NO. 3406188 DEVELOPMENT AND IMPLEMENTATION OF A VERTICALLY-INTEGRATED BEEF CATTLE DATA COLLECTION SYSTEM

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ABSTRACT

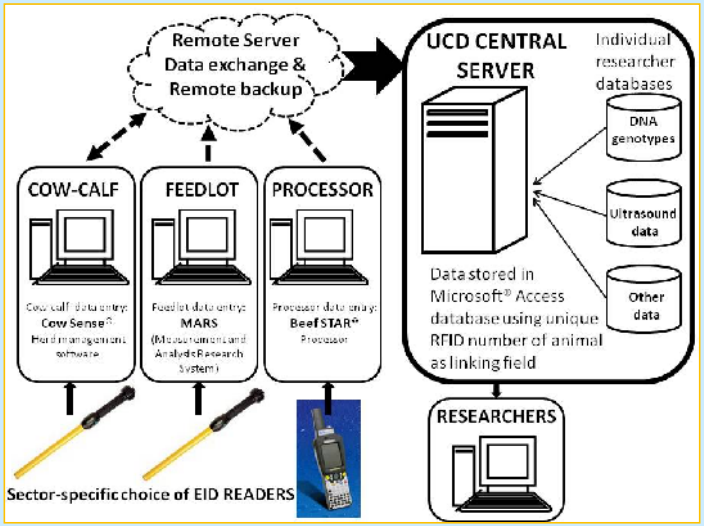
Breeding decisions made by cow-calf producers may be suboptimal on a chain-wide basis if they never receive performance data from the feedlot or harvest sectors. However, the segmented nature of the beef industry presents challenges to sharing data collected by each of the supply chain members. We developed a data collection system using commercially available computer software to track the performance of individual animals from birth through subsequent production phases to the final carcass value. Both the University of California cow-calf herd and commercial cooperator herds participated in this project. The key to linking records from each phase was a radio frequency identification (RFID) ear tag assigned to each animal in the cow-calf herd. Sector-specific software developed by Midwest MicroSystems L.L.C. including Cow Sense® for ranch data, MARS for feedlot data, and Beef STAR® for harvest data collection were used for the real time transmission of field data to off-site "office" computers. A small commercial processing facility cooperated in the program and collected harvest data using a handheld device. After initial training focused on transferring identification from pre- to post harvest, carcass data were routinely obtained from all cattle processed. ID transfer at a small processing facility was simplified by relatively slow chain speeds. Data collected by collaborators were transmitted to a central server where they were connected with other research data (e.g. DNA genotypes) in a Microsoft® Access database. Data correction privileges were only extended to field collaborators. Data consumers received "read only" permission levels, thereby maintaining a single source of data control and integrity. Benefits were 1) minimal disruption or changes to individual sector data collection methods and labor, 2) integration of data across sectors, 3) data integrity and security, 4) returning performance data to cow-calf producers to facilitate more informed selection decisions, and 5) development of a comprehensive dataset for research.

INTRODUCTION

Collecting data on the performance of individual beef cattle from birth to processing can improve both herd management and genetic improvement decisions. Likewise, being able to trace the origin and whereabouts of cattle which may have been exposed to an infectious disease agent is necessary to protect the health of the national beef herd. Such information is rarely available for a variety of reasons including the fact that cattle often change ownership numerous times in the beef production process. The increasing use of electronic individual animal identification (EID) offers an opportunity to introduce beneficial feedback to the supply chain. The value of comprehensive data collection can be further increased through the simultaneous use of DNA markers to resolve paternity, thereby enabling on-ranch genetic evaluations (Dodds et al., 2005; Pollak, 2005; Van Eenennaam et al., 2007). McEwan (2007) proposed that the widespread adoption of DNA technologies will depend on reducing the costs associated with sampling, DNA extraction, reporting and integrating the data into genetic evaluations. In New Zealand, DNA collection is being linked to EID, allowing automation of subsequent steps and return of data to genetic evaluation entities. If DNA information is going to become widely adopted in the U.S., it is likely that such approaches will need to be implemented here.

OBJECTIVE: Develop a dual-purpose data collection system capable of tracking animal performance and movement throughout the supply chain.

MATERIALS AND METHODS

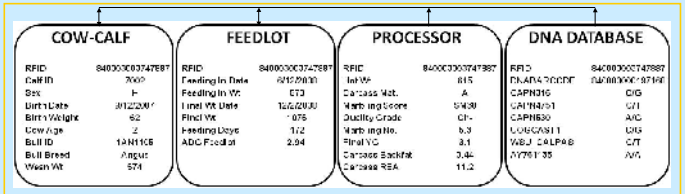


SCHEMATIC OF SYSTEM DESIGN

Individual users enter data from their facilities using combinations of office, facilities computers or handheld devices into commercially available software (Cow Sense®, MARS, Beef STAR®; Midwest MicroSystems, Lincoln, NE) designed for sector-specific data. Sole authority, capability and responsibility for data entry resides at these sites. Data are exchanged from the various sectors via remote servers (denoted with dotted lines) to the central database files (thick solid line). Individual researcher databases are integrated with the sector data. Researchers and collaborators can access data with password permission, but they cannot enter or edit data on the central server.

RESULTS

The data management system for the UC Davis cow-calf herd is comprised of several distinct operations (Figure 1). Various sectors (users) collect data using readers integrated with commercially-available software designed for their specific needs. Data are then transferred wirelessly to an office computer. Data collected by geographically-disparate users is exchanged with a central server via the internet through the Beef STAR® software program. At the central server, data from the sectors are connected in a generic Microsoft® Access database. Data also flows via Beef STAR® back to Cow Sense® herd management software providing the cow-calf manager with information on feedlot and carcass performance. Data integration enables development of on-ranch growth, feedlot and carcass trait EPDs for herd bulls (Van Eenennaam et al. 2008, Van Eenennaam et al. 2009). If detailed research data (e.g., ultrasound scans or DNA SNP genotypes) are collected on campus, that information is linked to the animal's unique EID number and stored in the central Access database. Additional database security is provided by remote location backup of databases stored on office computers, and read-only access for researchers querying the central server.



Representative data on a randomly-selected calf from the 2007 UC Davis cow-calf herd. Double-headed arrows represent two-way exchange.

DISCUSSION/CONCLUSIONS

This system has now been used to capture data across production sectors for three calf crops from the university herd, and two large commercial herds. SNP-based paternity determinations, in conjunction with the integrated data, allowed for the development of on-ranch growth, feedlot and carcass trait EPDs. System design featuring sector specific software, wireless exchange of data from working facilities, and automated exchange of data enhanced data collection, sharing and integrity. The system has resulted in greater networking of data within and between academic units, between research and commercial herds, and across production sectors.

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