarily of the first type: loss of fill and excretion.

There is additional movement (which has a metabolic cost) and there is a loss of body weight. These estimations are shown in Table 2. However, given a short period of rest and water to drink the body weight can be replenished in a short period, perhaps 30 to 60 minutes. However, the extra cost to the producer can occur if cattle are moved from retagging onto a truck to be shipped to a sale without being exposed to drinking water. Then retagging shrinkage in addition to normal trucking and holding pen shrinkage could be possible. If the cattle were retagged and sent back for feed and water the shrink would be minimal. This really depends on the management system.

The NAIS study⁸ suggested a shrinkage of 2.75 pounds on 524 pound calves being tagged or about 0.5%. There were no studies actually measuring the shrink but data from other work was used to estimate it. This is similar to best-guess losses in the industryⁱⁱⁱ.

The value used by the NAIS was discounted by 75% (that is only 25% of the two pounds was used) because for the industry evaluation they considered that the seller would lose the two pounds but the buyer would regain the difference through compensatory gain.

The present review is evaluating only that for the cow calf group where compensatory gain would not necessarily be realized. Also, the NAIS assessed a shrink value for shipping cows of about \$1.00 per head; the present review did not include a value for cows. In the end the present review used the 0.25% value for retagging only with no discount for compensatory gain.

Determining the Cost of Cow-Calf Traceability

Information for the traceability cow-calf scenario for the PC administration, borrowed reader (Model C, Figure 7) is shown in Table 3a. The scenario was modified from work from Kansas State University⁹. Other scenarios reviewed for the assessment were based on this same type of information.

ⁱⁱ Tim Page, Bayou Beef Tips, Louisiana State University, Agricultural Center, Beef Cattle Shrink, 2005.

ⁱⁱⁱ Chuck MacLean, Personal Communication, 2010.

Information input and calculations for the Traceability Model.

Table 3a. Traceability Model Borrowed Reader, PC Administration Input Information (C)*.

COW-CALF Estimated Costs for a Radio Frequency Identification (RFID) System										
	PC Administration									
	Borrowed Reader									
1	Average herd size, number of head		250 cows		Calves are tagged at one time; use Calving Start Date Method.					
2	Interest rate, %		5.85%		RBC 5 year mortgage April, 2010					
Scenario 1 - Alberta Agriculture Equipment										
3	Labour				16	Borrowed Reader				
4	Data	Labour Cost, Operations \$/ Hour	\$16	Alberta	17	data	km to get printer, round trip	50	km	
5	Data**	Admin/Clerical Cost, \$ per Hour	\$20	Alberta	18	data	time -get and take reader, hrs	2	hours	
6	data	Incremental Ops Calves Time Seconds/head	30	NAIS study	19	data	mileage cost, \$/km	\$0.50		
7	calc	Incremental Processing Time Calves, Total Hours	1.88		20	calc	Cost, Borrowed Reader	\$82.00		
8	data	Cow Turnover	5 years							
9	data	Incremental Admin Time, Sec/head	30		21	data	Internet access		\$400.00	
10	calc	Incremental Admin Time, Total Hours	2.08		22	data	Subscriptions/upgrade fees		-----	
11	data	Learning Reader, time- minutes	30		23	data	Calf weight, pounds		600	
12	calc	Learning Reader, cost, \$ per year	\$8		24	data	Calf Shrinkage		0.25%	
13	data	Reading Time Out per head, sec/ head	30	project	25	data	Calf Price, \$ per Pound		\$1.15	
14	calc	Reading Time Out Tot Hours/year	2.08		26	data	Auction Mart Retagging			
15	calc	Reading Time Out, \$ / year	\$33.33		27	data	Auction Mart retagging, feeders \$/head		\$10.00	
* The complete Model setup is shown in Appendix 1.					28	data	Auction Mart retagging, percent herd	4.5%	ARD 2010	
** "data" are entry values; "calc" are calculations from various data entries as describe as follows.										

* The complete Model setup is shown in Appendix 1.

** "data" are entry values; "calc" are calculations from various data entries as describe as follows.

Data information is as follows:

1. Average Herd Size. For this scenario 250 head was used. Other herd size costs were based on this value.
2. Interest rate: prime plus 2% or 5.85% based on RBC 5 year mortgage rate, April 2010. All costs were based on the cost of money for one year. For example, if tags were purchased or labour used it was assumed that the cost of money would be an additional amount shown in item 2.
3. Labour: Costs were determined for RFID tagging, going to town to borrow the reader (with mileage paid), administrative handling of data and information and for reading ear tags with the RFID reader.

4. Labour cost for handling livestock including tagging and tag reading was projected at \$16 per hour (paid and unpaid labour). This is referenced from ARD for typical cost including benefits. It was assumed that RFID tagging would be done when some other livestock activity was occurring such as tagging with a floppy tag, vaccinating or other process. Therefore, the tagging was considered incremental and time and costs were then considered incremental. However, retagging for lost RFID tags was considered to be a primary function; the full cost was estimated for this process.
5. Administrative work for data entry, book management or dealing with CCIA was projected at \$20 per hour (ARD rate, paid and unpaid costs).
6. The incremental time to RFID tag was 30 seconds per head (time entry). This was based on the US work done by NAIS in their time management studies of RFID tagging for different sizes of cow herds. This assumes that the cattle were already being processed and tagged; RFID retagging labour costs are in addition to this¹⁰.
7. Incremental operational total time in hours for tagging the 225 head calf herd (calculated as $225 \text{ head} \times 30 \text{ seconds/head} / (60 \times 60) = 1.88 \text{ hours}$).
8. Cow turnover every five years for average; this was projected at 5 years (ARD average).
9. Incremental administration time for office work: extra time for office work over regular administration time, in seconds per head (estimated).
10. Incremental administration time for office work for 250 cows. This was calculated as: a) cow herd size (250 head), b) times item 9 (seconds per head), c) divided by 60 times 60 (conversion from seconds per head to hours per year). Variable administration costs herd size were related to the curve in Figure 10.
11. Time to learn reader: estimated 30 minutes.
12. Cost in labour time to learn tag reader: a) item 11 (labour time), b) times labour hourly rate, divided by 60 (conversion from dollars per hour to dollars per year).
13. Tag reading time for calves, total seconds per head. The time to “read” each tag when using a reader was determined from the NAIS study. The base time for the 250 head herd was 30 seconds (0.5 minutes) per head. However, this was modified for inefficiencies for smaller herds (from Figure 10). This assumes the cattle had to be corralled and tags read as an extra function. Total projected times for 50 to 1,500 head are shown.
14. Reading Time Out for 250 head, Total Hours per year- item 13 times 250 head.
15. Tag reading costs for calves, reading when moved out (from item 14 times labour cost) in dollars per year for 250 head.
16. The present scenario uses a borrowed reader. The reader could be either purchased, rented from a veterinarian’s office or borrowed from ARD.
17. Estimated distance in kilometers, round trip to pick up reader from supplier (estimated).
18. Estimated time in hours to pick up reader.
19. Mileage cost to pick up reader (business estimated for vehicle costs in dollars per kilometer)..
20. Cost to pick up borrowed reader (calculated for time costs and vehicle costs per trip). Only part of this would be allocated to the reader pick up costs.
21. Internet access costs, total (estimated in dollars per year). Only a percentage of this would be allocated to the traceability system costs.

22. Computer program subscription costs (estimated). Some of this cost would be allocated to the traceability system costs.
23. Calf weight pounds. Used to calculate shrinkage.
24. Calf shrinkage
25. Calf price, \$ per pound. Based on Alberta average price for September 15, 2010.
26. Auction mart retagging costs. This assumes that some cattle lost tags before being sold. These would be tagged at the auction mart. In some cases this is a charged service; in others there is no fee.
27. Auction mart cost per head for missing tags estimated at \$10 per tag.
28. Auction mart retagging. Used 4.5% for cattle coming to auction mart, based on ARD Auction Mart Study, 2010.

Information from Table 3b. This is a continuation of data input and calculations from the model.

Table 3b. Retagging Costs including Labour, Tag Losses and Tag Costs, Model C*.

29	Retagging Labour			
30	data**	Percent Retagging, Calves	5%	
31	calc	Head Retagging, Calves Number	11	
32	data	Retagging Ops time, min/head, Calves	5	← estimated
33	calc	Retagging time Calves, total hours	0.9	
34	calc	Retagging Ops, Calves \$ labour	\$15.00	
35	data	Lost Tags, Cows	10%	
36	calc	Head Retagging, Cows Number/year	5	
37	data	Retagging Ops time, min/head, Cows	10	← estimated
38	calc	Retagging Ops, Cows hours, total	0.8	
39	calc	Retagging Ops, Cows \$ labour	\$13.33	
40		Tag Costs, basic \$ per tag	\$2.97	
41		Tag Incentive	\$0.00	←
* The complete Model setup is shown in Appendix 1.				
** "data" are entry values; "calc" are calculations from various data entries as describe as follows.				

29. Retagging Labour (on farm)
30. Percent calf retagging numbers. Assumed that calves were tagged at birth; some tags lost during the season (estimated from discussions with producers and NAIS study). This was considered to be the high end.
31. Head retagging (calculated from item 30 (percent retagging) times 225 head).
32. Retagging labour time for calves that have lost tags before shipping. This is estimated as an additional process that exists because of the need to tag based on minutes per head. This time includes rounding up calves from herd and processing through the chute.
33. Retagging calves, total hours (calculated).
34. Retagging labour costs for calves, \$ per year for 250 head: includes time cost (hours times labour hourly costs).

35. Lost tags from cows, estimated at 10 percent. This assumes that the heifers were tagged as calves; during the life of cow estimated losses by producers. Based on discussions with producers.
36. Lost cow retagging numbers in one year (percent loss times number of cows divided by cow turnover).
37. Retagging operations time for cows before shipping (estimated minutes per head); as an extra event because of traceability. This is the projected time needed to round up cows and process through the chute.
38. Retagging cows, hours. Calculation- Number of cows to be tagged times minutes per cow divided by 60.
39. Retagging cow labour costs:. Calculation - Number of hours times labour hourly rate.
40. Tag costs, basic. Estimated as average from discussions with producers. For variable sized herds a cost differential was used as follows:

Tag Purchases			
Units	10	25	100
Total	\$50.35	\$80.30	\$295.74
Per Unit	\$5.04	\$3.21	\$2.96
Ratio	1.70	1.09	1.00

41. Tag Incentive. This file was used to determine tag incentive paid for Age Verification that went against the cost of tag purchases. For the present calculation a value of “\$0” was used. For the Incentive payment the same value as item number 40 was used. This payment went against the purchase cost for calves only. Any tags purchased for cows or retagging did not carry an incentive amount.

