

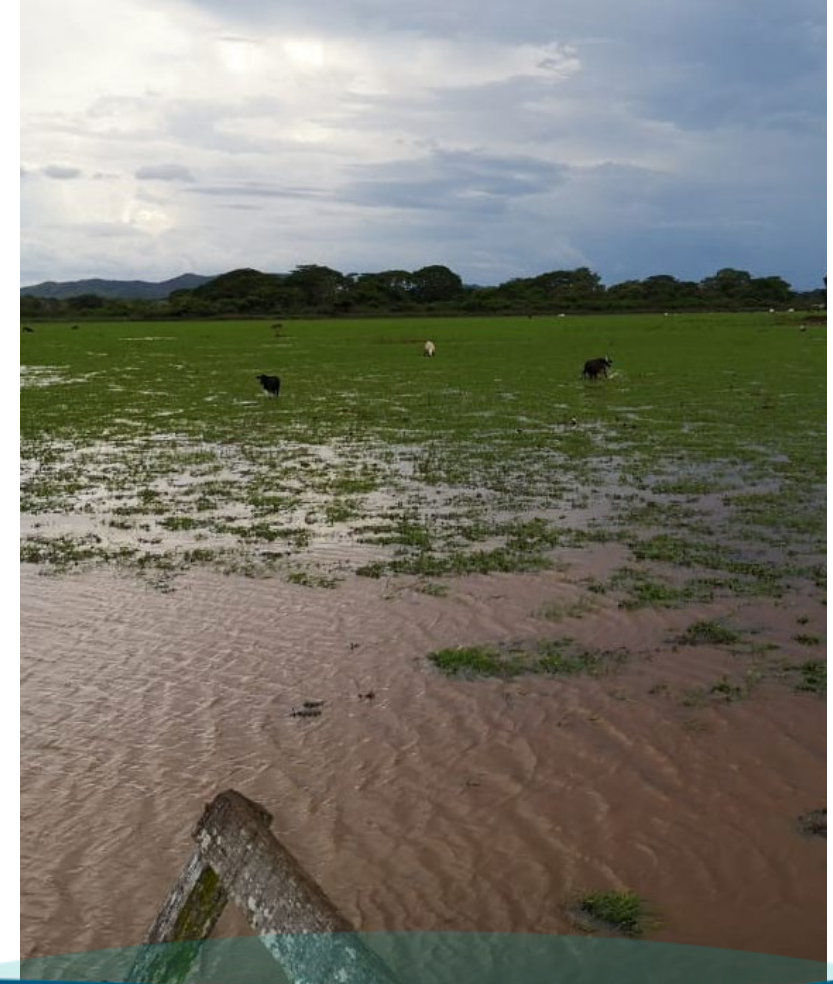


Evapotranspiration Analysis for Coffee Farms in the Upper Santa Maria River

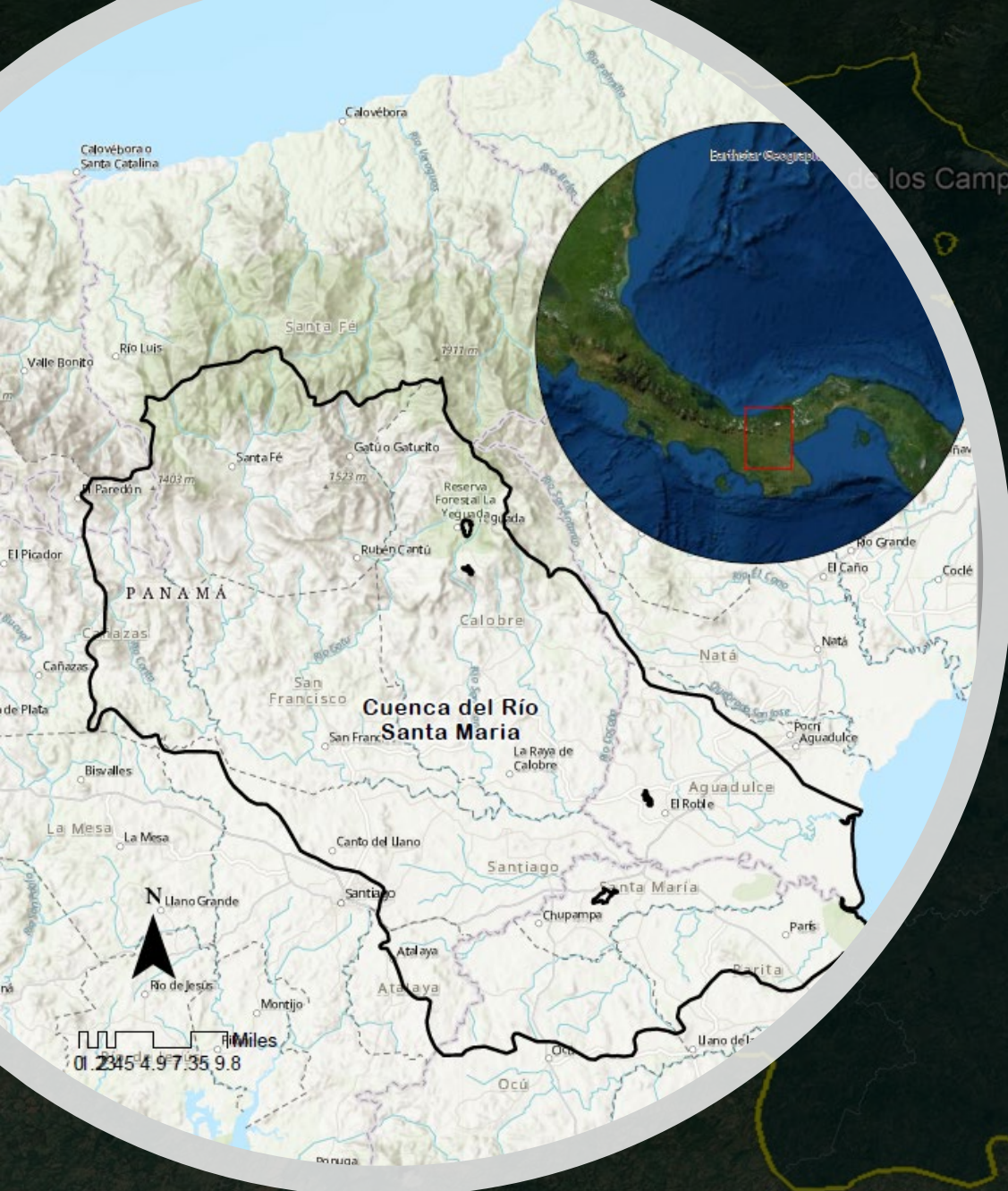
Conrado De Leon

Karoline Castillo

Richard Ortega



Ensuring water security in the mountain forests and wetlands of the Santa María River



Santa Maria River, Republic of Panama Area of study



Estimate

Estimate reference evapotranspiration (ET_o) using field data and modeled satellite imagery in the upper Santa Maria river basin

