• A Remote-Sensing-Based Bird Friendly Certification System for Sustainable Agroforestry

Qiongyu Huang*, Jin Xu, Ruth Bennett, T. Scott Sillett, Camila Gomez, Nick Bayly

*HuangQ@si.edu

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Team members

PI
Dr. Qiongyu Huang
Smithsonian Conservation Ecology Center

Co-I
Dr. Wenge Ni-Meister
CUNY Hunter College

Post-Doctoral Researcher
Dr. Jin Xu
Smithsonian Conservation Ecology Center

Ph.D. Student
Francesca Lingo
CUNY Hunter College

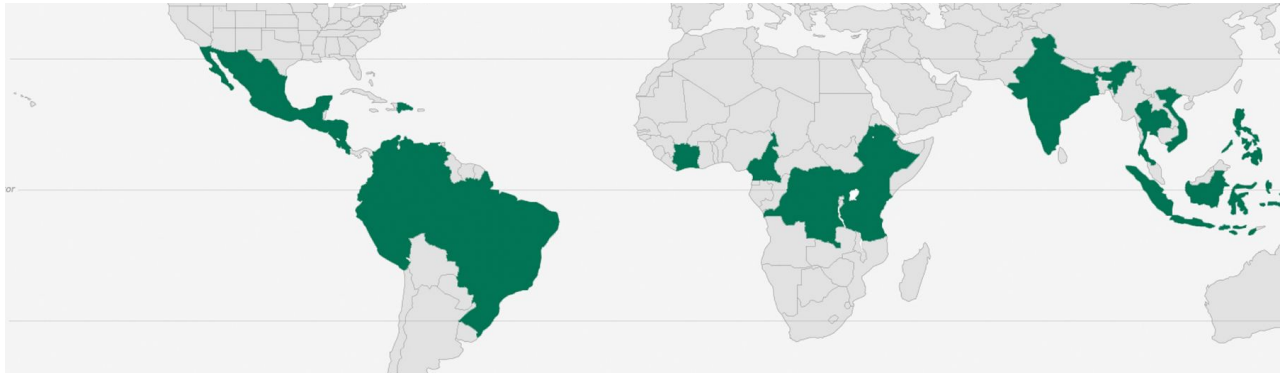
End Users

Co-I
Dr. Ruth Bennett
Smithsonian Migratory Bird Center

Co-I
Dr. T. Scott Sillett
Smithsonian Migratory Bird Center

Collaborator
Dr. Camila Gomez
SELVA

Co-I
Nick Bayly
SELVA



- Coffee is grown in over 70 countries across the tropics
- Latin America produces over 60% of the world's coffee
- Monoculture sun-grown coffee farms have produced most of the coffee that we consumed

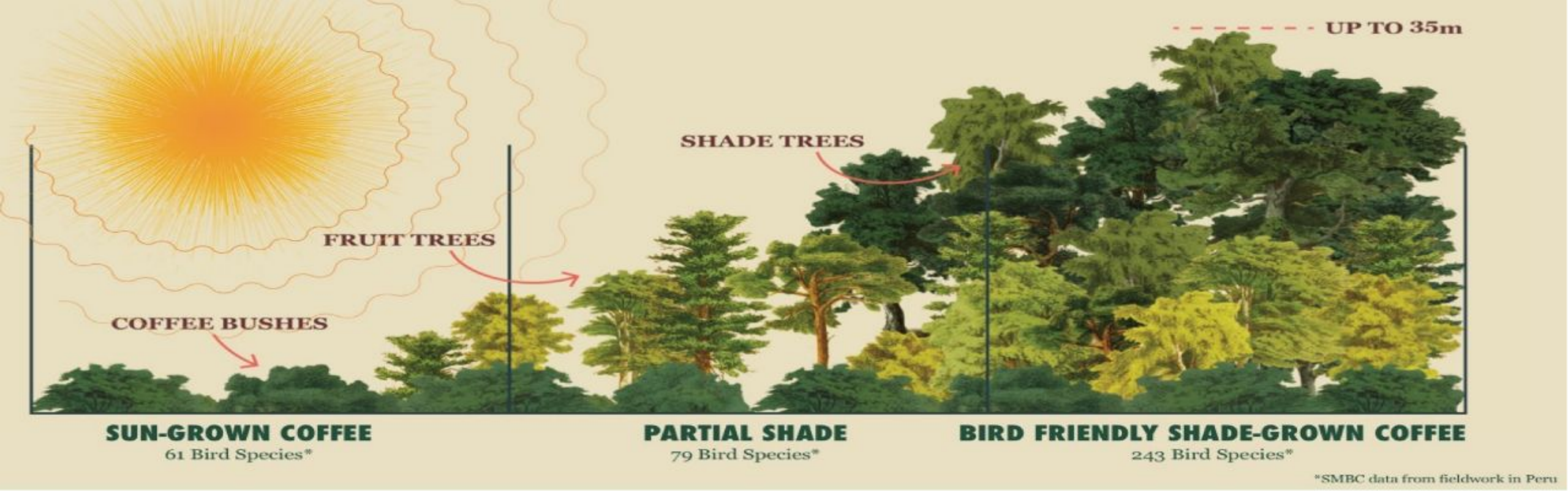
RUSTIC POLYCUTLTURE:
Very tall natural forest trees with coffee inserted under the natural canopy.

