Use of Smartphone and Tablet Technology in Moving Herd Recording into a Mobile Environment

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Abstract

Smartphone and tablet technologies provide an environment for recording and exchanging herd performance information. The current generation of mobile devices, user interfaces, and the associated WiFi and telephone infrastructure provide a significant increase in usability and connectivity over earlier mobile devices. For many users, the personal use of smartphones eliminates any additional hardware costs for these new herd recording benefits. Elements of the user software will be shown, including functionality to display, record, and transfer performance data. The user interface is the result of market research and trials to capture the usage patterns across various herd sizes. Methods for synchronizing data allow for the operation of locally-based or centralized data recording systems. This delivers flexible and creative solutions to conventional herd recording tasks as well as providing new opportunities for allied industry, including animal breeding, breed registry, and consulting firms. Dairy Records Management Systems will display and describe currently operational systems, as well as opportunities for future development.

Keywords: smartphone, tablet, mobile, handheld

Introduction

Current smartphone and tablet technology offers significant opportunity to herd recording agencies to extend the benefits of data recording, storage and analysis to a new platform. The latest technology platforms provide user interfaces and hardware that represent a significant advance over prior technology. Dairy Records Management Systems (DRMS) released the first mobile dairy management program in 2000, and just released a new system for the Android operating system.

Primary Benefits

The obvious benefit of mobile technology is the time savings in eliminating the double entry of field data (once on a notepad, then transcribed to the desktop computer). In larger farms (>1,000 cows), the central data entry function typically consumes 3-4 hours of an office staff member. This is a significant and direct economic benefit of using a mobile device. The largest deployment of mobile systems in the U.S. involved twelve mobile devices for entry of calving, breeding, health and reproductive data, and the arrival and sale of animals, with the office staff reviewing the quality of the incoming data and resolving errors. The office staff further has the ability to lock out particular users from entering data.

The less obvious, but equally significant benefit is the reduction of management lag. Staff on large farms without mobile devices typically provide their paper recording of animal events into the office staff at the end of the day. The office staff enters the data into the

desktop system the next morning, and provides the output and analysis to the farm management during the day. With a mobile system, the data are uploaded to the office system during the day. At the end of each day, the management staff can review the events of the day, and be ready to direct the farm staff the next morning. This reduces the management decision lag by a full day.

The ability of mobile systems to provide real-time edits increases the accuracy of field-recorded data. Although many recording errors can occur without detection, one large farm tracked a highly visible recording error – the misidentification of sold animals. By estimating the value of the cows sold in error, he was able to justify the cost of the mobile system (including RFID) on the basis of eliminating that single error.

A number of additional benefits can be found in personal testimonials including reducing the physical effort to return to the office for additional information on individual cows.

Evolution of Mobile Devices

After experimenting with earlier mobile devices, DRMS released the first mobile dairy management system in 2000 on the Palm operating system. Key lessons learned were 1) the ability to input data was essential; 2) the user interface had to be simple and intuitive; 3) consumer-level devices were sufficient for many farmers – rugged devices were only needed in the larger herds; and 4) the successful price point for the hardware was $150-250. This release was popular, with over 1,000 users.

By 2006, the Palm operating system was failing to keep up with technological evolution. DRMS developed two products (PocketDairy and PocketMeter) for the Windows PocketPC (PPC), but this environment proved to be far less popular due to 1) a less-intuitive operating system; 2) a difficult procedure for installing additional operating system components; and 3) slower on-farm performance despite a faster processor.

For the current version, DRMS investigated the following operating systems: Android, Apple, Blackberry, Microsoft and PalmOS. The Android OS was selected due to 1) the open-source development environment; 2) the open licensing and distribution environment; and 3) the number of manufacturers and variety of hardware options. Market share data show the Android and Apple in close competition, so Apple continues to be a potential platform for PocketDairy. The other operating systems do not have sufficient market share to be considered.

Success of Current Hardware and Operating Systems

The success of smartphones at the consumer level is due to 1) a new era of user interface design; 2) nearly universal data coverage; 3) fast, power-efficient processors; and 4) a population raised on computers. These factors appear to be valid for the agricultural community as well.

One surprise in the early trials of PocketDairy Android was the willingness of producers to use their personal cell phone for PocketDairy, rather than use a separate non-phone device. Even though the non-phone devices can be purchased for $200, users were

willing to carry (and risk dropping) their $600 phones. The majority of early users stated that a high priority was to minimize the number and complexity of the devices they had to carry. To offset the risk of dropping, most users subscribed to a damage insurance program.