Compare

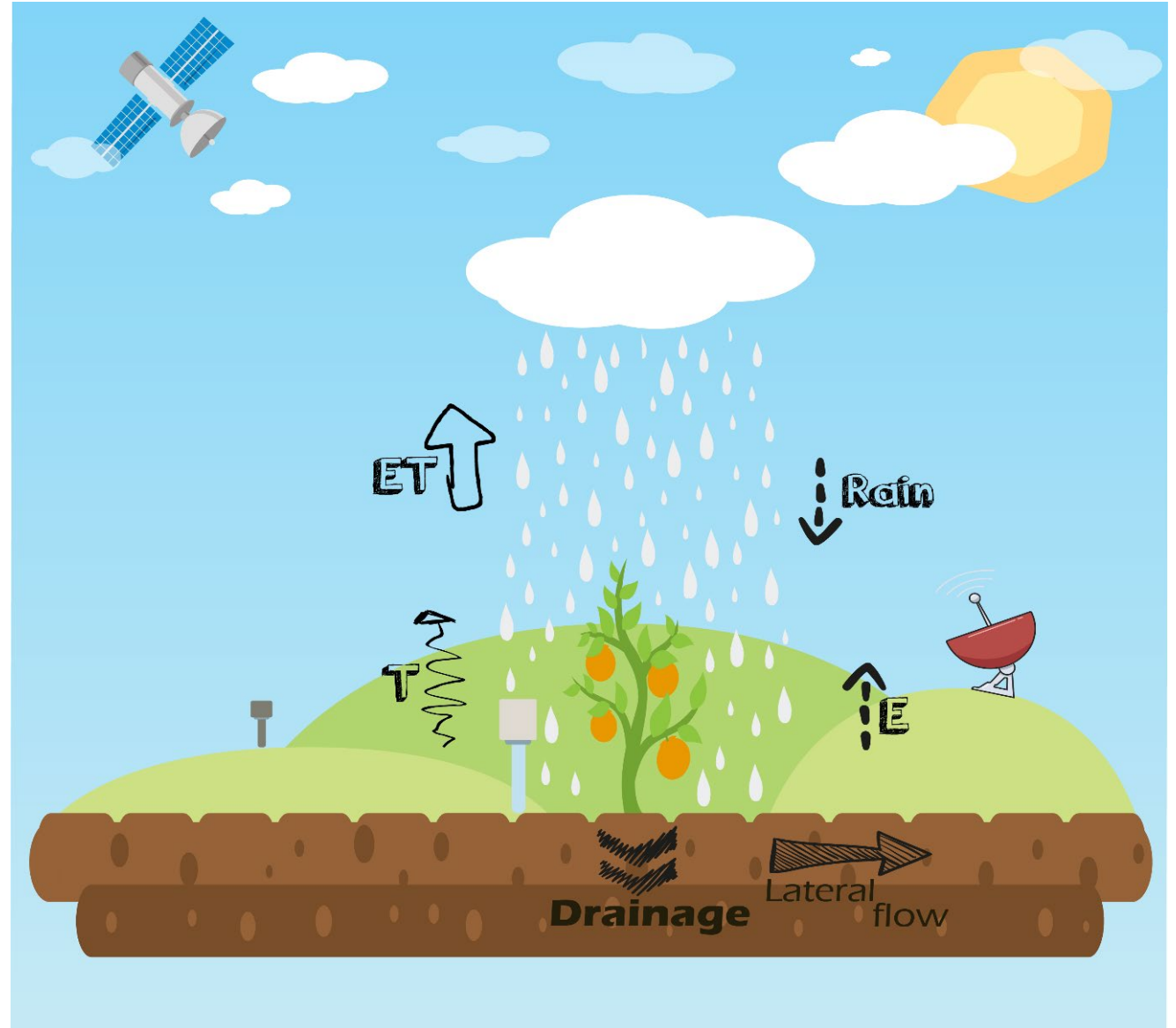
Compare reference evapotranspiration (ET_o) using gauged data and