The scenario was set up to capture costs for tags, labour to tag cattle, labour to administer the tag data, costs for a computer system to administer tag data into the CCIA system, costs for retagging cattle that had lost tags at the farm, costs to borrow or purchase an electronic tag reader, labour to read tags using a borrowed or owned reader (including mileage to go to town to get the reader).

Projected time computations for a) tagging calves (incremental), b) retagging calves (additional), c) retagging cows (additional), d) reading RFID tags (additional) and administrative times for registering CCIA information for both manual and computerized functions (incremental) are shown in Tables 4a and 4b.

Traceability Model Calculations*

Table 4a. Traceability Cost Projection Extension Calculations for 250 Head Cow Herd (Borrowed Reader, Model C). Main value Input Data is from Table 3a and 3b. Extended values for all models (A,B,C and D) are shown in Tables 5, 9, 10 and 12*.

42	RFID Components 250 Cow Herd- Borrowed Reader- Model C**								
	Description	Initial Cost	Per Head	Useful life	Salvage value, \$	Annual Cost, \$	% to RFID	RFID Cost	
43				Years				Total	Per Cow
44	RFID Transponder (electronic tag)								
45	Electronic tag calves	225***	\$2.97	---	---	\$688	100%	\$688	\$2.75
46	Electronic tag calves incentive	225	\$0.00	---	---		100%		
47	Lost Tags calves	4.5%	\$2.97	---	---	\$34	100%	\$34	\$0.14
48	Tags for cows (one-time purchase)	250	\$2.97	5	0	\$153	100%	\$153	\$0.61
49	Lost Tags Cows, per Year	10%	\$2.97	---	---	\$76	100%	\$76	\$0.31
50	Total Tags							\$951	\$3.81
51	Electronic reader								
52	Wand/stick reader	\$0		4	\$0		100%		
53	Data accumulator								
54	Laptop computer and Software	\$1,000		4	200	\$242	20%	\$48	\$0.19
55	Software / web-based analysis and storage								
56	Database Software	\$250		4	0	\$72	100%	\$72	\$0.29
57	Labour								
58	Incremental Ops Cost Tagging Calves	\$33		1	0	\$34	100%	\$34	\$0.14
59	Farm cost to obtain borrowed reader	\$82		1	0	\$84	50%	\$42	\$0.17
60	Farm cost to learn reader	\$8		1	0	\$8	100%	\$8	\$0.03
61	Labour per year retagging, calves	\$15		1	0	\$15	100%	\$15	\$0.07

* The complete Model setup is shown in Appendix 1.

** "data" are entry values; "calc" are calculations from various data entries as describe as follows.

*** Calf Crop surviving per cow includes miscarriages and calf death losses before 600 pounds weight at 90% from ARD.

Continued in Table 4b

42. RFID Components for 250 Cow Herd (in this case for Borrowed Reader): description of costs, useful life, salvage value (if any), annualized cost, percentage to Traceability, total cost to Traceability with amortization, total cost per head. Base Total is for 250 head cow herd before amortization costs.
43. Total and Cost per Cow
44. RFID Transponder (electronic tag)
45. Electronic Tags: Unit tag costs vary; values used were approximated from discussions with producers. Used \$2.97 per tag for 225 calves. For smaller sized herds tag costs were increased related to lot sizes. Cost was amortized over the year. Final value was reported as \$ per cow.

46. Electronic Tag Calves Incentive: This field is used to calculate any government incentive program that is applied for something such as age verification. In Alberta the Province is supporting up to \$3.00 per tag for producers to age verify their calves.

47. **Lost tag cost for calves at 5% or average of 11 calves for a 250 cow herd (225 calves).**

Projected tag costs are shown for 50 to 1,500 cows.

Head, Cows	50	100	150	200	250	300	350	400	1,000	1,500
Head, Calves	45	90	135	180	225	270	315	360	900	1,350
Retagging, Calves	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Tags Lost	2	5	7	9	11	14	16	18	45	68
Total Tag Cost	\$7	\$14	\$21	\$28	\$34	\$41	\$48	\$55	\$138	\$206
Tag Cost per Cow	\$0.15	\$0.14	\$0.14	\$0.14	\$0.14	\$0.14	\$0.14	\$0.14	\$0.14	\$0.14

-*derived from Figure 10. Any difference to total cost is due to rounding.

48. Tags for cows were considered one time purchase divided and amortized over 5 years. This was an average of \$0.61 per cow per year.

49. Lost tags for cows were considered at 10% over five years. Reports by some producers indicated this was low; other indicate it could be high. In some cases, tags were more easily torn from the ear when feeding large hay bales. However, suggestions indicated that much of this had to do with initial tag location on the ear. This cost was an average \$0.31 per cow.

50. Total Tag Cost: addition of all tags for calves and cows was \$3.81 per cow per year. This value includes the original cost of tags for calves and retagging costs for calves and cows. Auction mart retagging costs are shown as item 69.

51. Electronic reader/wandstick reader.

52. For this model the reader was borrowed, so the cost was \$0. For the purchased reader a value of \$450 per unit was used. This seemed to be typical from most reports. A life time of four years was used; this value was amortized over the four years.

53. Data accumulator is a computer.

54. A laptop and basic software costs were projected at \$1,000. This was considered to have a life time of four years; for traceability and age verification it was assumed that 20% of the computer value would go into this process. This value was amortized over four years. The value for the 250 cow model was \$0.19 per cow.

55. Computer Database Software/ computer software, spreadsheets, and other database programs.

56. Computer database software for the computer and traceability was considered to be \$250. In some cases the spreadsheet would be sufficient; however, this cost was left in the analysis.

57. Labour costs, percentage for traceability and amortization. The cost used was \$0.29 per cow.

58. Incremental Labour Costs for RFID tagging calves from items 4 (labour cost per hour) and 7 (incremental processing time, hours).

Incremental Labour Costs for Tagging Calves

Head, Cows	50	100	150	200	250	300	350	400	1,000	1,500
Head, Calves	45	90	135	180	225	270	315	360	900	1,350
Minutes Per Head*	0.90	0.80	0.60	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Total Person Hours	0.68	1.20	1.35	1.50	1.88	2.25	2.63	3.00	7.50	11.25
Labour Cost per Cow	\$0.22	\$0.19	\$0.14	\$0.12	\$0.12	\$0.12	\$0.12	\$0.12	\$0.12	\$0.12
Total Labour Cost	\$10	\$17	\$19	\$22	\$27	\$32	\$38	\$43	\$108	\$162

-*derived from Figure 10. Any difference to total cost is due to rounding.

For example, the incremental labour cost to tag 225 calves is projected at \$27 per year or \$.12 per cow. The differential cost per head between, for example, 50 cows and 250 cows is related back to the efficiencies recognized for larger herds (Figure 10).

59. Farm costs to obtain borrowed and return the reader; considered at 50% of the trip- would probably work it in with other business in town. For the present scenario the cost was \$42 per year or \$0.17 per cow.
60. Farm costs to learn reader from item 12. This was about \$8 per year or \$0.03 per cow.
61. Labour cost for retagging calves is considered an additional process from item 31 or 5% of the calves.

RFID Retagging Calves (Additional)										
Cow Herd Size	50	100	150	200	250	300	350	400	1,000	1,500
Calves	45	90	135	180	225	270	315	360	900	1,350
Head per Year	3	5	8	10	11	15	18	20	50	75
Head per Minute	0.08	0.10	0.14	0.18	0.20	0.20	0.20	0.20	0.20	0.20
Minutes Per Head*	13.0	10.5	7.1	5.5	5.0	5.0	5.0	5.0	5.0	5.0
Person Hours	0.5	0.9	0.9	0.9	0.9	1.3	1.5	1.7	4.2	6.3
Person Minutes	33	52	53	55	56	75	88	100	250	375
Labour Cost per Cow	\$0.17	\$0.14	\$0.09	\$0.07	\$0.07	\$0.07	\$0.07	\$0.07	\$0.07	\$0.07
Labour Cost per Year	\$9	\$14	\$14	\$15	\$15	\$20	\$23	\$27	\$67	\$100

-*derived from Figure10. Any difference to total cost is due to rounding.

For example, the cost for 250 cows to retag 11 calves is about \$15 per year or \$.06 per cow. The differential cost per head between, for example, 50 cows and 250 cows is related back to the efficiencies recognized for larger herds (Figure 10).

62. Labour costs for retagging cows from item 36 (as follows). This was considered to be 10% of the replacement cows each year. For example, for the 250 head herd cows were calculated to be replaced on a five year average or 50 cows per year. Of 50 head that were replaced it was estimated that 10% or 5 head would need to be retagged. For example, the cost for 250 cows to retag 5 cows is about \$14 per year. The differential cost per head between, for example, 50 cows and 250 cows is related back to the efficiencies recognized for larger herds (Figure 10).

Cow Herd Size	50	100	150	200	250	300	350	400	1,000	1,500
Cows Retagged per Year	1	2	3	4	5	6	7	8	20	30
Minutes Per Head*	26	21	14	11	10	10	10	10	10	10
Person Hours	0.4	0.7	0.7	0.7	0.8	1.0	1.2	1.3	3.3	5.0
Person Minutes	26	42	43	44	50	60	70	80	200	300
Labour Cost per Cow, \$/Year	\$0.14	\$0.11	\$0.08	\$0.06	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05
Labour Cost \$ per Year	\$7	\$11	\$11	\$12	\$14	\$16	\$19	\$21	\$53	\$80

-*derived from Figure 10. Any difference to total cost is due to rounding.

63. Incremental costs for administration or data handling are from items 5 and 10: hourly cost for administration times hours of incremental administration per year. Costs projections for incremental administration are shown for cow herds from 50 to 1,500 head.

