

Preliminary Progress Report

**NATIONAL ANIMAL IDENTIFICATION SYSTEM (NAIS)
FIELD TRIALS AND PILOT PROJECTS**

2004-2006

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Assembled
In
Cooperation With Participating States/Tribes

And

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Riverdale, MD

EXECUTIVE SUMMARY

This preliminary report provides an overview of sixteen field trials/pilot projects that were supported by Federal Commodity Credit Corporation (CCC) funds from the initial National Animal Identification System (NAIS) implementation effort in 2004. All field trials/pilot projects were implemented by State animal health officials. Due to timing of work plan submissions and subsequent need for approved extensions of time to complete proposed projects, nine of the fifteen State and one Tribe projects have not yet reached associated timelines for submission of final reports (90 days post-termination date). The following information summarizes information received from submitted quarterly progress reports to date.

It is extremely important to recognize that results and observations noted in this report should not be interpreted as hard science. These projects were developed in applied situations to demonstrate feasibility and document performance in those situations. Many factors affect the performance of any animal identification technology, let alone low frequency, radio frequency identification (LF RFID) technology which was used in all sixteen of these pilot projects/field trials. Any comparison of products noted in this overview should only be interpreted as an observation for that study. To fully understand the results of any and all projects, the project administrator (State animal health official) should be contacted to explain the entire scope of circumstances in which that project was conducted.

The most significant merits of the projects are in the solutions that resulted through the learning experiences. Early demonstrations reflected inadequate results of 50 – 60% relative to read rates (percent of animals whose identification code was recorded). Through continued evaluation, trial and error, many projects now report results in the high 90's. These pilot projects/field trials clearly demonstrate that LF RFID technology is not a plug-and-play application. Regardless of LF RFID technology chosen, the KY project documents, as an example, that RFID ear tag application and placement alone can account for as much as 40% of the variation in performance and is more influential to read rate than the choice of product. Collectively, many of these projects demonstrated that the environment in which the chosen product is used significantly influences performance. Again, understanding a technology and why and why doesn't a product work in a chosen environment may be more important than the choice of product itself. LF RFID is not designed to overcome human error.

Reviewing these sixteen projects yields two consistent observations common to all projects. The first is the customization of LF RFID technology to individual locations. Every operation is unique. Best results are obtained when one fully understands the limitations of a selected environment for incorporating a chosen animal identification technology; understanding the limitations of a chosen technology, including cost; and then optimally matching the two. Second, choosing a product may best be determined by the availability of service. Particularly in market situations, where speed of commerce is important, multiple observations were made where the need for timely technical assistance, both hardware and software, is critical. Down time is costly, let alone frustrating.

In summary, the real value of the pilot project/field trial component to NAIS is the "hands-on" experience of stakeholders using identification technologies, the

successful advancements made in automated data capture and the identification of individuals who have used various products and technologies that may be of interest to any stakeholder. The intent of this program is to furnish stakeholders with information regarding who to contact for reference experience. It is this opportunity for dialogue among interested stakeholders that will optimally advance NAIS and enhance the safeguarding of America's herds and flocks.

PARTICIPATING STATES/TRIBES

COMPLETED PROJECTS:

Colorado

Cooperative Agreement#: 05-9108-0942-CA

Project Initiation Date: 11/5/2004 Project Termination Date: 12/31/2005

Participants: Colorado Department of Agriculture
Colorado State University

Species/Industry: Cow-Calf operations
Beef Feedlots

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Y-TEX; Allflex (Half Duplex); Allflex (Full Duplex); Z-Tag Farnam; Digital Angel; Digital Angel Bluetooth; Allflex stick readers; Allflex wireless readers; and InfoClip bluetooth readers

Results:

- LF RFID equipment is not plug-and-play.
- Placing LF RFID tags in calves in a chute, reading with a bluetooth device, and immediately letting them out of the chute to pass by a panel reader yielded 60% read rates
- Panel antennas can be significantly affected with metal working facilities
- DNA (blood) can be 100% effective for validating animal identification
- Panel readers work best when ½ inch or greater distance is created between the panel and any metal behind it. This can be created with carpet, wood, or plastic spacers.
- Placing two panel readers in the same alley work best if they are not placed across from one another. Results are improved if two or more panel readers are staggered on opposite sides of the alley.
- Placement of antennas should be made in such a manner to avoid calves from bumping and/or moving the equipment to reduce tuning errors.
- Use of Bluetooth technology to assist in animal identification data transfer requires understanding and alertness to avoid loss of data from disconnection, sleep mode, etc.
- Hand-held reads in cattle squeeze chutes are generally higher than walk-past panel readers.
- 95% and 96% read rates using LF RFID technology at load out chutes were obtained

Florida

Cooperative Agreement#: 04-9100-0915-CA
Project Initiation Date: 9/30/2004 Project Termination Date: 9/29/2005
Participants: Florida Department of Agriculture and Consumer Services
Seminole Tribe of Florida
Florida Cattlemen's Association
Florida Association of Livestock Markets
Florida A & M University
University of Florida

Species/Industry: Beef Cattle
Equine

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Allflex; eMerge; Y-TEX; Global Vet Link

Objectives:

- Using 13 ranches in Florida, evaluate LF RFID in cattle destined for TX feedlots.
- Evaluate LF RFID in cull dairy and beef cattle for tracking movements from farms/ranches to markets to harvesting facilities
- Utilize Seminole Tribe cattle (68 individual brands) to evaluate ranch to feedlot and salvage cow programs
- Utilize microchip technology with equine "smart cards" to evaluate an approach to equine identification

Results:

- 17,000 calves were individually identified with LF RFID and shipped to TX and KS feedlots. No results regarding evaluation of the technology were reported.
- No data were reported for the cull cow objective.
- No animal identification data reported for the Seminole Tribe component.
- No objective data provided regarding the equine component relative to measuring its effectiveness as an animal identification technology.
- Observations from this project offered were primarily aimed at value-added aspects from using LF RFID technology rather than offering results from documenting any specific LF RFID technology in application.

Fort Belknap Reservation

Cooperative Agreement#: 05-9130-041-CA

Project Initiation Date: 11/15/2004 Project Termination Date: 11/14/2005

Participants: Fort Belknap Indian Community
Montana/Wyoming Indian Stockgrowers Association
12 additional Native American Tribes and Tribal Agricultural
Organizations

Species/Industry: Beef Cattle
Bison

Technology(ies) Evaluated: None specified

Vendors Evaluated: None provided

Objectives:

- Develop animal tracking for beef and bison through production and processing
- Document effective ways to individually identify bison

Results:

- No data reported.

Kentucky

Cooperative Agreement#: 04-9100-0922-CA

Project Initiation Date: 9/25/2004

Project Termination Date: 9/24/2005

Participants: Kentucky Department of Agriculture

Southeastern Livestock Network, LLC (SELN)

(SELN: AL, GA, KY, LA, MS, NC, SC, TN, VA, WV)

Beef Information Exchange

Species/Industry: Producers (1500 Cull Cows)

10 Stockyards

1 Slaughter Facility

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Y-Tex (Full Duplex); Allflex (Half Duplex); Allflex (Full

Duplex); Allflex Sheep (Full Duplex); Z-Tag Farnam (Full Duplex);

Digital Angel (Full Duplex); AgInfoLink

Objectives:

- Identify limiting factors associated with collection of NAIS data using cull cows as a model in auction markets of the SE United States
- Evaluate existing systems of data collection and their potential for integration with emerging technologies to enhance speed, accuracy, and efficiency of data collection and transfer

Results:

- Approximately 15% of producers reported to have and use internet access and e:mail
- 96% accuracy of the current backtag system exists, but is limited to the entry and exit of these animals from the auction market facility
- Worst orientation distances for hand-held read rate was most useful in making decisions on the width of alleys
- Of the LF RFID tags mentioned above, the range for worst orientation was 16-24 inches, with an average of 21.16 inches.
- Using a standardized reader, 6-weight cattle, full duplex technologies of Digital Angel, Z-Tags, and Y-Tex, 32 inch and 48 inch alleys, no control regarding animal flow, the overall read rate was 95.6%. With 108 animals with each of the three types of tags, the 48 inch read rates were 100% for Digital Angel, 95.83 % for Z-Tags, and 77.08% for Y-Tex.
- Tag placement within the ear of cattle was the single most important variable affecting read rate. There was a 40% reduction in read rates attributable to tag placement within the ear. Placing tags too close to the base of the head resulted in compression necrosis, infection, and high rates

of tag loss. Placement of the tag in the tops of the ear on the flat portion of the top rib yielded the lowest read rates and higher incidences of tag loss or infection. Best results were obtained by placing the tags in the mid-third of the ear.

- Three vendors associated with panel readers were evaluated. Although Allflex and EDIT (Farnam) readers resulted in similar performance in alley read installations, the EDIT system proved to be the more user friendly and was easily portable and less sensitive to variable environmental conditions. Cost for the EDIT panel reader system was less than \$5,000. Edit readers also provided easier synchrony of multiple readers in the same proximity. Digital Angel panel readers did not achieve the same level of performance as Allflex or Edit.
- Wide alley reader system from Boontech was evaluated using 10,000 animals with 2,700 being the most evaluated in any one day. Tags used included only Allflex half duplex and Digital Angel full duplex (b) tags in five foot alleys. Overall read rate was over 90%.
- Hand-held readers from Allflex, AgInfoLink, Digital Angel, IDology, and Boontech were evaluated with all models having acceptable levels of performance in terms of read distance and read rates. Both hard wired and wireless units were tested from most suppliers and the results indicate that wired readers gave the most dependable service. The most common problem with the wireless readers was the ability of the software to maintain a Bluetooth connection during continuous operation. Boontech and IDology readers yielded good read distance and read rates, but were not useful for the project because of linkage to proprietary software that did not meet data collection needs. The AgInfoLink RF reader did prove to be a dependable wireless option. IDology readers presented structural integrity issues.
- At one packing plant, permanent reader systems were installed in a 40 inch wide portal as cows exited trailers. Read rates were in excess of 90%.

Minnesota

Cooperative Agreement#: 04-9100-0917-CA

Project Initiation Date: 9/22/2004 Project Termination Date: 12/31/2005

Participants: Minnesota Pork, Dairy, Beef Cattle, Lamb and Wool, and Elk and Deer Producers

Minnesota Milk Processors

Minnesota Livestock Markets

Minnesota Slaughter Facilities

Minnesota Association of Meat Processors

Minnesota Veterinary Clinics

Minnesota Board of Animal Health

Minnesota Department of Agriculture

University of Minnesota

Species/Industry: Beef Cow-Calf Operations

One large farrow-to-finish swine operation (35,000 sows)

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Digital Angel

Objectives:

- Tag beef animals at premises of origin with LF RFID tags and read tags at markets and slaughter facilities to document read rates and other parameters
- Evaluate LF RFID tags for individual and group/lot protocols in a large swine herd

Results:

- No data reported.

Montana

Cooperative Agreement#: 05-9130-0947-CA

Project Initiation Date: 12/7/2004

Project Termination Date: 12/6/2005

Participants:

Montana Stockgrowers Association

Montana Livestock Marketing Association

Montana Woolgrowers Association

Montana Department of Livestock

Montana State University (Montana Extension Service,

Montana Beef Network, and Montana Sheep
Institute)

University of Nebraska

Species/Industry:

Beef Cow-Calf Operations and Feedlots

Sheep Flocks and Feedlots

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Allflex; eMerge Interactive; IMI Global; Beef Industry
Exchange

Results:

- 489 steer calves were tagged with LF RFID tags and subsequently read with an Allflex hand-held reader with calves caught in a head catch
- Of these same calves following trucking to OK and grazing on wheat pasture, 97% were scanned with a hand-held Allflex reader with calves caught in a head catch. 2.8% of tags were lost during pasture grazing and one tag did not read.
- Scanning of these same cattle at an auction facility without a head catch and attempting to use a hand-held Allflex reader with cattle passing through an alley greatly diminished the scanning efficiency.
- Using ATL scanner on 162 head of steer calves scanned in a single file with wood corrals, 93% was the highest read rate.
- Used ATL scanner on a load of calves (90) as they were unloaded from trucks with a wand reader gaining a 99% read rate. Same calves scanned with ATL scanner recorded 7% read rate. Problem was due to inhibition with sheet metal sides to the chute.
- No data provided from sheep LF RFID project

Wyoming

Cooperative Agreement#: 04-9156-0925-CA

Project Initiation Date: 9/24/2004

Project Termination Date: 9/23/2005

Participants: Wyoming Livestock Board
Wyoming Department of Agriculture
Wyoming Wool Growers
Wyoming Stock Growers Association
University of Wyoming
Mountain States Lamb Cooperative

Species/Industry: Beef Heifers
Ram Test Station
Livestock Market (Cattle) Facility

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Y-Text; Allflex; AgInfoLink Bluetooth readers; Z-Tag
Farnam; and Premier

Results:

- Using a stick reader and an electronic scale head, 139 rams were scanned in 50 minutes with 100% accuracy
- Using a panel reader, 135 rams were scanned in 40 minutes with 1 no read.
- Composition (metal, wood, etc.) of equipment near panel reader can affect results.
- Using an Allflex stick wand and two different brands of LF RFID ear tags in heifers and using a head catch, 160 head were read with 100% readability.
- Of these 160 head, differences in read distance between the two tags existed.

INCOMPLETE PROJECTS:

California

Cooperative Agreement#: 05-9106-0943-CA

Project Initiation Date: 11/15/2004

Project Termination Date: 3/15/2006

Participants: California Department of Food and Agriculture
University of California-Davis (including Cooperative Extension)

Species/Industry: Dairies
Calf Growers
Feedlots
Markets/Saleyards
Harvesting Facilities

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: AgInfoLink; none others identified

Objectives:

- Develop animal tracking project

Results:

- Electronic identification may be driven more by value-added, market forces than just NAIS alone
- LF RFID readers need to improve to accommodate speed of commerce
- Bluetooth hand-held devices often experience connection losses
- Some panel readers may not be optimally tuned to read other vendor tags
- Producers/stakeholders need continuing education on not removing RFID tags and replacing them with their own as frequently done in the past

Idaho

Cooperative Agreement#: 05-9116-0938-CA

Project Initiation Date: 11/1/2004

Project Termination Date: 6/30/2006

Participants: Idaho State Department of Agriculture
Idaho Cattle Association
University of Idaho, Caine Veterinary Teaching Center

Species/Industry: Beef Cow-Calf Operations
Dairy
Markets
Feedlots
Harvesting Facilities
Elk

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Global Animal Management; eMerge Interactive; Allflex stick reader with display; Digital Angel panel antenna; RangerID; and Y-TeX

Objectives:

- 21 objectives listed

Results:

- 127 producer participants are enrolled in the Northwest Pilot Project (NWPP)
- Seven states are involved in the NWPP
- Of 7,000 RFID tags placed in cattle, on two confirmed failures regarding reading rate were observed. When removed, these two were confirmed as functional and the failure then felt to be due to chute interference.
- Retention rate of RFID tags (product unspecified) has been well over 98% when the tags are placed within two inches of the ear base.
- Placing ear tags in extreme cold weather has not been confirmed to be a problem.
- In using panel readers as cattle are moved onto trucks for shipment to collect animal identification data, panel readers from two different sources (unidentified) were evaluated. Success has ranged from 65% to 98%. Paired, multiplexed panels have the most consistent and highest read rate accepting that the animals must pass between the panels in single file.
- Bluetooth technology may be problematic if the same equipment is not used in the system for each time of use.
- Rancher system (built by RangerID) was evaluated on two ranch systems for reading LF RFID tags at loading and unloading. Loading reads

averaged 60%+ and offloading resulted in only 30% reads. Speed and crowding of animals created problems. Equipment as designed was also bulky.