modeled satellite imagery

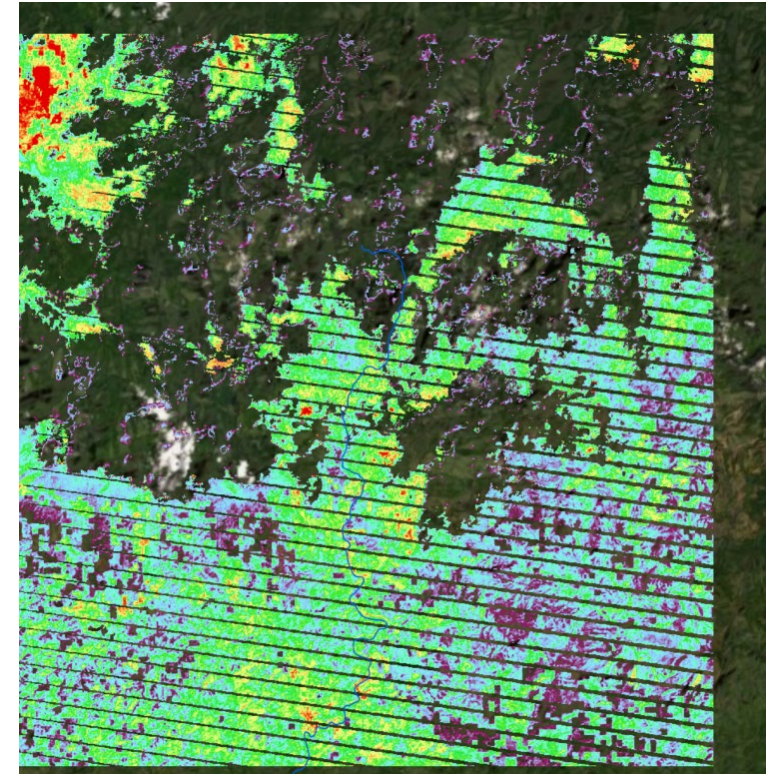
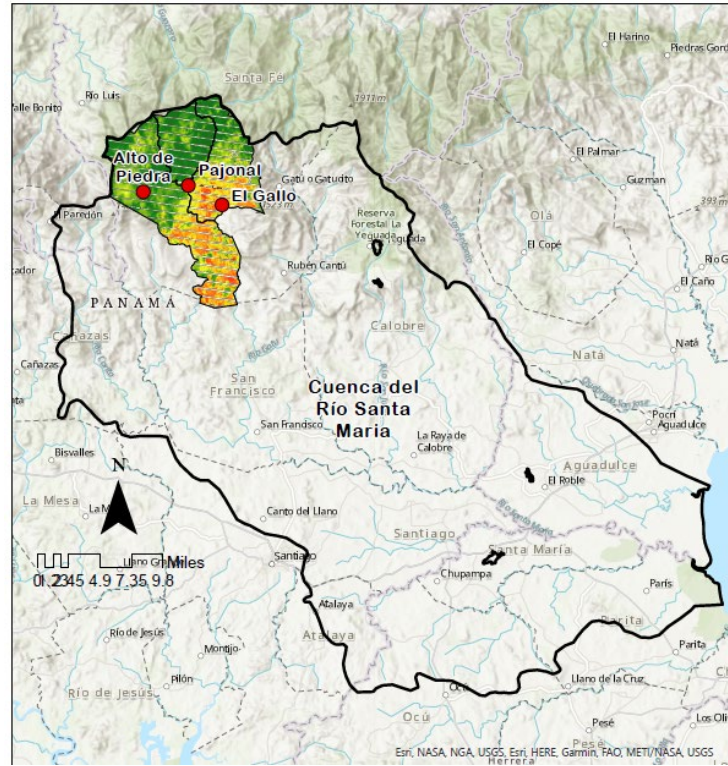
Estimate

