Title

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Journal

Translational Animal Science, 1(3)

ISSN

2573-2102

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Publication Date

2017-09-01

DOI

10.2527/tas2017.0027

Peer reviewed

Decision Making Tools: BeefTracker mobile app for tracking and analysis of beef herd pasture use and location[1]

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ABSTRACT: Beef Tracker is a web-based mapping platform that provides beef cattle ranchers a tool to demonstrate that cattle production fits within sustainable ecosystems and to provide regional data to update beef sustainability lifecycle analysis. After digitizing pastures, herd data (class and number of animals) are input on a mobile device in a graphical pasture interface, stored in the cloud, and linked via the web to a personal computer for inventory tracking and analysis. Pasture use calculated on an animal basis provides quantifiable data regarding carrying capacity and beef production. This data is sought by the National Beef Cattle Association to provide more accurate inputs for beef sustainability lifecycle analyses. This application is a useful way for large, complex ranching operations to have all employees remain informed as to cattle movements and ranch wide improvement projects. Better yet, as users make changes to their operation in BeefTracker, histories are automatically recorded and stored in the cloud. After initial testing by university range scientists and ranchers, we have enhanced the BeefTracker application to improve automation for increased ease of use. The following have been added: ability to access and edit the BeefTracker livestock inventory while disconnected from WiFi and cell service, ability to represent portions of a pasture in BeefTracker as irrigated and nonirrigated, and ability to report animal unit harvest (by pasture) calculated on an annual basis. This will provide quantifiable data regarding carrying capacity and subsequent beef production to provide more accurate data inputs for the beef sustainability lifecycle analysis, enhanced map synchronization, and improved security to allow a single individual to access multiple livestock operations without needing multiple user IDs and passwords.

Key words: animal mapping, cloud data storage, graphical interface

Transl. Anim. Sci. 2017.1:250–254
doi:10.2527/tas2017.0027

INTRODUCTION

Cattle inventory records by pasture become increasingly difficult to maintain as the complexity of a ranching operation increases (Fig. 1). Keeping track of the class of beef cattle, spatially, allows the operator to develop stocking data at a pasture level. A tool is needed to store and analyze this data so that pasture level stocking information across years will be available to ranchers and range managers. Further, it will provide beef cattle ranchers a tool to demonstrate that cattle production fits within sustainable ecosystems and to provide regional data to update beef sustainability lifecycle analysis. In 2013 (Phase I) the beef checkoff funded a research project with VESTRA Resources, Inc. (Redding, CA) to develop a working prototype of a web-based mapping platform named "BeefTracker". The objective of the Phase I project was to support the sustainability program by providing ranchers with a tool to demonstrate that cattle production fits within sustainable ecosystems and to provide regional data to update the current beef sustainability lifecycle analysis. As part of the Phase I prototype development, user testing was initiated by university range scientists and ranchers. Then, in 2014 Phase II

[1]This work was funded by the Beef Checkoff.
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Received March 30, 2017.
Accepted May 20, 2017.