Producer CCIA/CLTS Administration Labour Factors (incremental)

	50	100	150	200	250	300	350	400	1,000	1,500
Head Cows										
Administration Charge per Hour	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20	\$20
Time, Hours Manual*	0.5	0.9	0.9	0.9	1.0	1.3	1.5	1.7	4.2	6.3
Time, Minutes, Manual	33	52	53	55	63	75	88	100	250	375
Time, Hours Computerized	1.1	1.7	1.8	1.8	2.1	2.5	2.9	3.3	8.3	12.5
Time, Minutes, Computerized	65	105	107	110	125	150	175	200	500	750
Cost Manual Administration	\$11	\$17	\$18	\$18	\$21	\$25	\$29	\$33	\$83	\$125
Cost Computerized Administration	\$22	\$35	\$36	\$37	\$43	\$50	\$58	\$67	\$167	\$250
Cost Manual per Head	\$0.22	\$0.17	\$0.12	\$0.09	\$0.08	\$0.08	\$0.08	\$0.08	\$0.08	\$0.08
Cost Computerized per Head	\$0.43	\$0.35	\$0.24	\$0.18	\$0.17	\$0.17	\$0.17	\$0.17	\$0.17	\$0.17

-*derived from Figure 10. Any difference to total cost is due to rounding

For example, the incremental annual labour cost for administration for 250 cows of the CCIA program is \$21 for a manual system and \$43 for a computerized system. These costs are projected for the traceability program only; they do not consider additional work to maintain management records. The differential cost per head between, for example, 50 cows and 250 cows is related back to the efficiencies recognized for larger herds (Figure 10).

64. Readout costs- labour. If manual system were used this value would be \$0. For owned or

Reading Out Costs

	50	100	150	200	250	300	350	400	1,000	1,500
Cow Herd Size										
Calves	45	90	135	180	225	270	315	360	900	1,350
Time Per Head, Minutes	1.3	1.0	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Total Time, Minutes	59	94	96	99	113	135	158	180	450	675
Man Hours	1.0	1.6	1.6	1.7	1.9	2.3	2.6	3.0	7.5	11.3
Cost per Hour	\$16	\$16	\$16	\$16	\$16	\$16	\$16	\$16	\$16	\$16
Average Cost per Head	\$0.35	\$0.28	\$0.19	\$0.15	\$0.14	\$0.13	\$0.13	\$0.13	\$0.13	\$0.13
Total Cost	\$16	\$25	\$26	\$26	\$34	\$36	\$42	\$48	\$120	\$180

-*derived from Figure 10. Any difference to total cost is due to rounding.

borrowed readers the labour cost is from item 13. The projected labour cost to read ear tags includes putting calves into a pen and having them run by the wand reader. For this review the process was considered as an additional step; however, it could conceivably be tied in with another process. The differential cost per head between, for example, 50 cows and 250 cows is related back to the efficiencies recognized for larger herds (Figure 10).

65. Other Items

66. Internet Access- considered annual costs for high speed hook up, item 21; dedicated 25% of this to traceability costs. This was amortized over one year. For 250 cows this was about \$26 or \$0.10 per cow.

67. Subscription fees or upgrading fees for software considered to be \$0 per year, item 22; 50% directed to traceability and amortized.

68. Calf Shrinkage. This was estimated at 225 calves with 0.25% of body weight loss for a 600 pound calf with a value of \$1.15 per pound ($600 \times .25\% \times \$1.15 \times 225 = \$388$).

69. Auction mart retagging: from the ARD Study considered to be 4.5% lost tags for calves shipped to an auction mart. Cost of \$10 per head for retagging; averaged over total herd from items 27,

Projected Costs for Auction Mart Retagging										
Head Cows	50	100	150	200	250	300	350	400	1,000	1,500
Calves	45	90	135	180	225	270	315	360	900	1,350
Calves, %	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Calves	2	4	6	8	10	12	14	16	41	61
Cost per Head	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10
Total Cost, \$	\$20	\$41	\$61	\$81	\$101	\$122	\$142	\$162	\$405	\$608
Average Cost per Head	\$0.41	\$0.41	\$0.41	\$0.41	\$0.41	\$0.41	\$0.41	\$0.41	\$0.41	\$0.41

-*derived from Figure 10. Any difference to total cost is due to rounding.

28 and 39. No value was used for retagging cows at the auction mart.

In many cases this service may not be used. However, it would include lost tags and tags that do not read and need to be replaced. For the 250 head cow herd it was considered to be 11 or 12 head with a cost averaged for the herd of \$0.41 per head.

70. Total annual cost for the 250 head cow herd and cost per head as an average.

Table 4b. Continuation of data input and calculations from the model.								
Traceability Model Borrowed Reader, PC Administration Input Information (C)								
	Description	Initial Cost	Useful life, years	Salvage value, \$	Annual Cost, \$	% to RFID	RFID Cost Total	Per Cow
62	Labour per year retagging, cows	\$13	1	0	\$14	100%	\$14	\$0.05
63	Incremental Admin Costs	\$42	1	0	\$43	100%	\$43	\$0.17
64	Reading Costs Out	\$33	1	0	\$34	100%	\$34	\$0.14
65	Other							
66	Internet access	\$100.00	1	0	\$103	25%	\$26	\$0.10
67	Subscriptions/upgrade fees	\$0.00	1	0		50%		
68	Calf Shrinkage	\$388.13	1	0	\$388	100%	\$388	\$1.55
69	Auction Mart retagging, feeders/head	\$101.25	1	0	\$101	100%	\$101	\$0.41
70	TOTAL ANNUAL COSTS						\$1,777.90	\$7.11

See Appendix 1 for the complete Model.

Manual system, hand prepared documents, Birthing Start Date Method (A)

As indicated the manual system with had prepared documents is sufficient for the traceability and age verification process. In this case the calves are tagged with successive tag number range; the tag number range is reported to CCIA by giving the information to a CCIA staff person at their office or at the auction mart. The cost for variable sized herds before any age verification tag payment is shown in Table 5.

Table 5. Comparison of Traceability Costs for Manual System (A) for Various Cow Herd Sizes (\$ per Cow).

Cows	Review of Cost Break-down Manual Reading, Manual Administration				
	50 Head	100 Head	250 Head	250 Head	1,000 Head
Electronic tag calves	\$2.99	\$2.75	\$2.75	45%	\$2.75
Electronic tag calves incentive	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lost Tags calves	\$0.15	\$0.14	\$0.14	2%	\$0.14
Tags for cows (one-time purchase)	\$0.61	\$0.61	\$0.61	10%	\$0.61
Lost Tags Cows	\$0.33	\$0.31	\$0.31	5%	\$0.31
Total Tags	\$4.08	\$3.81	\$3.81	62%	\$3.81
Wand/stick reader	Not Used				
Data accumulator					
Laptop computer and Software					
Software/ web-based analysis and storage					
Labour					
Incremental Ops Cost Tagging Calves	\$0.36	\$0.29	\$0.14	2%	\$0.14
Farm cost to obtain borrowed reader	Not Used				
Farm cost to learn reader					
Labour per year retagging calves/ special	\$0.14	\$0.12	\$0.06	1%	\$0.06
Labour per year retagging cows/special	\$0.14	\$0.11	\$0.05	1%	\$0.05
Incremental Admin Costs	\$0.22	\$0.18	\$0.09	1%	\$0.09
Reading Costs Out	Not Used				
Other					
Internet access					
Subscriptions/upgrade fees					
Calf Shrink	\$1.55	\$1.55	\$1.55	25%	\$1.55
Auction Mart retagging, feeders/head	\$0.41	\$0.41	\$0.41	7%	\$0.41
Total annual cost base	\$6.91	\$6.46	\$6.10	100%	\$6.10

These values included a cost for tags, labour, administration and costs of animal shrinkage. The total cost for 250 cows was estimated at \$6.10 per cow. Sixty-two percent of the cost is tied up in tag costs for calves and cows including retagging. Twenty-five percent of the cost, or \$1.55 per head, is related to animal shrink. This shrinkage is probably realistic provided the calves are moved from the farm corrals, retagged and moved out directly to a sale where additional shrink could be expected before the sale weight. However, if calves were retagged and then put back to pasture or penned for a few hours and allowed access to water this amount would probably be negligible.

Variable Labour Costs- Manual Scenario

Labour costs to tag and retag calves and cows was about 4% of the total or \$0.25 per cow basis. This may seem like a small amount considering the work involved to round up, catch and tag calves and cows. However, a) the original calf tagging was considered to be incremental to other work being done with calves (original tagging that would be done, vaccinating and other handling).

The variable for labour for the first RFID tagging as it could impact traceability costs for herd sizes from 50 to 1,000 head is shown in Table 6. For 50 cows that takes half a minute per calf to tag the labour cost was \$27 per year or 2% of the total traceability cost; increased labour to 1½ minutes per calf (C) cost \$81 per year or 6% of the total traceability cost.

Table 6. Variable Incremental Labour Costs for Tagging Calves.

Head per Year, Cows		50	250	1,000
Head per Year, Calves		45	225	900
A	Minutes Per Head	0.90	0.50	0.50
	Total Person Hours	0.68	1.88	7.50
	Labour Cost per Cow	\$0.22	\$0.12	\$0.12
	Total Labour Cost	\$10	\$27	\$108
	Total Cost, Traceability per Cow	\$6.91	\$6.10	\$6.10
	Percent of Total Traceability	3%	2%	2%
B	Minutes Per Head	1.80	1.00	1.00
	Total Person Hours	1.35	3.75	15.00
	Labour Cost per Cow	\$0.43	\$0.24	\$0.24
	Total Labour Cost	\$19	\$54	\$216
	Total Cost, Traceability per Cow	\$7.12	\$6.22	\$6.22
	Percent of Total Traceability	6%	4%	4%
C	Minutes Per Head	2.70	1.50	1.50
	Total Person Hours	2.03	5.63	22.50
	Labour Cost per Cow	\$0.65	\$0.36	\$0.36
	Total Labour Cost	\$29	\$81	\$324
	Total Cost, Traceability per Cow	\$7.34	\$6.34	\$6.34
	Percent of Total Traceability	9%	6%	6%

The model used 5% (B) as the expected tag losses. Values were reported for the loss of tags and the labour for retagging per cow unit. For the 250 cow herd total costs for retagging came to about 3% of the total projected costs. At a 2% tag loss (A) the costs were 1% of projected costs. For a 10% tag loss (C) the loss was about 6% of total projected traceability costs.

Calf Shrink Variable Costs

The present scenario used 0.25% shrinkage effect as one of the costs of traceability. This value was not measured in the present review but took best case assumptions from the literature and industry. Table 8 compares variable shrink values with computed costs for shrink cost and total traceability costs.

Variable Retagging Costs-Calves: Tags and Labour

The variable costs of having to retag calves as it impacts the cost of traceability is shown in Table 7.

Table 7. The Effect of Variable Calf Retagging Costs on Traceability: Tags and Labour.