This also means that the hardware, installation, and support costs are borne by the cell phone usage, so in real terms, there are no addition hardware costs for PocketDairy.

Android (Google) and Apple provide a refined sales and marketing environment for consumer applications. However, these environments are somewhat restrictive (Android) or very restrictive (Apple). This led DRMS to distribute the PocketDairy application directly to users by web page, email, or CD. Over 20 early upgrades have been successfully distributed using this direct method.

The initial consumer-level devices have proving popular on farms. Semi-rugged and rugged devices are also appearing on the market for commercial applications, and will play a role in the agricultural sector for PocketDairy and similar applications.

Data Connectivity

Three primary methods are available for syncing PocketDairy Android:

1. Wired Connection to the Desktop PC – This method utilizes the USB connection. This is not the native sync method for current-generation smartphones, and is not recommended. However, 60 percent of early PocketDairy users have selected this method.

2. Wireless Router to the Local or Remote Desktop PC – This WiFi method is the recommended method. Although the technology is relatively easy to install and support, there is some reluctance among DHIA affiliates to offer support of this technology. In many cases, however, producers already have WiFi routers installed on the farm.

3. Cell Phone Data Plan – The growing availability of 3G and 4G data coverage in the U.S. makes this option feasible. Dairy management data is fairly small when compared to the typical monthly limit of 3 gigabytes per month. A significant concern was the delay of initiating a 3G connection (or handshake) for the sync, but this occurs quickly. The primary cell carrier in the U.S. (Verizon) plans to have complete rural coverage for data plans by 2014.

Design Criteria

Based on experience from the PocketDairy Palm and PPC versions and other software, the primary criteria were:

1. Operation will be simple and intuitive. No user's manual.
2. Minimize the number of taps to accomplish a task.
3. Minimize the navigational complexity (not achieved in the PPC version).
4. Minimize the installation steps.
5. Expect enthusiasm to border on emotional.

The validation of this design effort included:

1. Preliminary field interviews and one-on-one phone interviews.
2. Demonstration and feedback at trade shows.
3. Early and open distribution as a beta phase.

Earlier operating systems (Palm PPC) had one distinct advantage for data-rich dairy software – they were stylus-driven. This allowed significantly more data and input functions on a single screen. Current-generation devices are finger-driven, resulting in lower density screens. Numerous design elements used to overcome this challenge will be demonstrated.

Early feedback included numerous personal testimonials, an innovation award from a major publication, and over 350 beta users. The technical support effort for distribution, installation, and operation has been minimal due to the design as well as the evolution of the current smartphone environment.

Anticipated User Types

Dairy producer currently using the existing Palm OS
Dairy producer milking more than 150 cows
Dairy producer milking fewer than 150 cows
Herd recording technician
Herd recording organization manager

Product Scope

Display of Individual Cow and Heifer Data – Status information (lactation, reproduction) is shown through the use of the swiping action of the Android. Health events and treatments as well as user-defined database items are available.

Action Listings – Numerous lists are provided as well as rudimentary report options. These listings are updated in real-time mode based on user input.

Input Functions – Calving, breeding, health and other inputs are supported. This area was the greatest design challenge due to the lower density necessitated by the finger versus the stylus.

Synchronizing Functions and Setup – The user is allowed to select the synchronization options, program setup options, backup and restore, and other functions.

Language Support – Multiple languages are supported through use of appropriate translation files in XML format.

Form Factor – Numerous form factors must be supported in the mobile environment. The two most significant use cases in the dairy management market appear to be the pocketable device for general usage (phone and non-phone), and the tablet device for semi-stationary input (breeding chutes, maternity barns).

Live demonstration will be provided at the meeting.

Future Opportunities

Coverage – Syncing while in the farm office is easily supported by the current wired or wireless sync. Some intensive farm operations may demand more frequent syncing to permit greater real-time handling of data. Rural coverage by the major cell phone carriers in the U.S. is moving towards complete coverage by 2014. However, the expense of the data may be too high for many operations. The current WiFi technology may be used to cover the farm office area with additional nodes at key work areas on the farm. Extended-range antennas are now available, as well as "white space" broadband that covers a 1-2 mile radius.

Voice Recognition – Numerous mobile voice-recognition (VR) systems have been tried in agriculture (and the general consumer market) with little success. However, the recent success of the Siri and Iris VR systems may lead to an opportunity in mobile agricultural applications.