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Criollo Cattle as a Strategy to Maintain Output of Ecosystem Services Under a Changing Climate

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Data Management Plan

a. Expected Data Type

- Field data will include: 1) field measurements (e.g., line-point intercept data, utilization, soil aggregate stability, biological soil crusts cover) and 2) cattle beef metrics (e.g., body condition, weight).
- Animal positional data will consist of 10-minute GPS fixes for each of the 40 cows while on Drill pasture (app. 1.3 million locations over three years), and hourly GPS fixes for the rest of the year (while the experimental herd joins the rest of the herd; app. 0.8 million additional locations over three years).
- Animal pedometer data will consist of 10-minute interval summaries of second-by-second activity (lying and standing times, step count, and motion index) for each of the 40 cows while on Drill pasture (app. 4 million measurements over three years).
- Lab data will include: 1) cattle diet quality (e.g., % Crude protein, Digestible Organic Matter), 2) cattle dietary composition (DNA-derived identification of plant species/operational taxonomic units), and 3) soil chlorophyll a concentrations.
- Remote sensing products will include classification of WorldView-3 imagery.

All are primary data.

b. Data Format

- For field and chlorophyll a data, senior project personnel will train technicians and supervise data collection. Data will be entered in Microsoft Access forms that impose limits on the types and values of data that can be entered in a given cell. After initial data entry, data will be checked for errors by the PI, and data will be examined for outliers indicative of data entry errors. A log of any corrections to the data, as well as archives of previous data versions will be maintained.
- Animal positional data will be transmitted directly to the cloud via LoRaWAN system-enabled GPS collars. Pedometer data will be downloaded every year as the experimental herd leaves Drill pasture.
- Diet quality and composition data will likely be received from analytical labs in Excel spreadsheets, with associated metadata.
- Remote sensing products will be obtained by USGS in a raster format, segmented image files will be in vector format, and the data maintained by the USGS.

All field, lab, and animal position data will be stored in a PostgreSQL database. Meta-data will be created for all data. We will use Ecological Metadata Language to create metadata that follows KNB (Knowledge Network for Biocomplexity) standards: https://knb.ecoinformatics.org/#external// emlparser/docs/index.html.

c. Data Storage and Preservation

In addition to being incorporated into the project database, all field and lab data will be stored locally as separate files on PI Veblen's hard drive, which syncs instantaneously to a cloud server and daily to an external hard drive. Original datasheets will be stored at USU and scanned into pdf form to be stored electronically.

Animal positional and pedometer data will be stored as CSV files on an external hard drive, and on a cloud service, in addition to their integration into the project's database.

Remote sensing products will be stored on the USGS file server in [MOFFIT] which is backed up regularly.

d. Data Sharing and Public Access

During the course of the study, field, lab and animal positional data will be stored in a permanent database accessible to only project personnel.

After two years following project completion, or upon publication of project results in peer-reviewed journals (whichever comes first), field, lab, and animal positional/pedometer data will be made publicly available via public data repositories such as FigShare, USU Digital Commons. Prior to public availability the data will be available upon request to land managers and scientists with some restrictions on publication for the latter.

Remote sensing products, including fractional cover maps and classified imagery will be made available via a USGS data release (see example: https://doi.org/10.5066/P9SWDWLS).

e. Roles and Responsibilities

PI Veblen will be in charge of data management for the field and lab portions of the project; in the event that PI Veblen leaves the project, co-PI Duniway will take over this responsibility. Co-PI Avgar will be in charge of data management for animal location data; in the event that Avgar leaves the project, Veblen will take over data management. Co-PI Duniway will oversee management of remote sensing data; co-PI Reed will take over data management in the event that Duniway leaves the project. Veblen will oversee implementation of the DMP for the entire project; in the event Veblen leaves the project, responsibility will be turned over to the next available PI in the following order: Duniway, Avgar, Villalba, Reed, Thacker, Garcia.