TRADITIONAL POLYCUTLTURE:
A very diverse system of planted shade trees, some of which may be quite tall (>15-20 meters).

COMMERCIAL POLYCULTURE
The planted shade here is less diverse, but may meet the Bird Friendly standards.

SHADED MONOCULTURE
Only one or two planted species of shade make up this category, and the trees are kept rather short (<10m usually).

MONOCULTURE
Coffee only.



- Structurally diverse agroforestry landscapes promote high avian biodiversity
- In Latin America, shade-grown coffee creates habitat for long distance neotropical migratory birds that are spending their summer in North America
- Created by Scientists in 2000
- In 2023, Bird Friendly cocoa certification was launched

BIRD FRIENDLY
Smithsonian

Smithsonian Bird Friendly Coffee® Certification

- Currently 5000+ growers in 11 countries produce Bird Friendly coffee
- Requires inspectors to assess vegetation structure and vegetation composition in person
- Limited by the lack of trained inspectors to visit and conduct labor-intensive evaluation of coffee farms.

Bird Friendly Inspection Requirements

Canopy height > 12 m

40% shade cover

Structural diversity (3 canopy layers)

No deforestation in the last 10 years

At least 10 native tree species

Certified organic

End User Needs

- Transition to a 2-step certification system
- Remotely inspect new applications and monitor habitat use post-certification
- Identify high conservation value agroforestry area for Bird Friendly Coffee program outreach