Estimate crop evapotranspiration (ET_c) and water requirements in three different coffee farms.

Research objectives

Analyzing
water
requirements





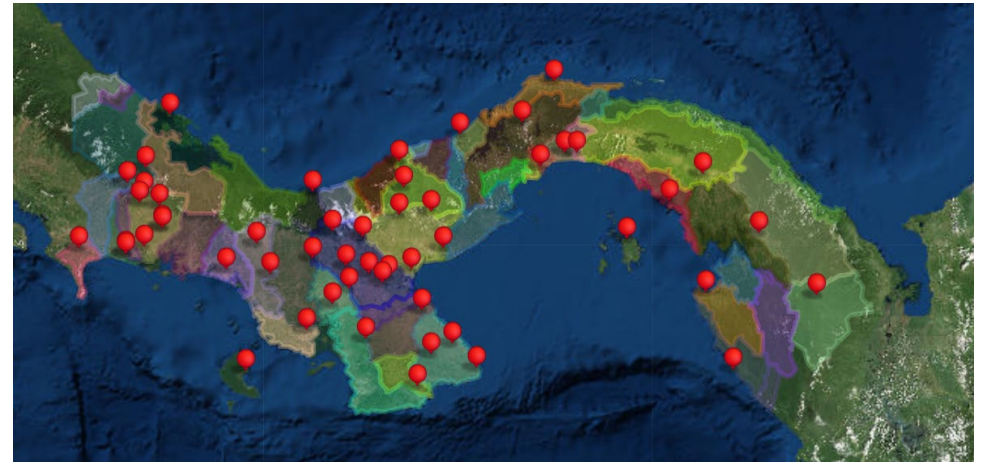
Upper Basin

3 Coffee farms

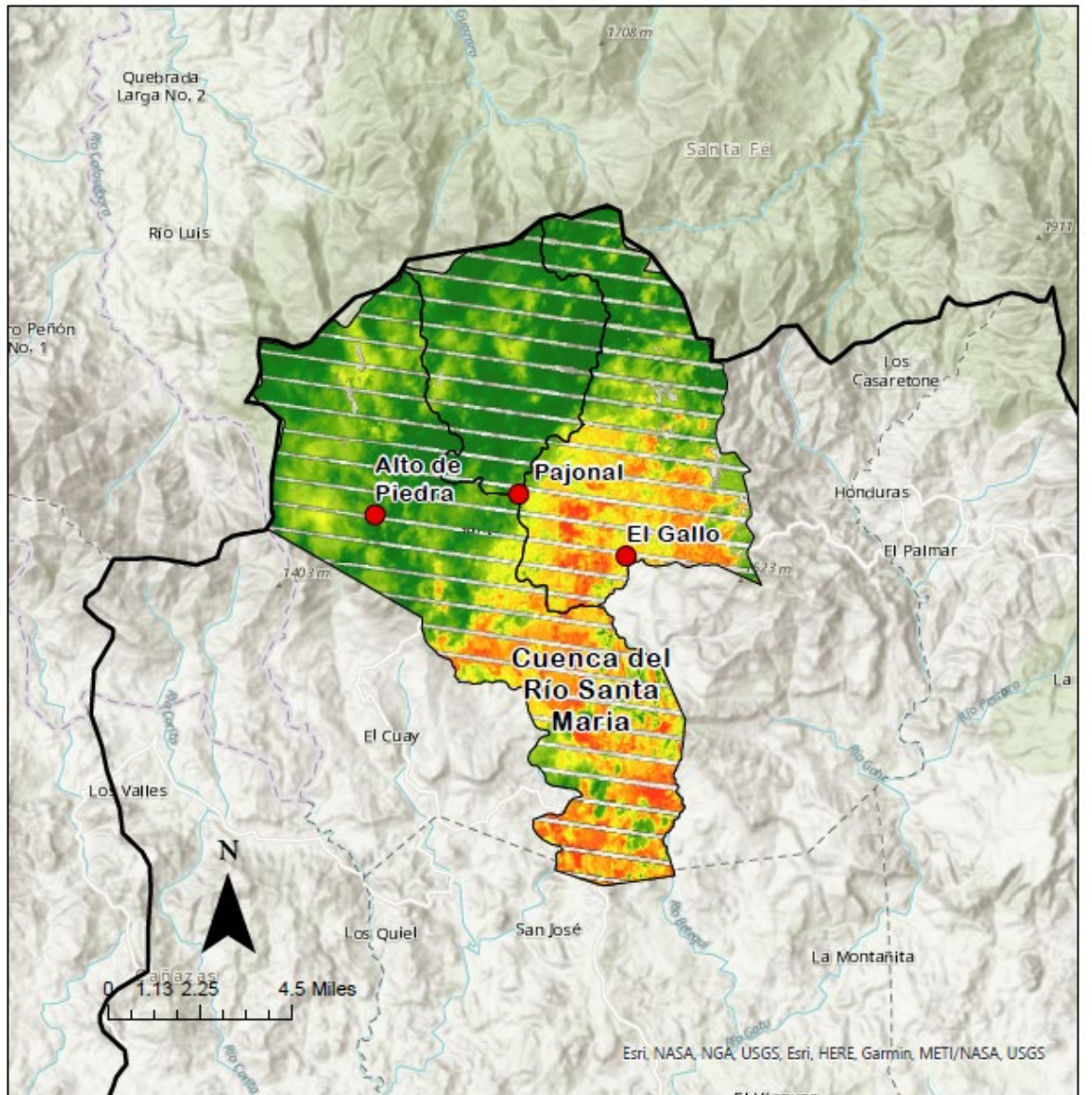
Estimating ET

- ETo (Penman Monteith, FAO)
 - ETESA's network
 - Project's Weather station
 - Earth Engine Evapotranspiration Flux (EEFlux)

$$ET_o = \frac{0.408 \Delta (R_n - G) + \gamma \frac{900}{T + 273} u_2 (e_s - e_a)}{\Delta + \gamma (1 + 0.34 u_2)}$$