Head per Year, Cows		50	250	1,000
Head per Year, Calves		45	225	900
A. Percent Retagging, Calves		2%	2%	2%
Tags Lost		1	5	18
Retagging Time, Hours		0.2	0.4	1.7
Tag Cost per Cow		\$0.06	\$0.06	\$0.06
Labour Cost per Cow		\$0.07	\$0.02	\$0.03
Total Cost, Traceability per Cow		\$6.71	\$5.98	\$5.97
Percent Total Cost Traceability		2%	1%	1%
B. Percent Retagging, Calves		5%	5%	5%
Tags Lost		2	11	45
Retagging Time, Hours		0.5	0.9	4.2
Tag Cost per Cow		\$0.15	\$0.14	\$0.14
Labour Cost per Cow		\$0.17	\$0.06	\$0.07
Total Cost, Traceability per Cow		\$6.91	\$6.10	\$6.10
Percent Total Cost Traceability		5%	3%	3%
C. Percent Retagging, Calves		10%	10%	10%
Tags Lost		5	23	90
Retagging Time, Hours		1	1.9	8.3
Tag Cost per Cow		\$0.30	\$0.28	\$0.28
Labour Cost per Cow		\$0.35	\$0.12	\$0.13
Total Cost, Traceability per Cow		\$7.23	\$6.29	\$6.30
Percent Total Cost Traceability		9%	6%	6%

Table 8. Comparison of the Variable Effects of Shrinkage on Traceability Costs.

	Cows per Year	50	250	1,000
	Calves per Year	45	225	900
A	Shrink Percent	0%	0%	0%
	Shrink Cost	\$0	\$0	\$0
	Total Cost	\$5.35	\$4.54	\$4.54
	Percent of Total	0%	0%	0%
B	Shrink Percent	0.1%	0.1%	0.1%
	Shrink Cost	\$0.62	\$0.62	\$0.62
	Total Cost	\$5.97	\$5.17	\$5.17
	Percent of Total	10%	12%	12%
C	Shrink Percent	0.25%	0.25%	0.25%
	Shrink Cost	\$1.55	\$1.55	\$1.55
	Total Cost	\$6.91	\$6.10	\$6.10
	Percent of Total	22%	25%	25%
D	Shrink Percent	1%	1%	1%
	Shrink Cost	\$6.21	\$6.21	\$6.21
	Total Cost	\$11.56	\$10.75	\$10.75
	Percent of Total	54%	58%	58%

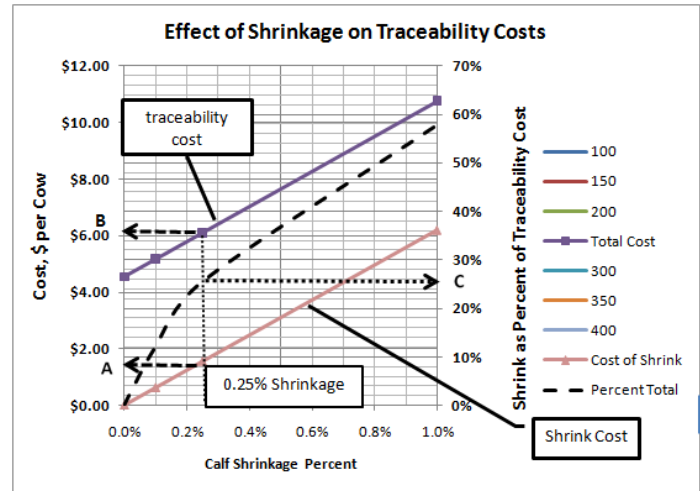


Figure 11. Comparison of Shrink on Traceability Costs. A is the Shrink Cost, B is the Traceability Cost and C is the Percent of Traceability Cost due to Shrinkage. Comparison can be determined on costs as shrinkage percentage increases.

For a no-shrink estimation the traceability cost for the 250 cow herd (Manual management A) is about \$4.54 per cow; the 1% shrinkage is about \$10.75 per cow or 58% of the total traceability cost. The range of projected costs is also shown in Figure 11. As shown the cost related to any shrinkage goes from none to \$1.55 per cow for 0.25%. At 0.1% the cost is about \$0.60 per cow. Nonetheless, going with 0.25% of body weight does impact the estimated traceability cost considerably (about 25% of projected cost) it does, at least, give some recognition to management costs that are at times considered to be a cost of doing business.

Auction Mart Retagging Costs

Auction mart additional tagging costs were based on 4.5% loss (Table 4a) ^{iv}. This accounted for about 7% of the total traceability cost (Table 5). At first, this number seems high; however, on average, this is the amount showing up at the auction sales in Alberta. Over time this will probably decrease. For the 250 cow herd the average number of calves required to be retagged is about 10 with an average cost of \$10.00 per head. The total cost is about \$101 with an average cost of \$0.41 per cow.

Auction Mart Retagging Costs

Cows	50	100	250	1,000	1,500
Calves	45	90	225	900	1,350
Calves Retagged	2	4	10	41	61
Cost per Calf	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
Total Cost	\$20.25	\$40.50	\$101.25	\$405.00	\$607.50
Cost per Cow	\$0.41	\$0.41	\$0.41	\$0.41	\$0.41

^{iv} ARD Auction Mart Study, Rick Frederickson, personal communication 2010

Administration Costs

With this management there are no costs tied up with computers, software or internet charges. Administration is basically tabulating the tag numbers and birthing dates and taking the document to the auction mart for recording into the CLTS program.

No cost was used for CCIA database charges; these are provided by the organization. The projected herd traceability costs of a basic system from Table 5 are as follows:

Cows	50	100	250	1,000	1,500
Manual Administration (A)	\$345	\$646	\$1,524	\$6,097	\$9,145

These costs estimate those for traceability without an incentive payment. Again, they include about 0.25% of the costs for animal shrinkage.

These costs are estimates for a basic management system with limited detail for any records, other than those needed for Alberta's cow-calf requirement. Any business management program costs in addition to these would not be charged to the traceability account.

Manual system, computerized administration for documents (B)

Table 9. Comparison of Traceability Costs for Manual System, Computerized Administration (B).

Cows	Manual Reading, PC Administration				
	50 Head	100 Head	250 Head	250 Head	1,000 Head
Electronic tag calves	\$2.99	\$2.75	\$2.75	41%	\$2.75
Electronic tag calves incentive					
Lost Tags calves	\$0.15	\$0.14	\$0.14	2%	\$0.14
Tags for cows (one-time purchase)	\$0.61	\$0.61	\$0.61	9%	\$0.61
Lost Tags Cows	\$0.33	\$0.31	\$0.31	5%	\$0.31
Total Tags	\$4.08	\$3.81	\$3.81	56%	\$3.81
Wand/stick reader	Not Used				
Data accumulator					
Laptop computer and Software	\$0.97	\$0.48	\$0.19	3%	\$0.05
Software/ web-based analysis and storage	\$1.44	\$0.72	\$0.29	4%	\$0.07
Labour					
Incremental Ops Cost Tagging Calves	\$0.36	\$0.29	\$0.14	2%	\$0.14
Farm cost to obtain borrowed reader	Not Used				
Farm cost to learn reader					
Labor per year retagging calves/ special	\$0.16	\$0.13	\$0.06	1%	\$0.06
Labor per year retagging cows/special	\$0.14	\$0.11	\$0.05	1%	\$0.05
Incremental Admin Costs	\$0.45	\$0.36	\$0.17	3%	\$0.17
Reading Costs Out	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Other					
Internet access	\$0.51	\$0.26	\$0.10	2%	\$0.03
Subscriptions/upgrade fees	Not Used				
Calf Shrink	\$1.55	\$1.55	\$1.55	23%	\$1.55
Auction Mart retagging, feeders/head	\$0.41	\$0.41	\$0.41	6%	\$0.41
Total Annual Cost base	\$10.06	\$8.11	\$6.77	100%	\$6.33

This system is similar to A except the data is managed through a computer system and the internet. This means that the RFID ear tag information is collected as a range of tags, with dates of first and last calving but the data is entered into the CLTS from the producer's computer using the producer's time. The projected per head costs for different herd sizes is shown (Table 9).

All costs are similar to model (A) except for computer, internet and administration cost differences.

These computer-related costs may seem high, but it does acknowledge something for ownership and use of this technology towards traceability expenses.

The total herd traceability costs are projected as follows:

Cows	50	100	250	1,000	1,500
Computerized	\$503	\$811	\$1,693	\$6,335	\$9,429
Administration (B)					

Comparison of the Manual (A) and Computerized Administration (B)

This comparison assesses the cost difference between using a manual system to record information that is submit to CCIA at the auction mart and using a computer to handle the information.

Table 10. Comparison of the Difference between Manual and Computerized Administration Costs.

	Total Herd Costs				
Cows	50	100	250	1,000	1,500
Computerized Administration (B)	\$503	\$811	\$1,693	\$6,335	\$9,429
Manual Administration (A)	\$345	\$646	\$1,524	\$6,097	\$9,145
Difference	\$158	\$165	\$169	\$238	\$284
Difference per Cow	\$3.16	\$1.65	\$0.68	\$0.24	\$0.19

For a 250 head cow herd the cost difference is about \$169 more for computer administration compared with the manual administration; this is about \$0.68 more per head. For the 1,000 head cow herd the cost difference is about \$238 or \$0.24 per cow. This reflects the increased cost of computer ownership and internet costs plus some for labour costs (paid and non-paid) working with a computer verses a manual record keeping system.

Electronic reader/ borrowed, computerized documents (C)

This scenario was the example given for Tables 3 and 4 (model). This system utilizes an electronic

Table 11. Comparison of Traceability Costs for Borrowed Tag Reader for Various Cow Herd Sizes (C).