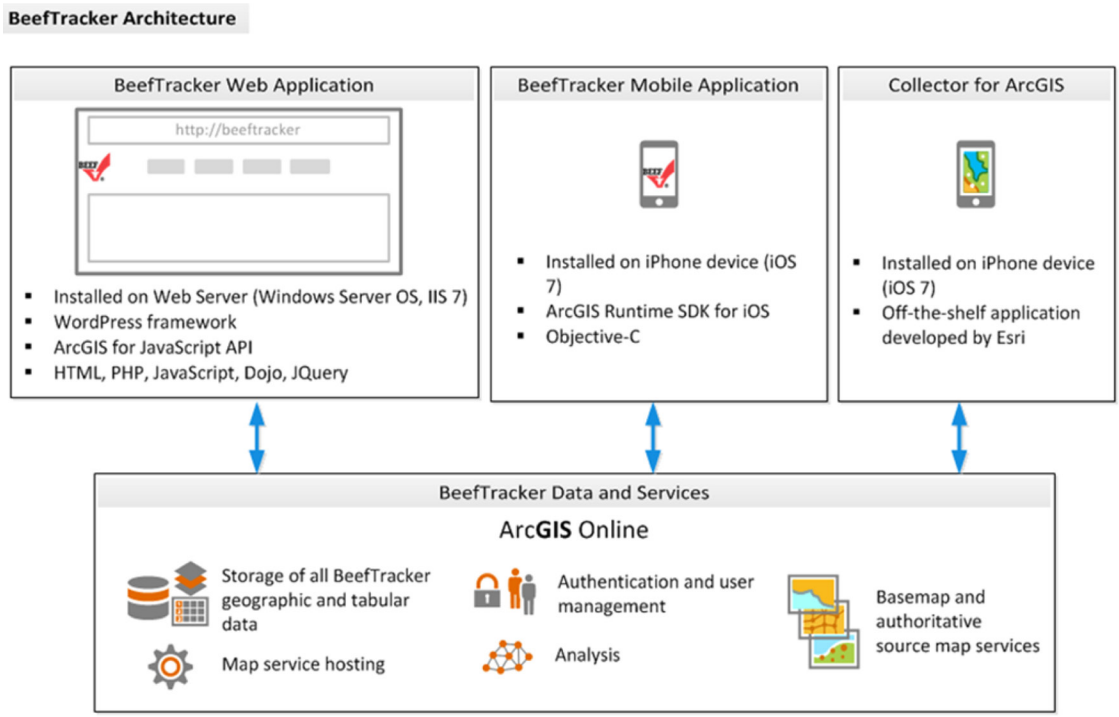

Figure 1. Architecture of BeefTracker software using a personal computer, an iPhone device, and cloud data storage.

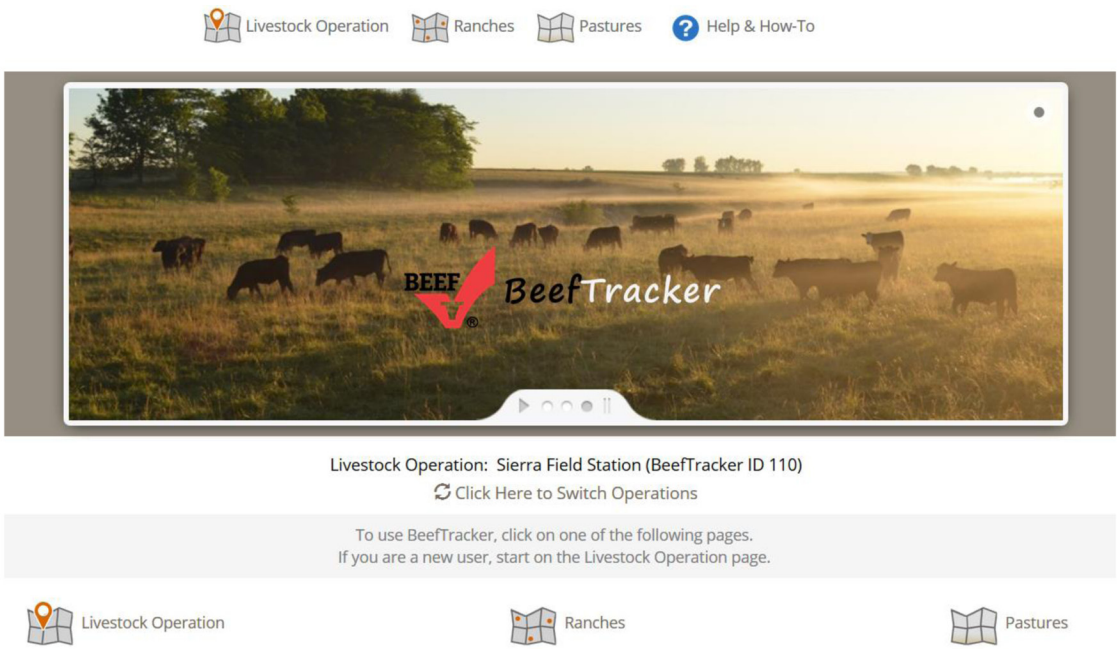

Figure 2. Landing screen of the BeefTracker web application showing that allows the user to set up beef cattle operations and add ranches or pastures.

began with the vison to enhance the BeefTracker application and to increase the use of BeefTracker throughout the U.S. The Phase I field testers identified several enhancements that were needed to support a broader adoption of the BeefTracker application. In Phase II enhancements to the BeefTracker app were developed and an outreach and extension program was established to encourage the use of the BeefTracker among leading cattle operations throughout the U.S.