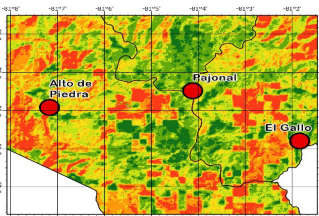


ETo maps

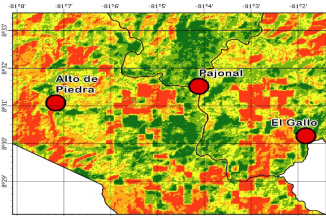


Análisis comparativo de la Evapotranspiración para el cálculo de la demanda hídrica de café en la parte alta de la cuenca del río Santa María

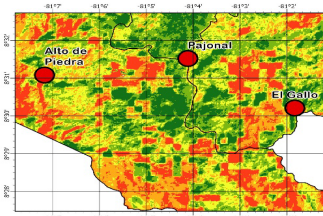
06 de diciembre



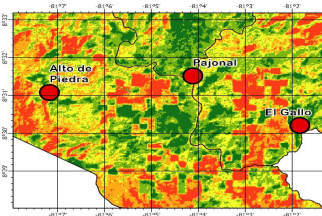
14 de diciembre



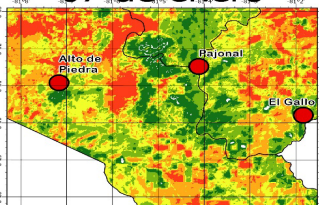
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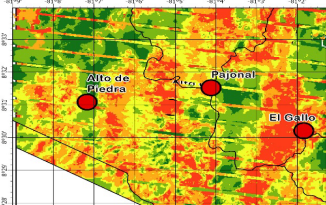
30 de diciembre