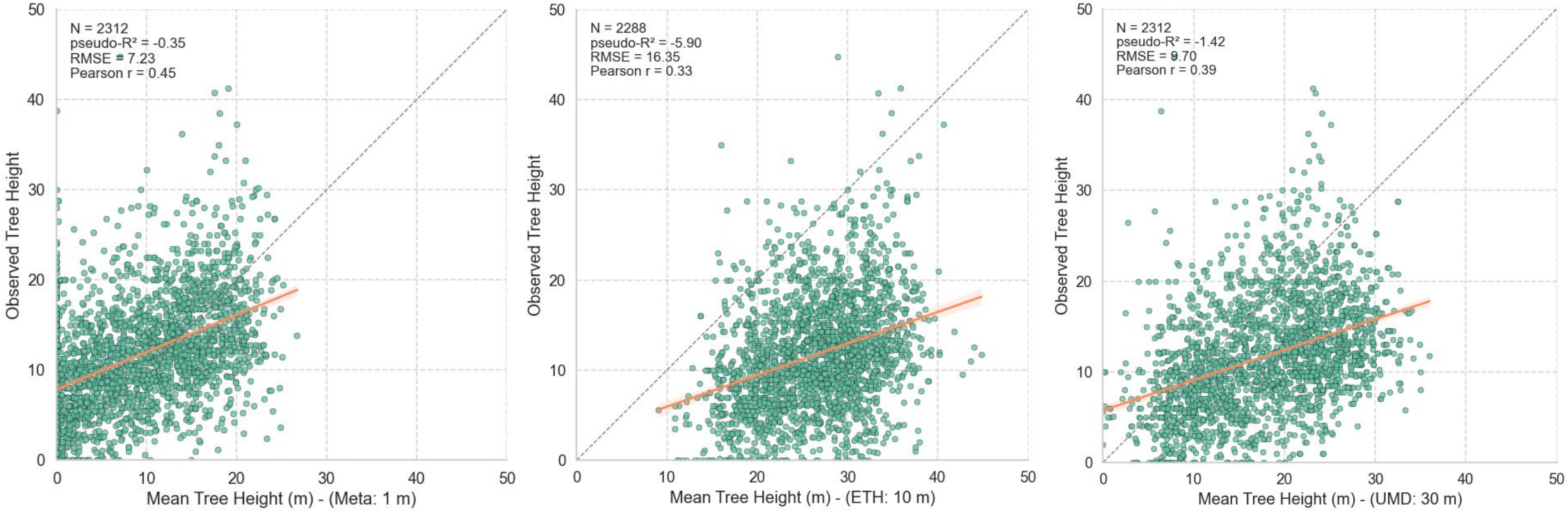
Project Objectives

- Create a web-based application to utilize multisensory remote sensing data including GEDI to evaluate bird habitat quality in coffee growing landscapes in Colombia, Peru, and Panama
- Make Bird-Friendly Certification process more accessible
- Co-develop remote sensing-based Bird Friendly inspection guidelines

Remotely Sensed Vegetation Height Products Available

- Meta high resolution canopy height map (Tolan et al. 2024)
    - 1m resolution, based on high resolution RGB commercial satellite data
- Sentinel-based global canopy height product (Lang et al. 2023)
    - 10m resolution , fused sparse height data from GEDI
- Landsat-based global forest canopy height product (Potapov et al. 2020)
    - 30m resolution, calibrated with GEDI measured forest height

Low correlation between ground measured height and remotely sensed height in Colombia

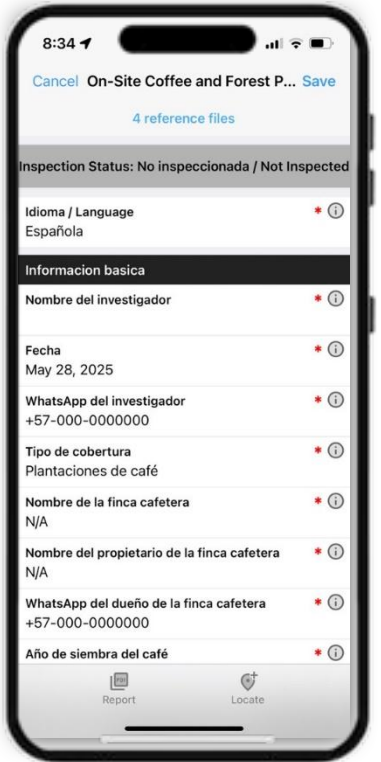


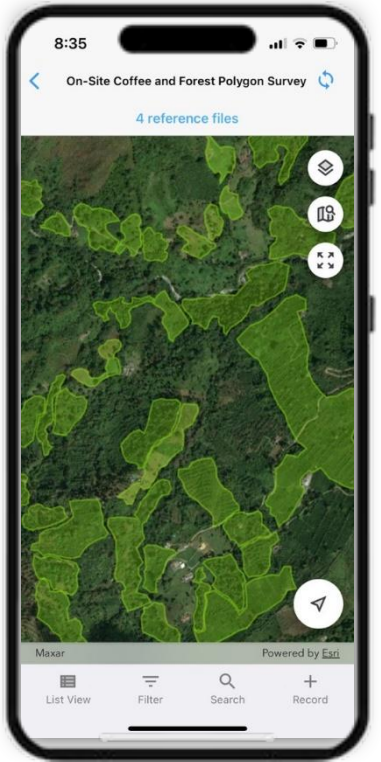
In situ data collection to establish high quality baseline