DESCRIPTION OF SOFTWARE

We developed a web-based mapping platform named BeefTracker in cooperation with VESTRA Resources (Redding, CA). The BeefTracker application (Fig. 2) allows operators to set up beef cattle business units called operations, add ranches and pastures, adjust inventory, and locate improvements as well as archive and retrieve geo-located monitoring

Table 1. BeefTracker App features

Functionality
Ability to access and edit the BeefTracker livestock inventory while "Off Line" which allows data collection disconnected from Wi-Fi and cell service
Ten classes of livestock, with the ability to customize weights for each class allow for more accurate reporting on use and sustainability
Ability to represent portions of a pasture in BeefTracker as irrigated and non-irrigated
Ability to report animal unit months (AUM) harvest by pasture on an annual basis
Security that allows a single individual to access multiple livestock operations without needing multiple user IDs and passwords
Multiple map types and synchronization
Help screens provided for each page and function

data (Forero et al., 2015). BeefTracker has the ability to represent portions of a pasture in BeefTracker as irrigated and non-irrigated. It allows the user to choose from multiple map types. It also has security features to allow a single individual to access multiple livestock operations without needing multiple user IDs and passwords (Table 1). Pasture delineation is designed to be done on a personal computer with web access (Fig. 3), herd data (class and number of animals) are input on a mobile device in the field with a graphical pasture interface, stored in the cloud, and linked via the web to a personal computer for inventory tracking and analysis (Fig. 4). This inventory feature is iPhone based. Set-up of the system is simple and maintenance of inventory information on the iPhone is largely intuitive and affords operators the ability to update inventory numbers and location at the time the changes occur. It also has the ability to access and edit the livestock inventory while disconnected from Wi-Fi and cell service. Once data is input, BeefTracker can report animal unit harvest (by pasture) calculated on an annual basis. We enhanced the application prototype, after initial testing by university range scientists and ranchers, and have introduced the BeefTracker application to the industry.

The University of California Cooperative Extension (UCCE) leads outreach efforts. University of California staff attends meetings (i.e., state Cattlemen's, American Society of Animal Science, and Society for Range Management) to demo the BeefTracker and showcase the use and functionality of the app as a management tool. The UCCE helped organize an in-person meeting with selected producers at National Cattlemen's Beef Association in Denver to introduce BeefTracker for the final round of Phase II testing. They have also encouraged use within University of California clientele.

All data is stored and maintained in iPhone's secure Cloud environment, which is password protected. Location of the data is only accessible to the key study team and the identified ranch operators/managers for their prospective ranching operation. VESTRA controls access into the network servers containing all

