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# Canadian Livestock Industry Traceability Movement Data Project

## REPORT SUMMARY

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## 1. **Executive Summary**

This project was developed by the Canadian Cattle Identification Agency (CCIA) and funded in part by the AgriAssurance Program - National Industry Association Component under the funding agreement entitled "Canadian Livestock Industry Traceability Movement Data", grant number CAP-AAPN-073.

The primary goal of the project was to demonstrate the suitability of automated data reporters (scanners / dataloggers) to collect and report traceability events across a number of co-mingling settings in Canada. This test equipment would record livestock movement events and report them directly to a project server, and ultimately to the Canadian Livestock Tracking System (CLTS). The quality of data captured would measure the accuracy of the reporting and allow for respective recommendations to industry on the future adoption of automated event capture.

## 2. **Project Overview**

The overarching goal of this project is to develop technologies, and methods, to help lift the burden of reporting of traceability data for industry and therefore save producers time and money in facilitating their obligations to capturing traceability data and reporting it to the CLTS.

15 test sites participated, located in Nova Scotia, New Brunswick, Prince Edward Island, Ontario, Manitoba, Saskatchewan, and Alberta, respectively.

The concept of a remote radio frequency identification (RFID) device complimenting traditional reporting methods has been around for over a decade, but technical limitations have inhibited its practical use.

With advances in technology the project explored the potential of an RFID reader (stationary or mobile) connected to a private data network, which would report real time sighted event data direct to the CCIA without human intervention.

This project was focused on four objectives:

I. Validate a methodology for remotely collecting livestock movement events and reporting it to the project landing server and ultimately CLTS.

II. Release validation results to industry.

III. Devise an optimal plan for sector uptake.

IV. Develop a digital framework with which to monitor and build new livestock movement data on.

Improvement, or success, in these objectives has the potential to lead to increased compliance with pending regulatory changes associated with animal movement reporting, and the possibility of improving the utility of the CLTS movement dataset in the case of an epidemic or reportable disease outbreak animal traceback scenario.

## 3. **Materials and Methods**

Autonomous data-reporters, commonly referred to as dataloggers, have been previously tried and tested at feedlots in southern Alberta to collect sighted data events. However, data points were absolute, with no indication of movement of the animal either into, or out of, the premises. Although this sighted data is valuable, more specific data would be required to better satisfy the overarching objective of the project to help reduce the reporting burden of traceability movement data for industry.

In partnership with the technology designers, dataloggers were modified with a new feature to enable direction of the animal flow to be reported for this project. With the addition of a switch the enhanced datalogger was able to flag the sighted data, enabling the easy reporting of move-out vs move-in events to the CCIA server.

An email feedback loop from the server to the premises requesting confirmation of numbers of animals scanned, tag numbers, and direction of the numbers scanned for each session, would put the onus on the premises for data integrity. The move-in/move-out flag could also be verified with the examination of legacy data stored in the CLTS. This verification will be developed further in the next phase of this project.

The enhanced dataloggers were deployed to the participating project sites, within locations including the inside of livestock markets, out of doors processing areas, and in open unheated structures.

The project has also looked at the implementation of UHF (Ultra High Frequency) based technology, to assist in overcoming the limitations of LF (Low Frequency) based technology, to meet the challenges of reading indicators from a great distance, read time, and where there is a greater volume of fast-moving animals, amongst others.

To facilitate the use of UHF indicators, animals would have a UHF indicator applied, which would then be paired with the already applied CCIA approved indicator. With the tags linked, either tag would point to the same animal in the CLTS.

A pilot data framework developed by HiggsGene Solutions Inc, called “TraceIt”, was developed and initially can be used to trace an individual animal based on the premises that its movements are registered to, (e.g., move in, move out and sighted), and to identify premises/herd with the most frequent move in and move out events. This framework will be used in the second phase of the project to leverage sighted data events with existing data in the CLTS using artificial intelligence/machine learning (AI/ML). The intention is to have an interactive interface that can assemble reported and archived tag events into synthesized movement events. The framework will allow various scopes of events linked to the animal in question to be analyzed using AI to predict various movement scenarios.

## 4. **Results**

For the period of January 1st to April 1st, 2023, a total of 65,000 sighted events were reported, of these 34,000 were unique sighted events. Once systems were established, the quality of data reported from the dataloggers has been excellent.

Due to connectivity issues at some of the more remote sites, additional equipment was needed to boost the data transmission signal, with one site having to be abandoned due to being unable to connect to the network.

A primary goal of the project has been to establish an interactive and user-friendly framework that allows for the reporting of a data event for an animal, or group of animals, easily. The framework needed to provide quick access to all event data related to an animal of interest, and at the current stage of development the project has been successful in these areas.