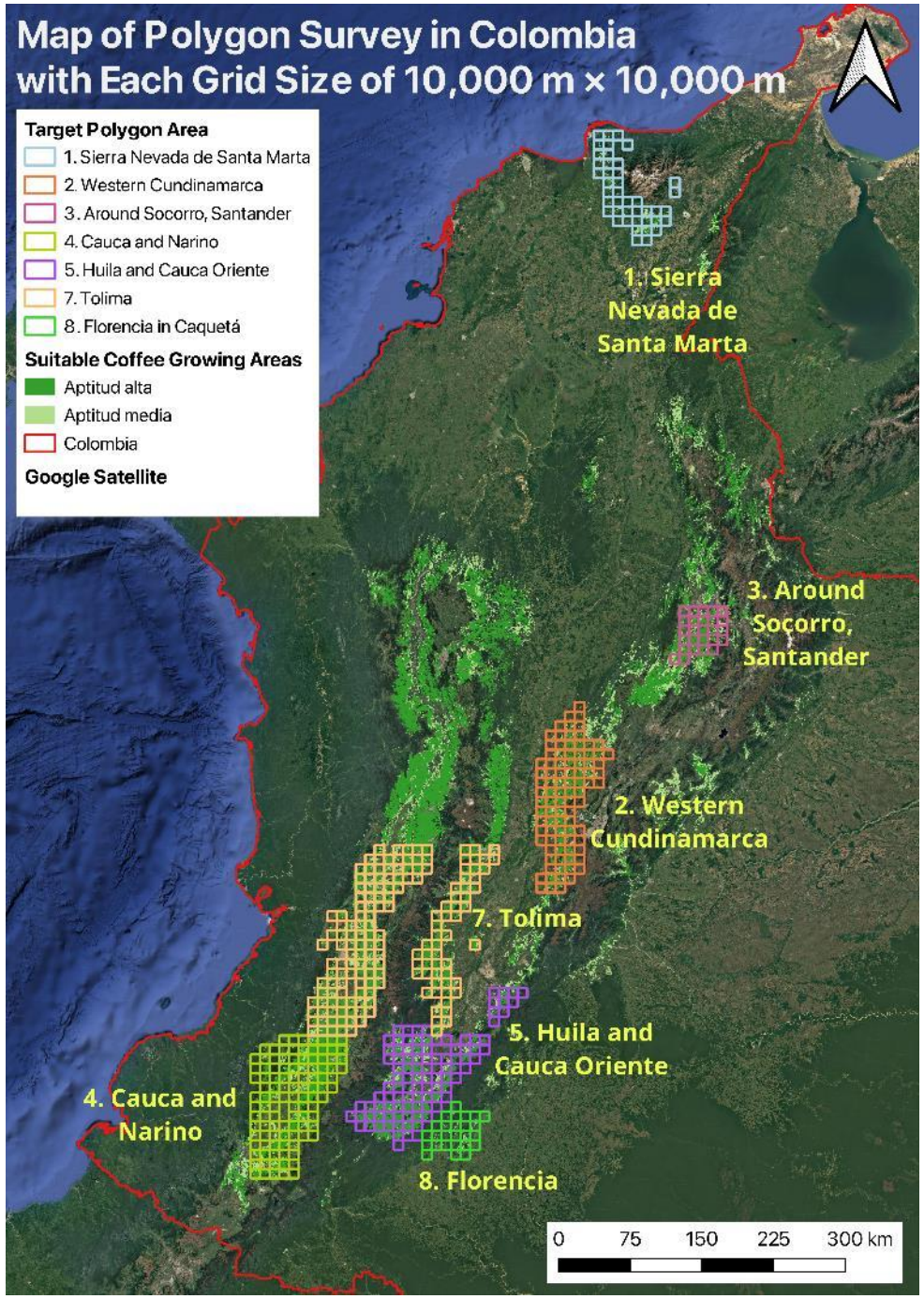
- Designed the survey on Fulcrum App
  - Created survey protocol and user guide
  - Trained 20+ local contacts
- Collecting homogenous polygons of
  - 4 coffee types (sun coffee, low/medium/ high-shade coffee) and
  - 2 forest types (secondary and primary forests)
- Goal: Collect 4000+ coffee and forest polygons by the end of summer 2025 to establish a baseline of Bird Friendly compliant vegetation structure

- The lower quantile values of vegetation height/cover of a reliable collection of confirmed Brid Friendly compliant coffee polygon can be used as certification thresholds

