Weigh day; an android application for DHI test day data collection

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Summary

Data collection is a critical component of milk recording systems. Efficient data collection not only minimizes costs but also reduces distractions on test days.

Methods for recording test day data—the cow identification, milk yield, cow location, and sample number associated with each cow – has evolved with technology. Initially, data was recorded with pencils on input forms. Then laptop computers were used. The introduction of handheld devices brought data collection 'cow side'.

Several programs have been available in the past; however, the rapid deprecation of hardware and software has presented challenges, resulting in a limited number of replacement options. Consequently, outdated hardware and unsupported operating systems are still in use.

In response, AgriTech Analytics developed an Android application that is not device-specific, offering users a variety of hardware choices.

Cows can be entered by side or individually. When utilizing the by-side method, milk weights are entered sequentially from the front or rear of the barn. The barn setup can accommodate up to 99 cows per side, up to eight sides, and a maximum of six milkings. Individual cow management numbers can include up to seven digits, and location designation options consist of three characters.

The application can import a herd file that verifies each cow's presence in the herd and its expected location. This file also includes the RFID of each animal, enabling technicians to scan the tag for improved identification accuracy. The imported herd file also includes the breed, lactation, days in milk, previous yield, and status.

Users receive notifications to enhance accuracy, including visual, audio, and haptic alerts. These notifications inform the user if a cow is in the herd, the yield is outside the normal range, or there are duplicates or missing cows in previous milkings.

Output options for the data include fixed-length, comma-separated, and JSON file formats.

Keywords: Android, large herd, data collection.

Introduction

Collecting data is crucial for milk recording programs, especially for large herds (over 500 cows), where efficiency, accuracy, speed, and minimal disruption are key. Legacy handheld systems struggle with large barns (over 3,000 cows) due to outdated processors, memory limitations, and unsupported hardware.

AgriTech Analytics, a division of the Holstein Association USA, developed Weigh Day, an Android app for recording cow production, pen location, and milk test samples. Compatible with Android Version 12 or higher, it supports various barn types. The app can be used with or without an import file; using RFIDs with an import file improves identification accuracy and efficiency. Users can set up tests based on herd and barn configurations and adjust settings as needed.

Functionality of the weigh day app

Weigh Day addresses three segments of the DHI test day:

- Setup prior to the test.
- Recording data during the test.
- Handling data after the test.

If a herd file is imported with the appropriate fields, the user can pair a RFID Bluetooth stick reader to the device to enhance cow identification. Otherwise, the user manually enters the herd management number of the animals.

Before starting the test, the user decides whether to import a herd file and use an RFID stick reader. If using an RFID Bluetooth stick reader, it needs to be paired to the device. Once paired, the devices will appear on the Test Days Screen. A herd file is required if the herd uses RFID.

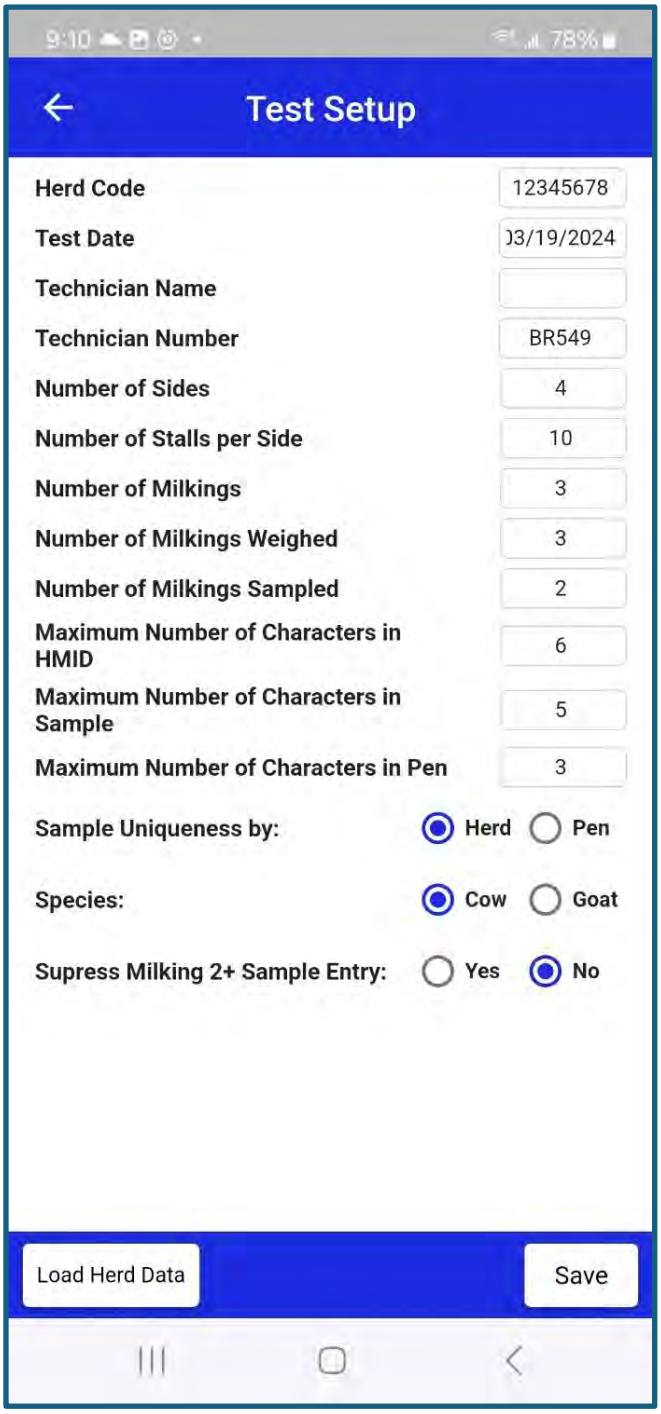
The user also decides whether to use a herd file even without RFID. That file contains the following fields:

- Herd Management ID.
- RFID.
- Pen/Corral/Group.
- Status (Dry, Fresh, etc.).
- Lactation number.
- Breed of the animal.
- Last test day milk.
- Days in milk for current lactation.

After the file has been read into the app, the user will complete the Test Day Setup Screen:

At that point, the user will save the setup and start the test.

The main test day input screen is shown below:


9:10
78%
Test Setup
Herd Code
12345678
Test Date
03/19/2024
Technician Name
Technician Number
BR549
Number of Sides
4
Number of Stalls per Side
10
Number of Milkings
3
Number of Milkings Weighed
3
Number of Milkings Sampled
2
Maximum Number of Characters in HMID
6
Maximum Number of Characters in Sample
5
Maximum Number of Characters in Pen
3
Sample Uniqueness by:
Herd
Pen
Species:
Cow
Goat
Supress Milking 2+ Sample Entry:
Yes
No
Load Herd Data
Save

The user inputs or scans a cow's number to display her herd management number. Weigh Day assigns a sample and pen number starting from 1, which can be changed as needed. The app supports herd identification numbers up to seven digits, sample numbers up to 99999, and pen numbers with three integers.

Notifications alert users about cows' herd status, duplicate entries, and milk yield limits. Unidentified cows can be entered using the 'No Tag' functionality, with issues resolved post-recording. Users can edit all input data, but the pre-loaded herd file is read-only.

Output options include fixed length files, comma-separated files, and JSON format.

Enhanced user functionality

Weigh Day offers several key features that enhance the usability of the application. When an animal enters the barn without identification, a double-tap on the cow cell will autofill the cell with NT-1, NT-2, etc., (NT references No Tag) allowing for later confirmation of the correct identification.

In cases where duplicate cow numbers are entered, the duplicate cows are indicated with XXX-D. It is advised that users confirm the identification of the cow that triggered the duplicate designation to resolve any conflicting data after the shift is completed. If the entry is correct, it is likely that the initial entry contains an error.

Should the user need to skip a stall, double-tapping the stall number will result in the stall being skipped without assigning a sample number or pen number.

For cows that have had the milking unit attached twice - such as slow milking animals moved up on a side or ride-around cows on a rotary - a long press on the second milk weight will combine the weights and remove the duplicate designation.

To clear data on a specific row, the user can perform a long press on the stall number to delete the data.

The hamburger menu (three horizontal lines in the upper left-hand corner of the Test Days Screen) allows the user to manually save and clear the input screen, clear the side, change milkings, change entry methods, or navigate to the Search and Edit Screen.

The kebab menu (three vertical dots) on the Test Days card provides options to go to the Search and Edit screen, edit test day settings, return to the main entry screen, produce various output files, and export the entire test data to transfer it to another device.

User notifications

The app provides visual, audio, and haptic notifications to assist users during data collection. High and low milk warnings are included. Cows not on file lack a check mark by their management number, while cows in unexpected pens have the pen number highlighted in red. A scanned RFID tag that is not included in the herd file triggers visual and audio alerts.

Additionally, pop-up notices appear when connecting to the RFID stick reader, forming a file, or entering a cow in the second milking but not the first. Devices that support haptic notifications will vibrate for valid RFID scans, duplicate cows, and duplicate sample entries.

Licensing and updating

A trial version of Weigh Day can be downloaded from Play Store onto your Android device. The trial version has all features of the licensed version except limiting the output to five animals. After financial arrangements have been made, one can activate to the full version and transfer it between devices. Updates are available through the Play Store.

Hardware requirements

The current version of the application is compatible with Android 12 or higher. It requires a minimum of 4 GB of RAM and 64 GB of storage. For optimal performance on large herds, devices with 6 to 8 GB of RAM are recommended. Depending on usage, 128 or 256 GB of storage may be preferable.

File transfer for Weigh Day is typically managed via email, Bluetooth transfer, or a thumb drive using a USB to USB-C converter, as most devices running the application are either Android phones or ruggedized smartphones.

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