Cows	50 Head	100 Head	250 Head	250 Head	1,000 Head
Electronic tag calves	\$2.99	\$2.75	\$2.75	39%	\$2.75
Electronic tag calves incentive					
Lost Tags calves	\$0.15	\$0.14	\$0.14	2%	\$0.14
Tags for cows (one-time purchase)	\$0.61	\$0.61	\$0.61	9%	\$0.61
Lost Tags Cows	\$0.33	\$0.31	\$0.31	4%	\$0.31
Total Tags	\$4.08	\$3.81	\$3.81	54%	\$3.81
Wand/stick reader	Borrowed				
Data accumulator					
Laptop computer and Software	\$0.97	\$0.48	\$0.19	3%	\$0.05
Software/ web-based analysis and storage	\$1.44	\$0.72	\$0.29	4%	\$0.07
Labour					
Incremental Ops Cost Tagging Calves	\$0.36	\$0.29	\$0.14	2%	\$0.14
Farm cost to obtain borrowed reader	\$0.84	\$0.42	\$0.17	2%	\$0.04
Farm cost to learn reader	\$0.16	\$0.08	\$0.03	0%	\$0.01
Labor per year retagging calves/ special	\$0.16	\$0.13	\$0.06	1%	\$0.06
Labor per year retagging cows/special	\$0.14	\$0.11	\$0.05	1%	\$0.05
Incremental Admin Costs	\$0.45	\$0.36	\$0.17	2%	\$0.17
Reading Costs Out	\$0.36	\$0.29	\$0.14	2%	\$0.14
Other					
Internet access	\$0.51	\$0.26	\$0.10	1%	\$0.03
Subscriptions/upgrade fees	Not Used				
Calf Shrink	\$1.55	\$1.55	\$1.55	22%	\$1.55
Auction Mart retagging, feeders/head	\$0.41	\$0.41	\$0.41	6%	\$0.41
Total Annual Cost	\$11.43	\$8.90	\$7.11	100%	\$6.52

borrowed reader to capture data and animal movement which can be down-loaded to the computer system (Table 11). For example, ARD has readers that are available free of charge. Other suppliers such as veterinarians or Livestock Identification Services (LIS) rent out readers. The LIS reader is advertized for a fee of \$.50 per head^v. Data collected can either be the start and finish of calving with the dates, or individual data on birth dates and management information.

Projected annual herd traceability costs for this system (C) are as follows:

Cows	50	100	250	1,000	1,500
Herd Costs Borrowed Wand (C)	\$571	\$890	\$1,778	\$6,522	\$9,685

^v Livestock Identification Services Ltd. (LIS) web-site. They will also download the information onto a spreadsheet and email the file back to the producers. <http://www.lis-alberta.com/>

Additional Cost of Using a Borrowed Wand to Manage Data

The difference between the Manual Reading System (B) and the Borrowed Reader System (C) is basically the labour costs of reading the ear tags with a wand without any ownership. This is shown in Table 12.

Table 12. The Cost of the Using a Borrowed RFID Wand (C) less PC Administration (B) Costs.

Cows	50	100	250	1,000	1,500
Borrowed Wand (C)	\$571	\$890	\$1,778	\$6,522	\$9,685
PC Administration (B)	\$503	\$811	\$1,693	\$6,335	\$9,429
Difference	\$68	\$79	\$85	\$188	\$256
Difference per Cow	\$1.37	\$0.79	\$0.34	\$0.19	\$0.17

The labour costs (paid and nonpaid) to read RFID tags on calves using a borrowed wand is about \$79 per year or \$0.79 per head for the 100 cow herd; for the 250 cow herd it is about \$85 per year or \$0.34 per cow for the 250 cow herd. This assumes that the information is for traceability information. In actuality, for the cow calf producers RFID tags are not presently required to be read moving. This would be the cost of using a wand to retain information for management purposes. This cost difference is related to picking up the wand in town each time it is used and the labour involved for reading tags.

Electronic reader/ owned, computerized documents (D)

Table 13. Comparison of Traceability Costs for Owned Tag Reader for Various Cow Herd Sizes (D).

Cows	Purchased Reader, PC Admin				
	50 Head	100 Head	250 Head	250 Head	1,000 Head
Electronic tag calves	\$2.99	\$2.75	\$2.75	37%	\$2.75
Lost Tags calves	\$0.15	\$0.14	\$0.14	2%	\$0.14
Tags for cows (one-time purchase)	\$0.61	\$0.61	\$0.61	8%	\$0.61
Lost Tags Cows	\$0.33	\$0.31	\$0.31	4%	\$0.31
Total Tags	\$4.08	\$3.81	\$3.81	51%	\$3.81
Wand/stick reader	\$2.59	\$1.29	\$0.52	7%	\$0.13
Laptop computer and Software	\$0.97	\$0.48	\$0.19	3%	\$0.05
Software/ web-based analysis and storage	\$1.44	\$0.72	\$0.29	4%	\$0.07
Labour					
Incremental Ops Cost Tagging Calves	\$0.36	\$0.29	\$0.14	2%	\$0.14
Farm cost to obtain borrowed reader					
Farm cost to learn reader	\$0.16	\$0.08	\$0.03	0%	\$0.01
Labor per year retagging calves/ special	\$0.16	\$0.13	\$0.06	1%	\$0.06
Labor per year retagging cows/special	\$0.14	\$0.11	\$0.05	1%	\$0.05
Incremental Admin Costs	\$0.45	\$0.36	\$0.17	2%	\$0.17
Reading Costs Out	\$0.36	\$0.29	\$0.14	2%	\$0.14
Internet access	\$0.51	\$0.26	\$0.10	1%	\$0.03
Subscriptions/upgrade fees	Not Used				
Calf Shrink	\$1.55	\$1.55	\$1.55	21%	\$1.55
Auction Mart retagging, feeders/head	\$0.41	\$0.41	\$0.41	5%	\$0.41
Total Annual Cost	\$13.17	\$9.78	\$7.46	100%	\$6.61

The final assessment was for a producer-owned reader system and computerized data management. The summary costs are shown in Table 13.

Reader ownership allows the producer to use a system when he wants to process his cattle and not have to wait for a borrowed or rented unit. For a 50 cow herd the cost is about \$13 per head. For a 250 cow herd the cost is \$7.46 per head and for the 1,000 head herd it is about \$6.61 per head.

Total herd costs would be as follows:

Cows	50	100	250	1,000	1,500
Reader Ownership (D)	\$659	\$978	\$1,865	\$6,610	\$9,773

Additional Cost of Using a Purchased Wand to Manage Data

An estimation of the cost of owning a wand reader to manage farm data compared with manual collection of CCIA data is shown in Table 14. All computer related costs are similar; the extra cost is owning a wand reader and the labour costs to move cattle around to use the wand to collect data.

Table 14. Comparison of the Cost of Wand Ownership (D) to Manual-PC Data Handling (B)

Cows	50	100	250	1,000	1,500
Reader Ownership (D)	\$659	\$978	\$1,865	\$6,610	\$9,773
PC Administration (B)	\$503	\$811	\$1,693	\$6,335	\$9,429
Difference	\$155	\$166	\$172	\$275	\$344
Difference Cost per Cow	\$3.11	\$1.66	\$0.69	\$0.27	\$0.23

For a 100 cow herd the extra costs would be about \$166 per year for the herd or \$1.66 per cow. For a 250 cow herd the extra costs would be \$172 for the herd or about \$0.69 per cow. Wand read collection of livestock data is not presently needed for the traceability program; most of these extra costs would be justified by using livestock data for farm management purposes.

Comparing the Purchased Wand (D) with the Borrowed Wand (C)

A comparison of the cost of using an owned wand reader with a borrowed wand reader to identify calf tag information is shown in Table 15. All other wand labour costs and computer-related administration costs remain the same.

Table 15. Cost of RFID Wand Reader Ownership (D) versus Borrowed Wand Reader (C).

Cows	50	100	250	1,000	1,500
Wand Reader Ownership (D)	\$659	\$978	\$1,865	\$6,610	\$9,773
Borrowed Wand (C)	\$571	\$890	\$1,778	\$6,522	\$9,685
Difference	\$87	\$87	\$87	\$87	\$87
Difference Cost per Cow	\$1.74	\$0.87	\$0.35	\$0.09	\$0.06

If using a wand for RFID inventory control and data management the cost of owning wands is relatively small compared to borrowing wands. In this assessment it is about \$87 per year extra.

For a 100 cow herd the cost difference is just under \$0.90 per head; for a 250 cow herd it is about \$0.35 per head. This reflects the cost of owning the equipment written off over four years with an accounting for interest on the money to purchase the system.

Incentives

On June 5, 2008, the Alberta government implemented mandatory age verification of cattle and premises identification effective January 1, 2009 through to December 31, 2012. Incentive-discounts are to be paid up to \$3.00 per head towards the cost RFID tags. Therefore at least during this period the cost of traceability is offset by this amount.

The costs are shown for summary estimations without any incentive in Table 16. For the Manual and Computerized management system the average cost is \$6.43 per cow. Of this about \$1.55 or 24% is from shrink and 59% from the tag costs.

Table 16. Estimated Traceability Costs Summary without a Tag Incentive Program for 250 Head Cow Herd.

	Manual A	PC Admin B	Average \$ (A+B)	Average (A+B)%	Borrowed Reader C	Owned Reader D
Electronic tag calves	\$2.75	\$2.75	\$2.75	43%	\$2.75	\$2.75
Lost Tags calves	\$0.14	\$0.14	\$0.14	2%	\$0.14	\$0.14
Tags for cows (one-time purchase)	\$0.61	\$0.61	\$0.61	10%	\$0.61	\$0.61
Lost Tags Cows	\$0.31	\$0.31	\$0.31	5%	\$0.31	\$0.31
Total Tags	\$3.81	\$3.81	\$3.81	59%	\$3.81	\$3.81
Other Costs	\$0.74	\$1.41	\$1.08	17%	\$1.75	\$2.10
Calf Shrink	\$1.55	\$1.55	\$1.55	24%	\$1.55	\$1.55
Total Cost	\$6.10	\$6.77	\$6.43	100%	\$7.11	\$7.46

The incentive program takes the basic costs of tags for calves out, but leaves in the cost of lost tags, and cow tags. This is shown in Table 17.

Table 17. Estimated Traceability Costs with the Mandatory Age Verification Tag Incentive Program for a 250 Head Cow Herd.

	Manual A	PC Admin B	Average (A+B)%	Average (A+B)%	Borrowed Reader C	Owned Reader D
Electronic tag calves	\$0.00	\$0.00	\$0.00	0%	\$0.00	\$0.00
Lost Tags calves	\$0.14	\$0.14	\$0.14	4%	\$0.14	\$0.14
Tags for cows (one-time purchase)	\$0.61	\$0.61	\$0.61	17%	\$0.61	\$0.61
Lost Tags Cows	\$0.31	\$0.31	\$0.31	8%	\$0.31	\$0.31
Total Tags	\$1.05	\$1.05	\$1.05	29%	\$1.05	\$1.05
Other Costs	\$0.74	\$1.41	\$1.08	29%	\$1.75	\$2.10
Calf Shrink	\$1.55	\$1.55	\$1.55	42%	\$1.55	\$1.55
Total Cost	\$3.35	\$4.02	\$3.68	100%	\$4.36	\$4.71

Average costs for manual and computerized administration is about \$3.68. Tags still account for about one dollar of the costs or 30% of the costs; shrink accounts for the \$1.55 or 42%.