Fulcrum

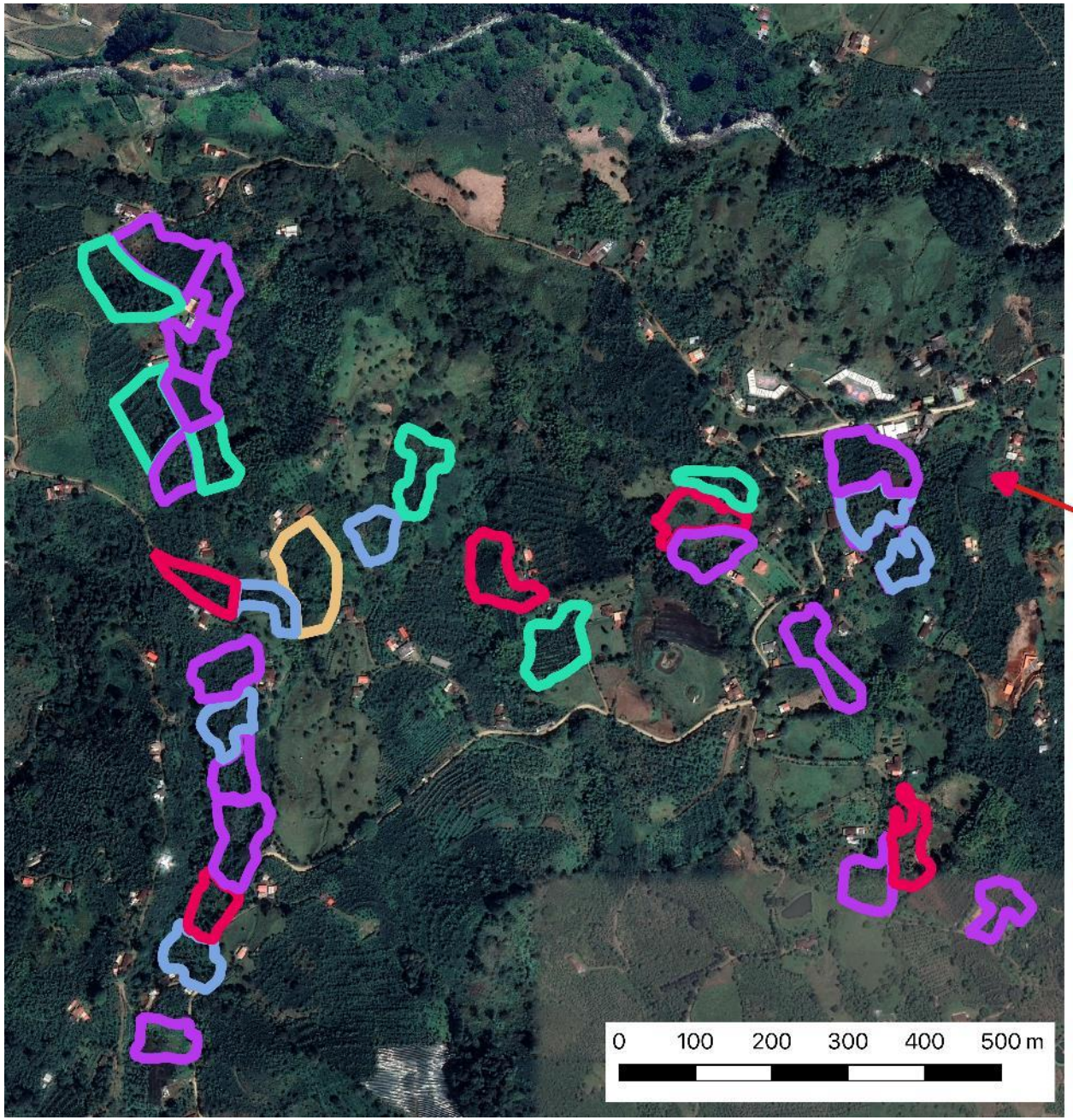






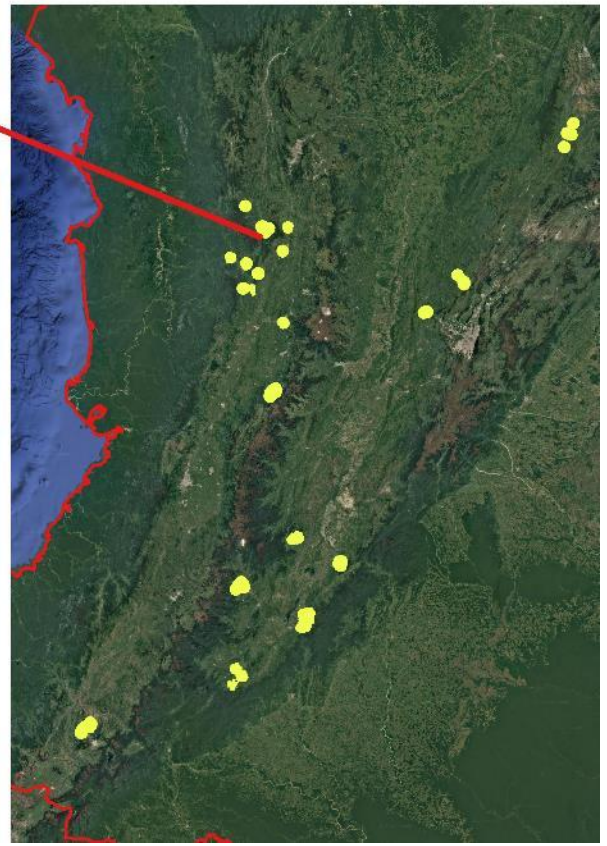
Survey grid system in Colombia

Region ID	Region	The number of grids	The number of polygons planned to collect
1	Sierra Nevada de Santa Marta	42	248
2	Western Cundinamarca	91	538
3	Around Socorro, Santander	26	154
4	Cauca and Narino	106	626
5	Huila and Cauca Oriente	104	614
6	Eje Cafetero (Caldas, Rizaralda, Qindio Depts)	160	945
7	Tolima	164	969
8	Florencia in Caquetá	26	154
	TOTAL	719	4248