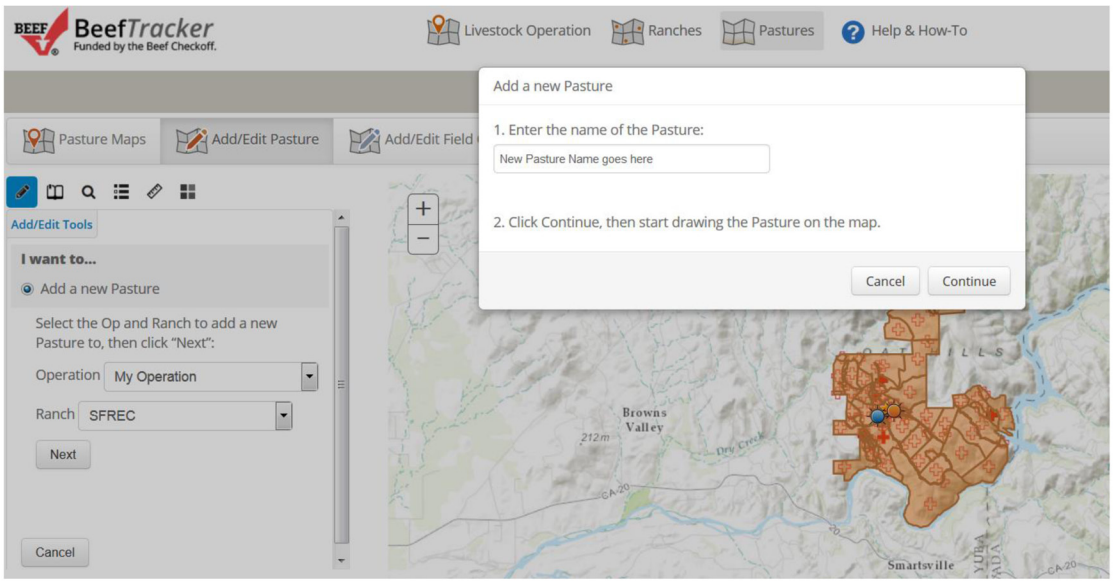

Figure 3. BeefTracker screen on a personal computer with web access for initial identification and mapping of pastures.

Figure 4. Screens of iPhone menus for livestock actions in BeefTracker.

project files. VESTRA's quality management system is independently assessed against the most recognized and comprehensive international standard for quality management systems, the ISO 9001. All data analyses, results, and interpretation of the findings undergo VESTRA's quality control process for accuracy.

RESULTS AND DISCUSSION

The number of days different classes of animals spend on a pasture provides quantifiable data regarding carrying capacity and subsequent beef production to provide more accurate data inputs for beef sustainability lifecycle analysis. After initial testing by university range scientists and ranchers, we have enhanced the BeefTracker application to improve automation for increased ease of use. This will provide quantifiable data regarding carrying capacity and subsequent beef production to provide more accurate data inputs for the beef sustainability lifecycle analysis (Oltjen and Gunter, 2015). We are now in the process of education to increase its use throughout the U.S. Its ultimate utility depends on how well it and similar land and resource use programs are adopted and utilized.

Challenges in the development of BeefTracker have been the distance between programmers, advisors, users, and project leaders. Email and occasional face-to-face meetings have helped, but the distance has delayed both software development and application. Further, there has been difficulty in identifying a consistent user base that will consistently use the program and report bugs, inconveniences, and desires for improvement. Some users, most notably the University of California Sierra Research and Extension Center, have provided longer term and quite useful feedback, but others have used the program for a few months and then became too busy or distracted by other activities to continue use. Technical challenges with web and iPhone constraints have occasionally slowed development as well.

Opportunities for future development are many, with a list of potential software additions and improvements submitted by various users and advisors in hand that can direct further BeefTracker enhancements. During the last part of 2015 resources were redirected from further introduction of BeefTracker to addressing a number of these opportunities, and most notably the ability to make animal inventory adjustments via the personal computer (instead of having to use the iPhone) was added, as requested by many users—both for data entry as well as data editing. Also, map display and editing capabilities was enhanced. With continued use additional opportunities for BeefTracker improvement will arise.

Over the past year, leading beef cattle producers and key academic advisors to the beef industry have been introduced to BeefTracker and become aware of its potential as a sustainability tool and for its ability to improve management efficiencies. Some key takeaways from these sessions, collected by a survey after these producers have had some time to use the program are that 83% of those who attended the training program are still planning on using the program into the future. Participants also responded that training is essential. A common improvement desired was being able to use the computer instead of only the iPhone to move cattle around pastures; that feature has

now been added. Finally, 100% of respondents think BeefTracker will be useful to cattle producers.

Some recommendations for increased adoption of the BeefTracker software as we move forward include making the software easier to use by continuing to collect user feedback and employment of someone to provide user support. Also, software improvement will require a relationship with VESTRA or equivalent. A strong website is necessary as well to help users, to increase familiarity with BeefTracker, and to provide a platform for evaluation and feedback.

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