Summary

A review the regulatory burden of the direct costs of animal traceability was done using four scenarios for manual and computerized administration systems, and for using borrowed and owned RFID tag readers. This review did not consider any costs for upgrading corrals or handling systems.

Under the Traceability Livestock Identification regulation, owners of cattle born on or after January 1, 2009 must tag all calves with a CCIA approved tag and report the birth date into the Canadian Livestock Tracking System (CLTS) prior to a) the animal leaving the birth farm or b) within 10 months, whichever comes first.

When cattle are shipped for sale a birth certificate can go with the shipment as information for prospect buyers. Cow calf producers are required to have ear tags in their stock; they are not required to scan the tags for the program. However, producers may wish to scan tags for their own management records. The new owners (feedlots or packers) are required to scan tags as they acquire the livestock. This tag information is sent to the CLTS; packers finalize the transfer by “retiring” the tag.

In most discussions about traceability from reports from the US, Australia or other regions calf tags are scanned and reported into a system by the cow calf producer. This generates an additional step, and additional costs.

For the present assessment costs were determined for four scenarios where all calves and cows were tagged and sold into the system: A) manual reporting through the auction mart link to the CLTS, B) producer reporting using a computer linkage to the CLTS, C) borrowed wand reading tags, reporting information to the CLTS and D) owned wand reading tags, reporting information to the CLTS.

The first two scenarios are part of the direct costs for cow calf producers associated with Alberta’s traceability program; the last two scenarios add another level of tag reading, whereby management information could be used by the producer for data entry to his own system. Only the first two processes will be considered a “cost” of the traceability program; the other processes are included to project a cost if the program changes to require some tag information stream from the producer to the CLTS.

The review did not use primary research data. Information was obtained from the literature and with discussions with producers. RFID tag prices were a major cost to the program; these were determined from Alberta suppliers and discussions with producers. The time to carry out certain functions such as tagging calves or looking after the account management were taken from other reports or estimated.

One cost that had a major effect on the cost of traceability was animal shrink. This was estimated from the literature and from some discussion with experienced producers in the field. But again, this projection was somewhat arbitrary, and could be overstated (or understated) depending on how the cattle are managed.

Incentive Payments

Traceability costs for the cow calf herd were assessed using Manual Administration (A), Computerized Administration (B), use of a Borrowed Wand to read ear tags including computerized Administration (C) and an Owned Wand and computerized Administration. A comparison of the costs with and without the incentive program is shown in Figure 12. Base values for the regular, non-incentive were taken from

Tables 16 and 17. The Incentive values had the cost of tags (\$2.99 for 50 cow herds to \$2.75 for 100 cows or more) backed out of the regular costs. These backed-out tag costs included the cost of interest of tag ownership.

For a smaller 50 head cow herd the manual cost of traceability was about \$6.91 per cow; for the 1,000 cow herd the average cost was about \$6.10 per cow.

The cost with the incentive program for a 50 head cow herd was about \$3.92 per cow; for the 1,000 cow herd it was about \$3.35 per cow.

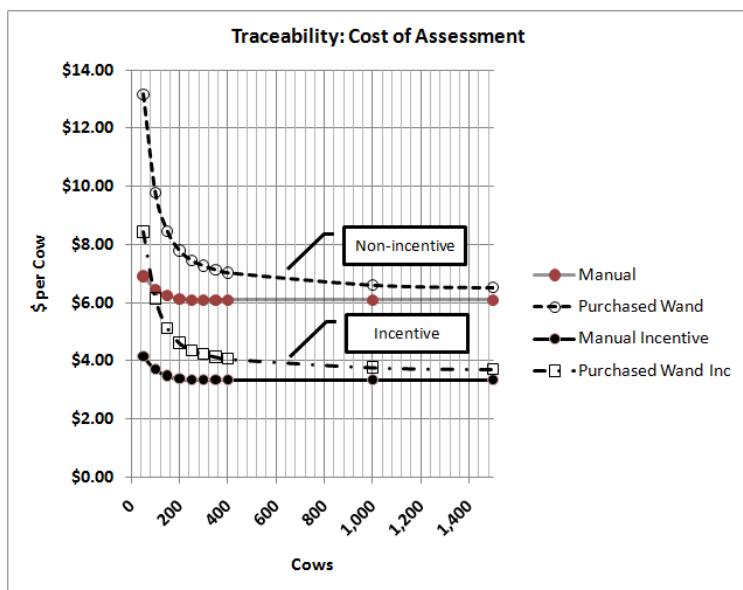


Figure 12. Comparison of Manual and Computerized Traceability Costs With and Without any Incentive.

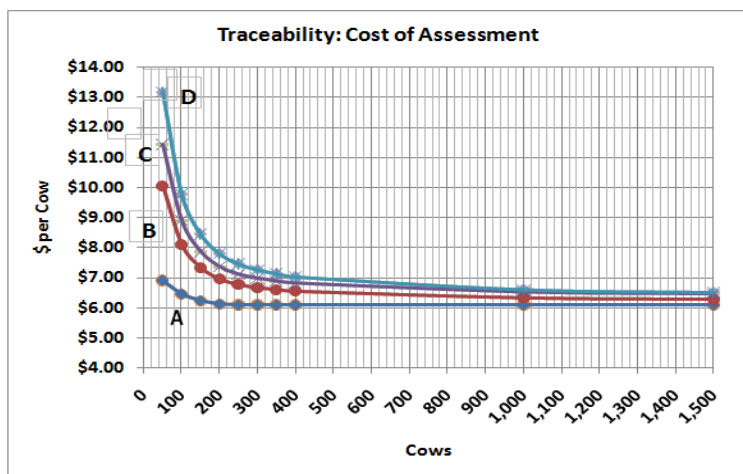


Figure 13. Comparison of Traceability Costs between Manual (A), Manual with PC Administered Data (B), Borrowed-Wand (C) and Owned Wand (D) Systems. The Last two systems include a readout cost with computerized information management.

Tag Reading Costs

The scenario also looked at an ear tag reading process with data entry using a producer's computer system; this includes models C and D. Reading tags to collect information was considered to be a management process and not presently necessary for traceability with CCIA.

Tag reading increases the cost above the manual-computer process (B) marginally, but does include the ability to maintain other management data with each animal in the system.

Tag reading, as used in this review, increased the cost primarily due to a) cost of either borrowing or owning a reader and b) time used to read the ear tags. The projected times for this are shown in Table 3 (also item 64).

For a 100 head herd the time is about 94 minutes; for a 250 herd it is about two hours. Therefore, the extra cost is the time component times the labour rate of \$16 per hour. These values per head are shown in Tables 11 and 13 as reading out costs.

For small herd sizes the use of readers (borrowed or owned) becomes financially prohibitive in a range of \$1.50 to \$3.00 per head for readers and labour (Tables 12 and 14). For herd sizes over 200 head the use of readers becomes more

reasonable, especially when using the system to help administer management information. The comparison of costs per cow for all models (manual records, no tag reading “A”, manual records, computerized records, no tag reading “B”, borrowed reader, computerized records “C” and owned reader, computerized records “D”) is shown in Figure 13.

Projection of Cost of Traceability and Age Verification to the Provincial Herd

Regular Program-No Incentives

The tabulated costs for traceability and herd management using RFID tag system from projection from totally manual systems, manual tags with computerized data administration, and data collection using borrowed and purchased readers is shown in Table 18.

Table 18. Comparison of Projected Traceability and Management Costs, Dollars per Head Using RFID Systems.

Costs for Traceability and Information Management, \$ per Cow*										
Cows Herd Size	50	100	150	200	250	300	350	400	1,000	1,500
Manual (A)	\$6.91	\$6.46	\$6.24	\$6.13	\$6.10	\$6.10	\$6.10	\$6.10	\$6.10	\$6.10
PC Admin (B)	\$10.06	\$8.11	\$7.34	\$6.96	\$6.77	\$6.68	\$6.61	\$6.55	\$6.33	\$6.29
Borrowed Wand (C)	\$11.43	\$8.90	\$7.87	\$7.36	\$7.11	\$6.98	\$6.89	\$6.82	\$6.52	\$6.46
Purchased Wand (D)	\$13.17	\$9.78	\$8.45	\$7.80	\$7.46	\$7.27	\$7.14	\$7.04	\$6.61	\$6.52

*values include 10% breeding and calving losses to calf market age

From this an assumption was made to project types of systems that would probably be used in Alberta to collect this data for any particular herd size. This is not based on any study but is purely conjecture. This assumption is shown in Table 10.

Table 19. Projected Average Costs to Assess Traceability and Management Data using RFID Systems (from Table 18).

Projected Costs for Traceability Program, \$ per Cow										
Cow Herd Size	50	100	150	200	250	300	350	400	1,000	1,500
Manual (A)	\$6.91	\$6.46	\$6.24	\$6.13	\$6.10	Not Used				
PC Admin (B)	Not Used		\$7.34	\$6.96	\$6.77	\$6.68	\$6.61	\$6.55	\$6.33	\$6.29
Average	\$6.91	\$6.46	\$6.79	\$6.55	\$6.43	\$6.68	\$6.61	\$6.55	\$6.33	\$6.29

For the province of Alberta it was assumed that a combination of producers would use either the manual system or computerized system to handle calf and cow data for the database. This information was not developed through a survey.

For herds of 100 or less it was assumed that the manual system of data collection and reporting at the auction mart would be used. For 150 to 250 head herd sizes a combination of producers (50:50) were assumed to use manual and computerized methods. For anything over 300 head the assessment used a computerized record keeping system. The average values are shown in Table 19.

These basic values were used to generate average values for the provincial herd.

The number of farms for Alberta in 2010 were derived from 2006 Census data. This was projected at 22,000 cow-calf operators (Table 20). Cow ranges were defined by Statistics Canada. The average number of cows for each range was calculated to make the final head the same as those from Statistics Canada information. Therefore, the total number of cows per range is a derived “best-fit” number. The average cost for traceability and management (average cost per cow) was derived from Table 19. The

extended cost per range group is the projected cost to use the RFID system for regulatory traceability functions.

Table 20. Projected Alberta Provincial Traceability and Management Producer Costs from Statistics Canada and Alberta Agriculture Data, 2010.

