

Drone Mapping of Cacao Agroforestry Parcels in Ecuador

By OpenForests



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Summary

The goal of this project was to obtain drone imagery of six cacao agroforestry parcels spread throughout the central coastal region of Ecuador. The imagery consisted of photos from two different cameras, one conventional RGB camera, and one multispectral camera with an orange, cyan, near-infrared (OCN) filter. The images from each camera and each parcel were then stitched together to form orthomosaics.

Study Area

The total study area is approximately 3 ha spread over six 0.5 ha cacao agroforestry parcels. Two of the parcels are located near the town of Milagro, Ecuador, while the other four are located near Mocache, Ecuador.

Data Collection

The data was all collected over two days, October 27th & 28th with the assistance of Steeven Leon from UNOCACE. An automated flight plan was created for each parcel so that there would be an 80% overlap in the images while flying at 40m above ground level, and approximately a 20m buffer around the edge of the parcel boundaries. The RGB camera of the Mavic 2 Pro drone took a photo at every preprogrammed point of the flight plan in order to satisfy the 80% overlap requirement, while the OCN camera was set to take photos every 2 seconds throughout the whole flight. The photos from the RGB camera were geotagged with the onboard drone camera, but the OCN camera takes photos independently of the drone camera, so it has a separate GPS receiver that geotags every photo taken.

The order that the parcels were visited and monitored was:

1. Flora Pluas
2. Nestor Macias
3. Manuel Macias
4. Leonor Aspiazu
5. Carlos Vera Arteaga
6. Carlos Vera Guevara

The photos were all taken between the hours of 9AM and 12PM. The weather was overcast for the first four parcels and sunny for the last two.

Results



Example of RGB Orthomosaic

The end products are six RGB orthomosaics and six OCN orthomosaics. Each orthomosaic has a specific pixel size, or ground sampling distance (GSD), and a certain level of GPS error. The following tables summarize these values for both the RGB and OCN orthomosaics.

RGB	GSD (cm/pixel)	Long. Error	Lat. Error
Flora Pluas	0.97	0.25	0.66
Nestor Macias	1.10	0.60	0.53
Manuel Macias	1.13	0.69	0.30
Leonor Aspiazu	1.06	0.47	0.45
Carlos Vera Arteaga	1.04	0.26	0.59
Carlos Vera Guevara	1.19	0.27	0.65

OCN	GSD (cm/pixel)	Long. Error (m)	Lat. Error (m)
Flora Pluas	2.08	2.20	2.98
Nestor Macias	2.28	2.36	2.74
Manuel Macias	2.39	4.15	4.07
Leonor Aspiazu	2.27	1.53	0.82
Carlos Vera Arteaga	2.25	1.17	1.77
Carlos Vera Guevara	2.98	1.19	1.84

To stitch the images together we used Agisoft Metashape Professional software. This software also auto-calibrates the multispectral imagery before processing. For the orthomosaics of the OCN images, we chose to display an NDVI index, however this can be changed to suit WWF's needs.