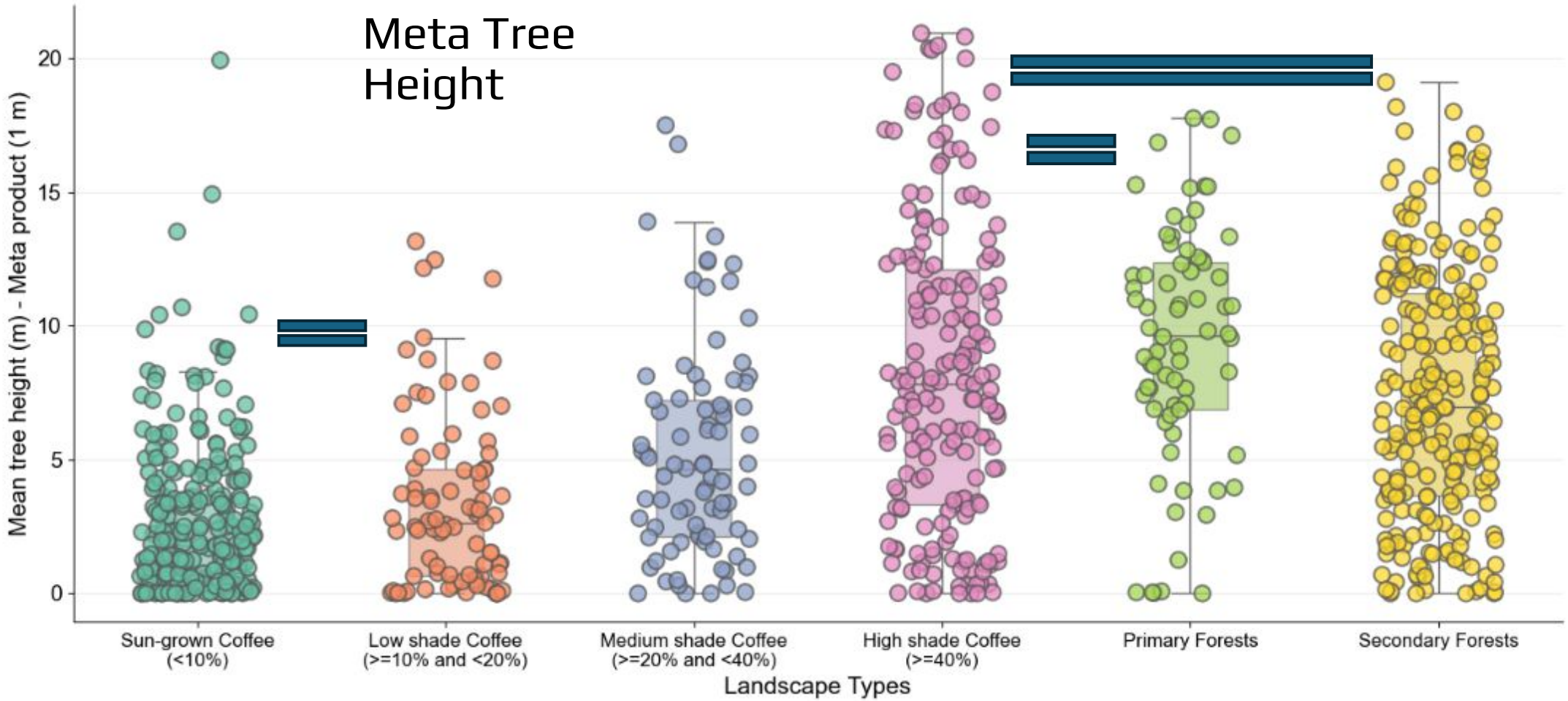


Coffee and forest polygons

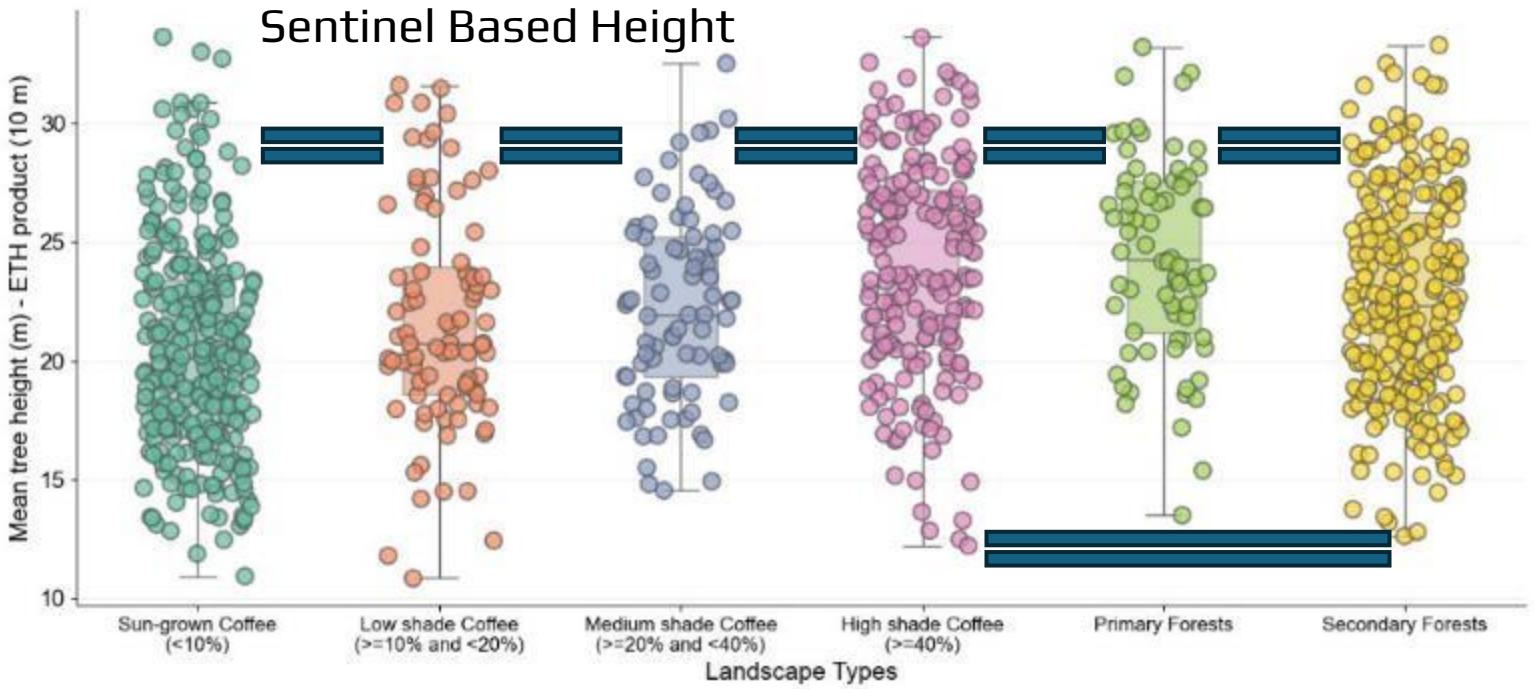
- Sun-grown (< 10%)
- Low shade (>= 10% and < 20%)
- Medium shade (>= 20% and < 40%)
- High shade (>= 40%)
- Secondary_Forests
- Colombia