Range	1-47	48-77	78-122	123-177	178-272	273-527	528 +	Total
Average Head, Cows	28	56	93	139	208	361	600	
Farms	11,152	3,607	3,239	1,774	1,337	782	181	22,072
Total Head, Cows	312,256	201,992	301,227	246,586	278,096	282,302	108,600	1,731,059
Average Cost per Cow*	\$6.91	\$6.68	\$6.62	\$6.67	\$6.55	\$6.52	\$6.31	
Total Cost	\$2,156,170	\$1,349,853	\$1,995,482	\$1,644,041	\$1,820,325	\$1,840,854	\$685,308	\$11,492,033
Cost per Group	19%	12%	17%	14%	16%	16%	6%	Average Cost
Accumulated Cost	19%	31%	48%	62%	78%	94%	100%	\$6.64

*from Table 19 adjusted for herd range size. Value includes estimated 90% calves to market from original cow herd size.

This was about \$11.5 million projected for 1.7 million cows in the province for the year 2010. From this the average cost of traceability for all cows in the provincial herd was \$6.64 per head. Of the \$11.5 million, 48% came from 122 cows or less; the remainder came from over 122 cow farm operations.

In practical terms the assessment for costs by herd size is for the 1 to 47 cow herds of about \$7 per cow to \$6.31 for herd sizes of 528 and over cows.

The Provincial Herd Cost with the Incentive Program

In May 2010 the Alberta government announced the \$15 million age verification incentive program to run from January 1, 2009 through to December 31, 2012 to offset the cost of tags up to \$3.00.

Substantial uptake in the age verification program had taken place in Alberta up to this time regardless. As of December 31, 2009 before any announcement of a program age verification for the 2008 herd was about 79% of the total as reported in the CCIA monthly news letter report^{vi}.

Table 21. Projected Provincial Traceability and Management Producer Costs with the Mandatory Tag Incentive Payment*.

Range	1-47	48-77	78-122	123-177	178-272	273-527	528 +	Total
Average Head, Cows	28	56	93	139	208	361	600	
Farms	11,152	3,607	3,239	1,774	1,337	782	181	22,072
Total Head, Cows	312,256	201,992	301,227	246,586	278,096	282,302	108,600	1,731,059
Average Cost per Cow	\$4.15	\$3.93	\$3.87	\$3.92	\$3.79	\$3.77	\$3.56	
Total Cost	\$1,297,096	\$794,135	\$1,166,751	\$965,637	\$1,055,231	\$1,064,189	\$386,529	\$6,729,569
								Average Cost
								\$3.89

^{vi} CCIA CLTS Statistics- As of December 31, 2009.

The average cost difference between Tables 20 and 21 is \$2.75 per head. This is the average tag cost used for the provincial herd.

Even with the incentive program some producers would not bother to apply for the financial support. Using an estimated value of 85% uptake in the program the cost to Alberta's beef producers for 2009 to 2012 will be about an average of \$3.90 per cow for a total of \$6.7 million for one year.

Table 22. Projected Costs of Traceability to Alberta Cow Calf Producers for One Year with a Government Supported Traceability Program.

Cows in Alberta, Head	Number of Calves to Market at 90%	Amount of Uptake at 85%, Head	Projected Cost at \$3.89 per Head for Incentive Participants (85%)	Projected Cost at full cost \$6.64 per Head for Non-Participants (15%)	Total Cost for All Producers	Average Cost with Incentive for Provincial Herd, \$ per Cow
1,731,059	1,557,900	1,324,200	\$5,151,000	\$1,551,700	\$6,702,800	\$3.90

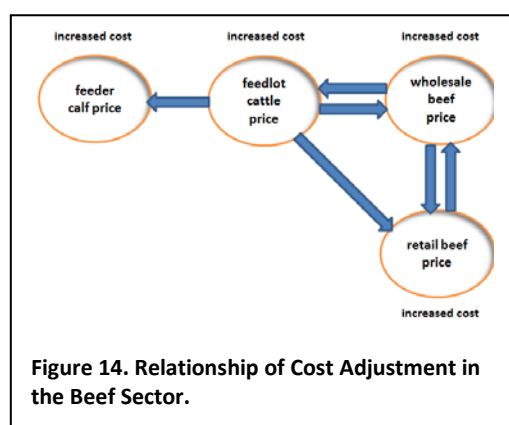
At 85% uptake the incentive program would cost the province about \$3.9 million per year (Table 23).

Table 23. Projected Cost to the Government of Alberta for the Tag Incentive Program

Cows in Alberta, Head	Number of Calves to Market at 90%	Amount of Uptake at 85%, Head	Projected Tag Cost Incentive at \$3.00 per Tag
1,731,059	1,557,900	1,324,200	\$3,972,600

Discussion

Traceability cost to Alberta's cow-calf sector projected to be \$11.5 million or \$6.64 per head per year is handled in two ways. The cow-calf producer is a price taker: extra costs are not passed on to other parts of the value chain and must be absorbed¹¹. Figure 14 shows the cost flow relationship for parts of the value chain including cow-calf, feedlots, wholesale and retail beef sectors¹². Any costs on the feeder side stay with the cow-calf sector. With sector realignment over time (perhaps as much as 5 to 10 years) costs will move up the chain.



Projections of the cost of traceability have been reported by various groups; most have used the cost of tags and tagging plus costs for reading tags with a tag reader (Table 24). These projections were in a range of between \$4.00 to almost \$10.00 per head. Again, these were estimates using RFID tag reading technology to monitor animal identification. They did not allow for any costs to calf shrinkage.

AAFC assessed the costs for a 250 cow-calf herd with calves

having RFID tags in the ears, but by using a telephone to transmit tag number information to the database centre (see Reference 1). This is more in line with the present assessment. Their assessment cost was in a range of \$5.68 per head for the low scenario case to \$10.35 per head for the high scenario situation. As well, they did allow something for calf shrinkage.

Table 24. Comparison of Traceability Costs from Different Studies (derived from AAFC reference 1).

Key Cost	Alliance Consulting [1]			Australian Beef Association [2]		Kansas State University [3]		Beefstocker USA [4]		Farnam Livestock [5]	
Factors	Fixed Lo	Fixed Hi	Per Head	Fixed	Per Head	Fixed	Per Head	250 Head	1,000 Head	250 Head	1,250 Head
* Total Per Head Cost is not the sum total of individual costs above. Per head cost is the quoted estimate in each respective study.											
Equipment											
RFID Tags			\$3.64		\$3.54		\$2.61			\$2.71	\$2.71
RFID Readers	\$846	\$6,140	\$0.03	\$357	\$0.36	\$986	\$0.99			\$0.72	\$0.14
Computer			\$0.05			\$1,160	\$1.16			\$0.58	\$0.12
Software										\$0.81	\$0.16
Labour											
Device Application			\$0.69		\$0.74						
Replacement Tag Application					\$1.47						
Tag Reading & Data Transfer			\$0.69		\$0.18					\$0.96	\$0.49
Internet Services						\$557	\$0.56			\$0.23	\$0.12
Total per Head Cost			\$5.26		\$6.29		\$5.31	\$8.00	\$4.00	\$9.67	\$4.63

[1] Alliance Consulting (2004). Cost Analysis of NLIS Compliance for Beef Producers. Queensland, Australia.

[2] Australian Beef Association (2005). Submission to the Queensland Government Relating to the NLIS Regulatory Impact Study, Toowoomba, AU. Includes the cost of a reader amortized over three years with an 8% discount rate.

[3] Dhuyvetter, K. (2006). Economics of Animal Identification. Retrieved February 26, 2007 from [http://www.agmanager.net/dhuyvetter/presentations/Economics_of_Animal%20ID\(Mar2006\).pdf](http://www.agmanager.net/dhuyvetter/presentations/Economics_of_Animal%20ID(Mar2006).pdf). Includes the cost of a reader amortized over four years with a 6.5% discount rate.

[4] Blasi, D. (2004). Survey of Animal Identification Industry. Beefstocker USA, Kansas State University. February 2007: <http://www.beefstockerusa.org/rfid/>.

[5] Farnam Livestock Tracking Systems (2005). About EID. Retrieved February 26, 2007 from <http://www.farnamlts.com/benefits.htm>.

Presently in Alberta beef traceability can be done without the need of an electronic tag reader by recording the RFID tag numbers when purchased through the sales outlet or by giving the RFID tag list to CCIA staff at the auction mart. This was classified as process (A) in the present review.

For a 250 head cow herd the average cost was \$6.10 per cow unit. When the tags were purchased and the information was sent into the CCIA database using a computer (process B) the cost was about \$6.77 per cow unit. Neither of these methods, as a way of dealing with traceability, requires an RFID tag reader. Therefore, the cost comparisons with other studies reporting use of RFID tag reading is not exactly valid.

In the present review a tag reader was not required because of the structure of the present requirements of having to have an RFID tag before shipping cattle to market and reporting these tag numbers to the database administrator at CCIA. Tag reading by a wand is not necessary. This step does

eliminate the cost of having a wand or tag reader, the labour cost of reading the tags and the effect of the cost any shrinkage on stock running through a chute or pens to read the tags.

The cost of traceability in the NAIS study⁷ used a value of \$US 3.50 per cow with a range of \$US 5.12 for small herds to \$US 2.48 per cow for large herds for herds presently tagging livestock. However, the cost projected for any shrinkage for the cow calf herd was only two pounds for tagging with an additional 2.75 pounds for tag reading for a total under 5 pounds.

For a 600 pound feeder calf this would be under one percent. However, they assumed that of this shrink about 75% would be recovered by compensatory gain leaving an overall 0.20% shrinkage. The present review used 0.25% shrinkage. The problem is that both values are based on assumptions which can tend to add substantial costs to the projected traceability cost depending on what is used. In the present review calf shrinkage accounted for about 22% to 25% of the overall costs (Table 8).

Although the present traceability program for cow calf producers does not require reading ear tags costs for this is also assessed. At some time cow calf operators may be required to read tags for traceability functions.

As it turns out these costs are relatively minimal. The present review indicates a cost for a 250 cow herd of RFID tag reading of \$0.34 per cow with a borrowed reader (Table 11) and \$0.69 per cow with an owned reader (Table 13). This is an increase of about 5% for a borrowed and 10% for an owned wand above the cost of not using an RFID tag reader, respectively. These costs include the cost of wand ownership and the labour to read tags.

Alberta's beef sector does support certain attributes of the present traceability program that starts with the cow calf sector^{vii}.

The fundamentals of why and how animal traceability should be addressed are basic to the industry. It has been addressed as a benefit to the industry with a focus on animal health. As such the provision has been addressed under the Health of Animals Act. In addition, any value-added component of a traceability program should be market driven to assist the livestock sector in providing good access to breaches of animal health. It should also act as a mechanism to renew commerce as quickly as possible if something such as a border closure occurs.