## 5. **Conclusions**

Where the dataloggers were installed, and data reported, the project trial has been a success; with the opportunities to facilitate the adoption of new technology to monitor livestock movements obvious. The overall activity of developing, deploying, and testing autonomous sighted data collection/reporting solutions in the Canadian livestock environment is a clear success; and further, remote datalogger systems can reduce the burden of animal traceability data collection in industry settings (e.g., feedlot operations, cattle auction markets). However, the true utility of sightings data will only be fully understood and realized once regulatory and policy questions around the suitable use of such data are understood and resolved. The development of such a framework would allow for a more accurate appraisal of the true benefit from a functionality and cost benefit analysis to traceability resulting from any change in national disease surveillance strategies.

Some of the highlights of this phase of the research included:

I. Installation of LF alley scanning system at a small cattle auction market. Passive reading had no effect on business processes or movement of animals in/out. Feedback of collected data back to the market would enhance the value of the system to the stakeholder.

II. Medium sized feedlot using a wand reader to scan animals at the headgate. A Bluetooth adaptor was configured onto the datalogger so the operator could continue to collect tag numbers, allowing tags to be sighted automatically and sent to the project server. There was no impact on the stakeholder or the stakeholder's data.

III. Some sites had no readers, and/or no internet access. Potentially, the A4 Systems LF processing scanner could be a solution in these situations. Animals could be scanned on arrival and CCIA tag numbers sent to the Cloud by clicking a button. This could be developed into a turn-key solution for industry to report movement data electronically.

The LF Processing scanner is configurable to collect various data attributes at the premises and link them to the animal/group. The data field options were set by the manufacturer; however, these could be programmed to accept traceability data options such as: conveyance license number, destination premises ID, source premises ID, etc.; and this data would be uploaded in conjunction with the animal tag data. This is potentially a stand-alone device to report livestock movement events in Canada. This was not for a designated activity in this project however, the scanner was used within the UHF data collection portion and the potential was readily apparent to the project. The potential for the scanner to be a solution for the collection of traceability movement data (with some further development) is therefore worthy of mention here.

IV. Location of registered livestock premises in the CLTS can vary greatly from the actual location of the livestock. Dataloggers report geolocation data which can differ from the registered address of farm/ranch. Inclusion of the geolocation information into the account holders' CLTS files will be beneficial in times of crises or emergency. As an example, two of the participating co-mingling sites could not be located via Google maps and in one case Google Maps gave incorrect directions to the farm.

V. Exploratory work has begun by A4 Systems on the use of low-cost satellite-based data transfer rather than LTE cell services, which will overcome the deficiencies experienced in this project for future data collection. If this technology is viable, it would be a solution for areas of the country with no LTE wireless access either due to lack of infrastructure or geographic location. This was not an evaluation criterion of the project, but is very much related, and of potential interest moving forward.

VI. The use case of linked LF and UHF tags to collect sighted data as set out in the project in large co-mingling sites is a possible solution that will continue to be explored further. The overall cost of

entry for this type of solution is relatively low; and installation is straightforward. Networking and synchronization of readers is not required. A potentially valuable tool for collection of sighted data in larger co-mingling sites.

VII. It is noted that there are other variations of data collecting/reporting tag scanners within the market which were not evaluated in this project. Industry has choices with respect to the hardware they select.

## 7. **Recommendations**

Based on outcomes highlighted above, the authors of this project make the following recommendations:

I. Internal discussion on the viability and value of automated sighted data reporting to CCIA; with a review to assess the potential implementation of a wider scale rollout and cost efficiencies to be gained with scale.

II. Building onto the constructed data framework that will use sighted data events in conjunction with historical data in the traceability database. All collected data available will be used to synthesize movement data events if possible. Synthesized events will be compared to actual movement data events to understand data confidence and decide how synthesized data events can support traceability in the absence of actual movement data.

III. Review cost/potential implementation of LF movement event handheld recorder/reporter for SME sites.

IV. Further testing of LF/UHF linking at large co-mingling sites. This may prove to be an effective, low-cost solution to sighted/move-in/move-out data at these sites including processing facilities. Producers have identified opportunities to use this technology/data for their own use.

V. The discussion regarding the location of animals and farm addresses in the CLTS revealed that it is possible to easily produce geolocation coordinates from legal land descriptions. The addition of geolocation data could be beneficial in time of emergency or crisis. Geolocation data could be added to existing CLTS premises data if appropriate. The inclusion of geolocation data for each livestock premises would also be beneficial for displaying (movement) data of animals if required. Coordinates on the map make data visualization much easier.

VI. Develop technical solutions/methodologies to ensure that only unique RFID tag reads are uploaded by the datalogger, which will help reduce costs of data transfer and will make the dataset more concise and easier to store and handle.

VII. Develop dataloggers capable of providing connectivity not only via LTE but also via internet where connections exist at the premises.

VIII. Continue the development of the data framework to include multiple layers of commingling situations, so a more comprehensive analysis can be made easily and efficiently. A dashboard is envisioned to allow better visualization and reporting of events.
A framework using artificial intelligence and machine learning in conjunction with legacy data and sighted data will synthesize movement events.