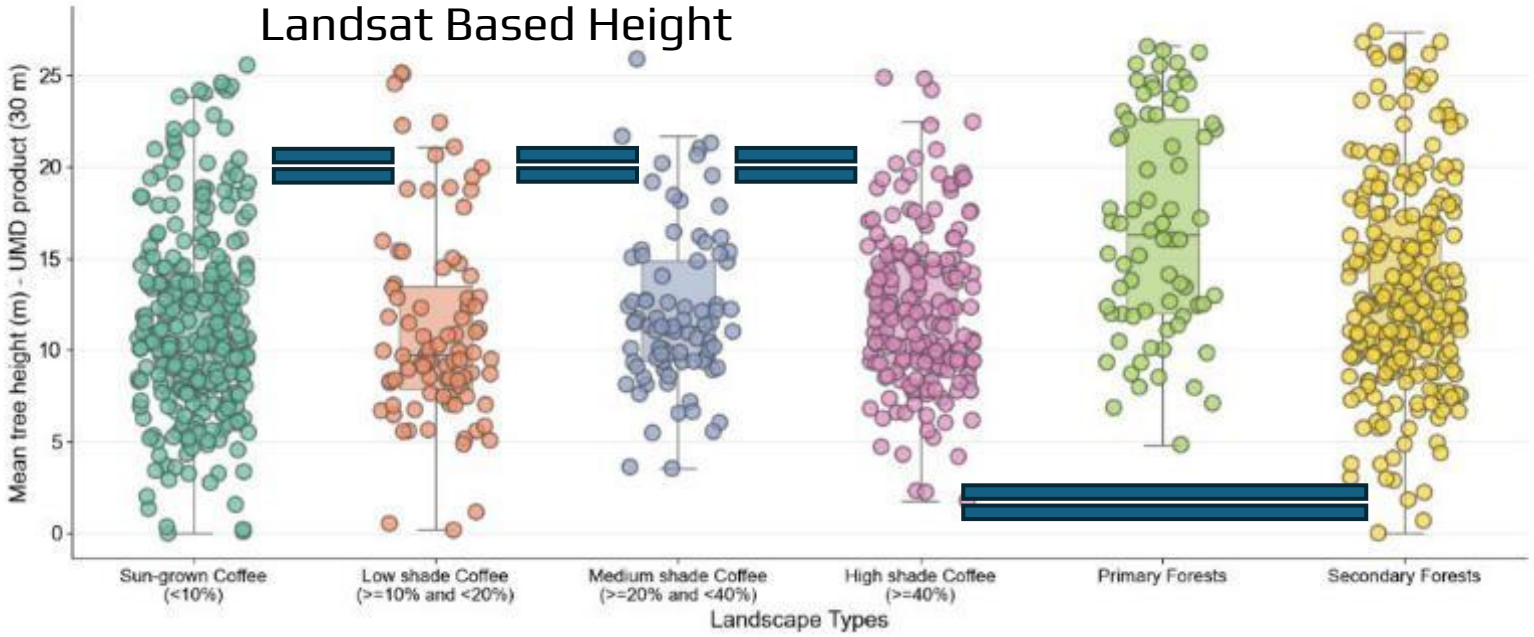


High resolution meta tree height data shows significant separation between coffee types



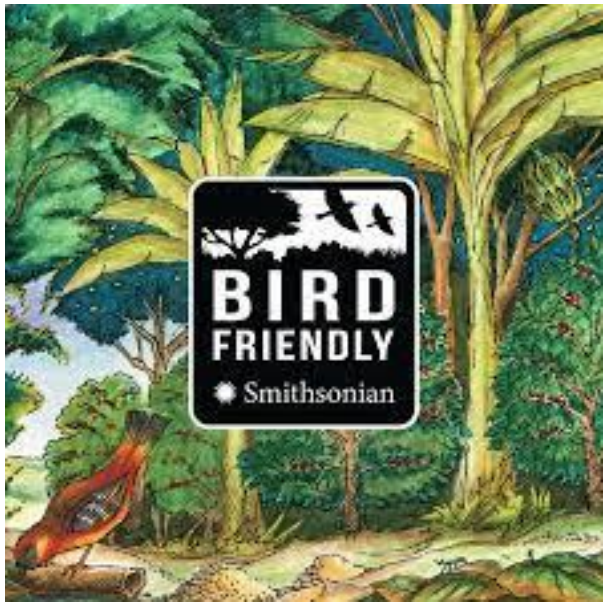
Medium resolution forest height datasets do NOT show clear separation of height between coffee types





Ongoing development & Next steps

- Finalize the certification thresholds for vegetation height and cover
- Produce time series vegetation height, canopy cover layers
- Co-develop Web-based application with end users
- Revise Bird Friendly inspection guideline



Thank you

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