Mandatory aspects, such as that presently for age verification, are difficult to accept by many primary producers because of the non-health component. Age verification, although tied in as a part of the traceability program has a separate focus: that of providing age verified products to a special market. This has been difficult for many producers to buy into, even though some compensation has been provided in the age verification incentive offered by the government of Alberta.

There are at least two issues here. One is that many producers in Alberta (almost 80% for the year 2008 to the end of December 2009) were already age verifying their calves in the system. Secondly, some producers were receiving a premium as much as \$30 per head for age verified calves. The mandatory component eliminated this premium; this was considered by these producers as a "cost" to them; they would not be in line for the possible premium.

^{vii} Alberta Beef Producers, Discussion of the Alberta Livestock and Meat Strategy, 2006

Traceability participation does have a cost element to the producer and to industry as shown in the present review. To attain a profit, for both producer and for the industry as a whole, traceability needs to be considered an investment.

Attributes of a Traceability System

A. As a Cost

The cost to the cow calf producer of having the program, without the mandatory incentive is about \$7 per cow. If all of the cost were based on calf

Table 25. Estimated Equivalent Cost as Death Loss or Reduced Calf Price to the Cow-Calf Producer.

1. Average Calf Weight 600 pounds
2. Average Calf Price of \$1.15 per pound
3. Total Calf value of \$690 per head
4. Direct Cost of Cow-Calf Traceability of \$7 per cow
 - A. $\$7 \div \$690 = 1\%$ of calf value or 1% death rate: that is, changing from 10% to 11% calf losses per cow; or
 - B. The equivalent of a decrease of 1.28 cents per pound when selling 600 pound calves. For example:

	Base	Change
i. Cows	250	250
ii. Calves	90%	89%
iii. Calves, head (i X ii)	225	223
iv. Value per head (3)	\$690	\$690
v. Total Value (iii X iv)	\$155,250	\$153,525
vi. Value Difference, Total (Base v – Change v)		\$1,725
vii. Value difference \$ per pound of calves sold (vi ÷ (base iii X weight (1)))		\$.0128
viii. Value difference for Calves, cents per pound (Change vii ÷ 100)		1.28 cents

sales then this would be equal to approximately an increased death loss of 1% (Table 25). Alternatively, a reduced live weight sales price for calves of 1.28 cents per pound would be equivalent.

If viewed as a cost then some decrease in cow-calf profit margin would be expected, even though relatively small. This does not include any “cost” of a lost premium for having age verified calves. For a 250 head cow herd this would be \$1,725 per year. As an overall cost this amount would not be recovered by the cow-calf producer; and it would not be expected to be able to pass it along to other parts of the value chain (Figure 14).

B. As an Investment

An enhanced investment in agriculture for one stage can be shown generally to increase the value along the value chain provided some attribute is being passed along from one

owner to the next one¹³. For example, vaccination information has some value from one owner to the next; this is identified as an attribute. Age verification information in cattle is an attribute; it has some value for the next owner in the value chain. Some of Canada’s international trading partners now request birth date information as a prerequisite for export. Japan for example, will only accept beef from animals under-21 months of age. However, there is a perception among cow calf and feedlot producers that their work of traceability and age verification mainly benefits someone else, such as an exporter.

The experience so far has shown that when members of the chain invest approximately 0.5% (half of one percent) of the cost of the raw product paid by the first stage processor for each unit of production, they are able to reap from 2% to 5% increased profit. This is based upon the revenue generated by the last agricultural producer who sells to the first food processor. This means however that the investment, or attribute, has some value and is in fact an investment.

Some of the attributes that could come with the traceability process were described in Table 1. These include risk benefits such as livestock disease management that has a high benefit both in the short

term and long term to producers. Food safety and public health are also benefits. But these impact society more than they do producers.

A long term attribute in livestock disease management would be a function in maintaining an open border for the sector, or getting the border reopened in a situation with an industry disease problem such as BSE. This indeed is a worthy attribute directly affecting producers along the value chain. The present review did not assess the possible return on such investment in potential dollars to the industry and to individual producers, but is worthy of some investigation.

Other aspects of having attributes come outside the intention of a regional (provincial or federal) program, although much of the rhetoric is bound up in these. For example, increased beef trade (Table 1) is highly beneficial to all producers and the industry. However, the current traceability program is being promoted as a health based initiative, but the trade aspect has a high focus.

The debate, however, is around who pays for this increased trade opportunity and who benefits? If the primary producer is the payer (or the investor) then the return on this investment should be returned to that group. However, with flow-back dynamics (Figure 14) this has been difficult to really assess.

In the present review the average investment in Alberta for traceability by the cow calf producer is approximately \$6 to \$7 per head, not including anything for age verification incentive. This \$7 on a 600 pound steer valued at \$1.15 per pound is about 1% of the raw product value to the next level. This does not include any direct cost incurred by subsequent levels of the value chain, such as those for back grounding, auction marts, feedlots and processors. Invariably, much of these costs would trickle back to the cow calf producer creating a larger, overall cost than the \$7 per cow.

In the cow calf sector of the beef cattle industry, for example, investing about \$7 per cow head (1% of raw product value) has the potential to increase profitability by somewhere between 2% to 5% or \$14 to \$35 per cow unit following the experience of value chains in general. So the \$7 investment might increase revenue by \$14 to \$35. This has yet to be shown.

Follow up

These beef sector value-chain regulatory relationships need to be further assessed considering the full extent of all systems from the cow-calf sector through to the packing sector. In addition, a cost-benefit analysis of traceability needs to be done for the Alberta initiative to better understand the relationships and financial benefits of supporting this in the future.

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Borrowed Reader, PC Admin									
COW-CALF Estimated Costs for a Radio Frequency Identification (RFID) System									
PC Admin			Allflex retail						
Borrowed Reader			For small Cow-calf producer with 50 or less head.						
1	Average herd size, number of head		250	Calves are tagged at one time; use Calving Start Date Method.					
2	Interest rate, %		5.85%	RBC 5 year mortgage April, 2010					
Scenario 1 - Alberta Agriculture Equipment									
3	Labour			16	Borrowed Reader				
4	data	Labor Cost, Operations \$ per Hour	\$16	Alberta	17	data	km to get printer, round trip	50	km
5	data	Admin/Clerical Cost, \$ per Hour	\$20	Alberta	18	data	time -get and take reader, h	2	hours
6	data	Incremental Ops Calves Time Sec/head	30.0	NAIS study	19	data	mileage cost, \$/km	\$0.50	
7	calc	Incremental Ops Time Calves Total, Hrs	2.08	calculation	20	calc	Cost, Borrowed Reader	\$82.00	
8	data	Cow Turnover, years	5						
9	data	Incremental Admin Time, Sec/head	30		21	data	Internet access	\$400.00	
10	calc	Incremental Admin Time, Total Hours	2.08		22	data	Subscriptions/upgrade fees	\$65.00	
11	data	Learning Reader, time- minutes	30		23	data	Calf weight, pounds	600	
12	calc	Learning Reader, cost, \$ per year	\$8		24	data	Calf Shrinkage	0.25%	
13	data	Reading Time Out per head, sec/ head	30.0	projected	25	data	Calf Price, \$ per Pound	\$1.15	
14	calc	Reading Time Out Tot Hours/year	2.08		26	data	Auction Mart Retagging		
15	calc	Reading Time Out, \$ / year	\$33.33		27	data	Auction Mart retagging, feeders/head	\$10	
					28	data	Auction Mart retagging, percent herd	4.5%	ARD Study
29	Retagging Labour								
30	data	Percent Retagging, Calves	5%						
31	calc	Head Retagging, Calves Number	11						
32	data	Retagging Ops time, min/head, Calves	5						
33	calc	Retagging time Calves, total hours	0.9						
34	calc	Retagging Ops, Calves \$ labour	\$15.00						
35	data	Lost Tags, Cows	10%						
36	calc	Head Retagging, Cows Number/year	5						
37	data	Retagging Ops time, min/head, Cows	10						
38	calc	Retagging Ops, Cows hours, total	0.8						
39	calc	Retagging Ops, Cows \$ labour	\$13.33						
40	data	Calf Crop	90%	ARD					
41	Tag Costs, basic \$ per tag		\$2.97						
42	Tag Incentive		\$0.00						
43	Description	Total		Initial Cost Per Head	Useful life, yrs	Salvage value, \$	Annual Cost, \$	Percent to RFID	RFID Cost Total Per Cow
44	RFID Transponder (electronic tag)								
45	Electronic tag calves	225	\$2.97	---	---	\$688	100%	\$688	\$2.75
46	Electronic tag calves incentive	225	\$0.00	---	---	---	100%	---	---
47	Lost Tags calves	5%	\$2.97	---	---	\$34	100%	\$34.39	\$0.14
48	Tags for cows (one-time purchase)	250	\$2.97	5	0	\$153	100%	\$152.84	\$0.61
49	Lost Tags Cows, per Year	10%	\$2.97	---	---	\$76	100%	\$76.42	\$0.31
50	Total Tags							\$951.45	\$3.81
51	Electronic reader								
52	Wand/stick reader	\$0		4	0		100%		
53	Data accumulator								
54	Laptop computer and Software	\$1,000		4	200	\$242	20%	\$48	\$0.19
55	Software / web-based analysis and storage								
56	Computer Database Software	\$250		4	0	\$72	100%	\$72	\$0.29
57	Labour								
58	Incremental Ops Cost Tagging Calves	\$33		1	0	\$34	100%	\$34	\$0.14
59	Farm cost to obtain borrowed reader	\$82		1	0	\$84	50%	\$42	\$0.17
60	Farm cost to learn reader	\$8		1	0	\$8	100%	\$8	\$0.03
61	Labor per year retagging, calves	\$15		1	0	\$15	100%	\$15	\$0.06
62	Labor per year retagging, cows	\$13		1	0	\$14	100%	\$14	\$0.05
63	Incremental Admin Costs	\$42		1	0	\$43	100%	\$43	\$0.17
64	Reading Costs Out	\$33		1	0	\$34	100%	\$34	\$0.14
65	Other								
66	Internet access	\$100.00		1	0	\$103	25%	\$26	\$0.10
67	Subscriptions/upgrade fees	\$0.00		1	0		50%		
68	Calf Shrinkage	\$388.13		1	0	\$388	100%	\$388	\$1.55
69	Auction Mart retagging, feeders/head	\$101.25		1	0	\$101	100%	\$101	\$0.41
70	Total annual cost							\$1,777.91	