Dataset Documentation

Name:

Drone Imagery Classification Training Dataset for Crop Types in Rwanda

Publication Date:

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Version:

1.0

Description:

RTI International (RTI) generated 2,611 labeled point locations representing 19 different land cover types, clustered in 5 distinct agroecological zones within Rwanda. These land cover types were reduced to three crop types (Banana, Maize, and Legume), two additional non-crop land cover types (Forest and Structure), and a catch-all Other land cover type to provide training/evaluation data for a crop classification model. Each point is attributed with its latitude and longitude, the land cover type, and the degree of confidence the labeler had when classifying the point location. For each location there are also three corresponding image chips (4.5 m x 4.5 m in size) with the point id as part of the image name. Each image contains a P1, P2, or P3 designation in the name, indicating the time period. P1 corresponds to December 2018, P2 corresponds to January 2019, and P3 corresponds to February 2019. These data were used in the development of research documented in greater detail in "*Deep Neural Networks and Transfer Learning for Food Crop Identification in UAV Images*" (Chew et al., 2020).

Methodology:

Rather than visit field locations in person, an in-office web-based system was leveraged to remotely label crops. The web-based viewer was designed to support multiple users simultaneously, tracking user and date of entry for all collected labels. Tools were provided within the viewer to support capture of labels by point location and by polygon delineation.

For each point or polygon added by the user, a preconfigured menu of attribute options was provided. Polygon delineations were principally used to capture large monocrop areas. These polygon areas were reduced to points by random sampling within the polygon area. To ensure quality, a local Rwandan agricultural expert performed initial labeling of crops in the viewer and then trained and supervised a team of three independent labelers remotely.

Each point in the dataset was then used to extract discrete image chips where the labeled point is at the center of each chip. The resulting exported PNG images are 200 × 200 pixels, with each

pixel representing 2.25 cm capturing the resolution of the original UAV imagery which varied from 3 to 4 cm.

The final training dataset consists of six distinct classes: Banana, Maize, Legume, Forest, Structure, and a catch-all “Other” category (Figure 1). Each image is labeled as one of the six classes and represents 4.5 m x 4.5 m on the ground. The three main agricultural classes (Banana, Maize, and Legume) were chosen to represent priority food security crops that are both prevalent and important to livelihoods in Rwanda. Common land cover types prevalent in the Rwandan countryside were included as additional classes (Forest and Structure). In cases when more than one class is present within the same image, labelers were instructed to label for the class occupying the majority of the image.

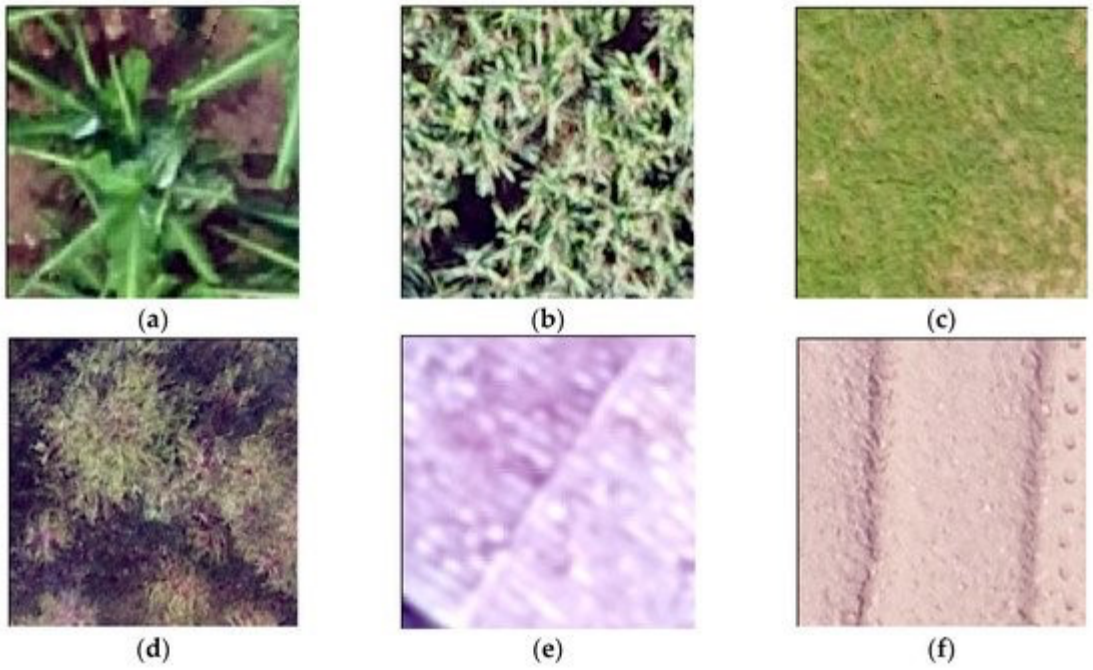

Figure 1. Example images of the six classes used for training and validating the model; (**a**) Banana, (**b**) Maize, (**c**) Legume, (**d**) Forest, (**e**) Structure, and (**f**) Other.

Although we selected sites for their diversity in agroecological zones and cropping patterns (both intercropping and monocropping), we cannot guarantee that these sites are fully representative of Rwandan farmland. Similarly, labeled crop instances were not chosen at random from the drone flight areas but, rather, were adaptively selected to ensure coverage of the crop types of interest. Even though this process was useful for generating training data, it may introduce selection bias if the labeled images differ from the overall drone flight area.

Coordinate Reference System:

Unprojected geographic decimal degrees, datum WGS84

Spatial Extent:

The geographic coverage of the data is Rwanda. The latitude and longitude of the corresponding bounding box is:

2.742892 S, 29.437344 E
1.531246 S, 30.431295 E

Temporal Extent:

The image chips are taken from drone imagery flown between December 10, 2018 and February 22, 2019.

License:

Citation:

Rineer J., Beach R., Lapidus D., O'Neil M., Temple D., Ujeneza N., Cajka J., & Chew R. (2021) "Drone Imagery Classification Training Dataset for Crop Types in Rwanda", Version 1.0, Radiant MLHub https://doi.org/10.34911/rdnt.r4p1fr

Reference:

Chew, R., Rineer, J., Beach, R., O'Neil, M., Ujeneza, N., Lapidus, D., Miano, T., Hegarty-Craver, M., Polly, J., & Temple, D. S. (2020). Deep neural networks and transfer learning for food crop identification in UAV images. Drones, 4(1), 7. https://doi.org/10.3390/drones4010007

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