Kansas

Cooperative Agreement#: 05-9120-0946-CA
Project Initiation Date: 10/26/2004 Project Termination Date: 3/31/2006
Participants: Kansas Animal Health Department
 Kansas Department of Agriculture
 Kansas Livestock Association
 Kansas State University
 National Beef
 US Premium Beef
Species/Industry: Beef Cattle
 Mobile Animal Identification (Livestock Truckers)

Technology(ies) Evaluated: LF-RFID
Vendors Evaluated: Allflex; Digital Angel; AgInfoLink
Objectives:

- Evaluate the potential use of LF RFID readers mounted on commercial livestock transport trailers for assistance in animal identification

Results:

- 99 loads of cattle representing 4,516 head were hauled to and from six states
- Concept of placing LF RFID readers at unloading and loading area of livestock trailers can work
- Average of complete files (a file represents one load of cattle) read rate from two trucks recording 24 loads was 48.4% with a range of 0% to 100%.
- Average read rate at packing plant from 27 loads was 81.0% with a range of 28.7% to 100%.
- Of 99 loads of cattle, 134 errors were documented with the majority of those attributed to some degree of human error.

North Dakota

Cooperative Agreement#: 05-9138-0944-CA
Project Initiation Date: 10/20/2004 Project Termination Date: 4/25/2006
Participants: North Dakota Stockmen's Association
 North Dakota Beef Cattle Improvement Association
 North Dakota State University
 North Dakota State Board of Animal Health
Species/Industry: Beef Cattle
 Dairy Cattle
 Sheep

Bison

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Not identified in the report

Results:

- Working time of the North Dakota identification team associated with LF RFID applied to 5,170 calves, 944 cows, and 37 yearlings was an average of 1.1 head per minute (54.5 seconds per head)
- Of calves moved to backgrounding facilities, 79% had their tags removed upon arrival
- Of calves leaving the backgrounding facility and moving to feedlots, an additional 18% of calves had their tags removed upon arrival
- Based upon management practices used and/or exposed in this study, 815.3 hours (over 20 weeks (5 months) at 40 hours per week) were used to track 5,170 calves including access to brand inspection data.
- Non-standard ISO (International Organization for Standardization) equipment that limited the ability of tag and reader compliance often led to frustration and removal of tags
- Of the 5,170 calves, none were tracked electronically from birth to harvest. Complicating issues included the lack of electronic connectivity from one premises to another. For value-added purposes, not all parties are willing to use the same database.
- Estimated cost for tag, data management and verification for value-added purposes was \$5.00 per animal.
- Estimated cost for calf working, tag placement and documentation of an LF RFID tag was \$7.00 per animal.
- Estimated cost for feedlot and packer electronic data management, again for value-added purposes, was \$8.00 per animal.
- Total estimated cost for tracking an animal for value-added purposes was \$20.00 per animal.

Oklahoma

Cooperative Agreement#: 05-9140-0951-CA

Project Initiation Date: 12/23/2004

Project Termination Date: 4/30/2006

Participants:

Oklahoma Department of Agriculture, Food, and Forestry

Oklahoma Cattlemen's Association

Oklahoma Farm Bureau

Oklahoma Farmers Union

Oklahoma Livestock Marketing Association

Oklahoma Veterinary medical Association

Species/Industry:

Beef Cattle

Livestock Markets

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: No specific information provided

Objectives:

- Evaluate LF RFID technologies in sale barn environments

Results:

- None reported to date.

Pennsylvania

Cooperative Agreement#: 05-9142-0935-CA

Project Initiation Date: 10/25/2005 Project Termination Date: 10/24/2006

Participants: Pennsylvania Department of Agriculture
Lancaster Dairy Herd Improvement Association
Pennsylvania Beef Council
Pennsylvania State University

Species/Industry: Dairy Cattle
Beef Cattle
5 Auction Barns
2 Packers

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: None provided in the report

Objectives:

- Evaluate LF RFID panel readers at five auction barns
- Evaluate LF RFID panel readers at two harvesting facilities
- Evaluate effectiveness of state animal tracking database

South Dakota

Cooperative Agreement#: 05-9146-0939-CA

Project Initiation Date: 10/18/2004 Project Termination Date: 10/17/2006

Participants: South Dakota Animal Industry Board
South Dakota Department of Agriculture
South Dakota State University Cooperative Extension
Service

South Dakota Bureau of Information and
Telecommunications

South Dakota Beef Quality Assurance/Critical
Management Plan Steering Committee

Species/Industry: Beef Cattle
Swine
Auction Markets

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Allflex stick reader; Y-Tex panel antenna and reader
(EDIT); Farnam panel reader (EDIT); Allflex RFID panel
reader; Digital Angel panel antenna and universal brick
reader; and AgInfoLink

Objectives:

- Evaluate value-added program as incentive to participate in NAIS

- Evaluate identification options for adult cull swine
- Evaluate use of electronic animal identification in auction markets

Results:

- South Dakota Certified TM Beef program continues to expand and increase participation with requirement to comply with NAIS and South Dakota guidelines
- Adult cull swine project is progressing with interest from the National Pork Board and others relative to the value of this project. Extension was provided to best accomplish objectives with resources provided.
- On days when scanning equipment works, read rates have been in the range of 85-95%, sometimes as high as 100%
- Unsuccessful attempts to utilize LF RFID in markets were usually due to some type of interference or to a defective piece of equipment.
- All three types of panel readers used in this study required an on-site trouble-shooting visit by company representative
- Electrical interference with auction markets was common. Having a powered-up laptop computer within three feet of the reader caused problems; too much metal in the reading alley; and having the data collection computer too far away from the reader allowed other signals to be picked up and cause interference.
- Average cost to equip an auction market in South Dakota with LF RFID scanning equipment was \$15,000.
- In this study, with various panel readers working adequately, no differences were noted in the different tags used.
- Each auction market was unique and required some level of customization and was based upon their facilities, cattle flow, available electrical power supply, available internet access, and presence of other interfering “noise.”
- Read rates improved as salebarn personnel became more familiar with the scanning equipment and when care is taken so that cattle move calmly through the reading alley in single-file.
- Data management services and licensing fees for markets and state databases should be considered in planning for use of electronic animal identification systems.

Texas

Cooperative Agreement#: 05-9148-0949-CA

Project Initiation Date: 11/5/2004

Project Termination Date: 6/30/2006

Participants: Texas Animal Health Commission
 Texas A & M University
 San Angelo State University
 Texas Parks and Wildlife Department

Species/Industry: Beef Cattle
 White-tailed Deer
 Sheep
 Goats
 3 Livestock Markets
 2 Order Buyers

4 Feedlots
1 Harvest Facility

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: No specific information provided

Objectives:

- Evaluate LF RFID technology for use in cattle throughout marketing channels from weaned calves to harvest
- Evaluate LF RFID technology in sheep and goats
- Evaluated LF RFID technology in captive white-tailed deer

Results:

- No objective data has been reported to date.

Utah

Cooperative Agreement#: 05-9149-0945-CA

Project Initiation Date: 11/8/2004

Project Termination Date: 6/30/2006

Participants: Utah State Department of Agriculture

Utah State Brand Bureau

Utah State University

Species/Industry: Beef Cow-Calf Operations

Dairy

Markets

Feedlots

Harvesting Facilities

Technology(ies) Evaluated: LF-RFID

Vendors Evaluated: Global Animal Management

Objectives:

- Participate in the Idaho Northwest Pilot Project

Results:

- No objective data provided.