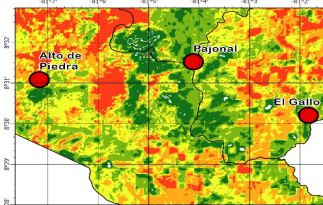
07 de enero



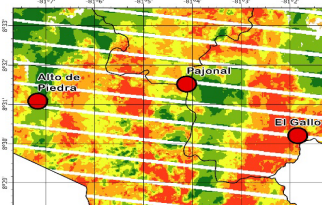
15 de enero



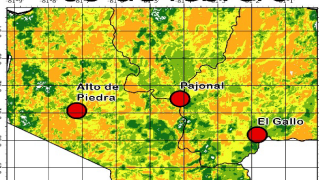
23 de enero



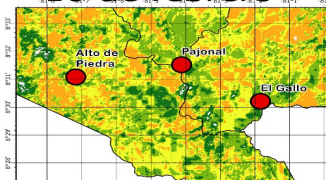
31 de enero



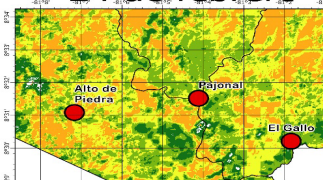
08 de febrero



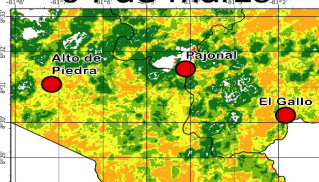
16 de febrero



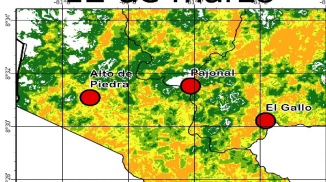
24 de febrero



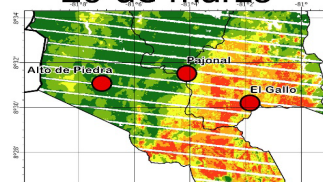
04 de marzo



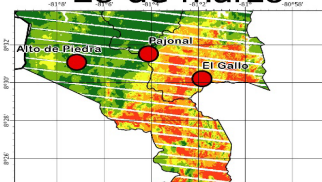
12 de marzo



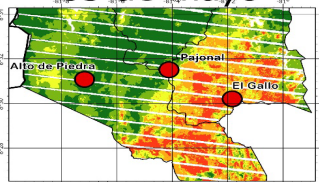
20 de marzo



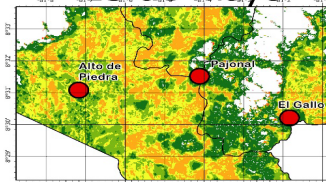
28 de marzo



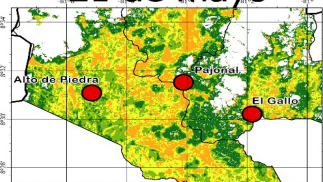
05 de mayo



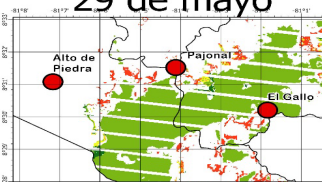
13 de mayo



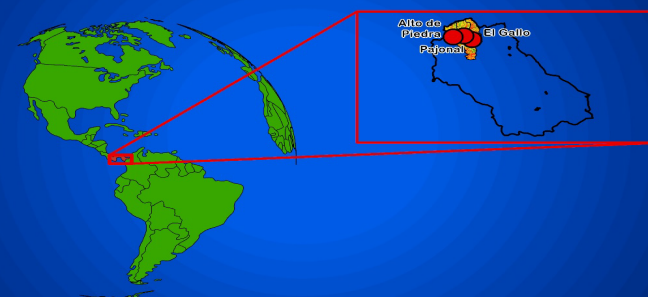
21 de mayo



29 de mayo



Ubicación en el mapa



Leyenda

- Santa Fé (Alto de Piedra)
- El Pantano (Pajonal)
- El Alto (El Gallo)
- ⊕ Corregimientos
- ⊖ Límite de la Cuenca del Río Santa María
- 0.03 - 1.50
- 1.51 - 2.08
- 2.09 - 2.55
- 2.56 - 3.00
- 3.01 - 3.48
- 3.49 - 6.74

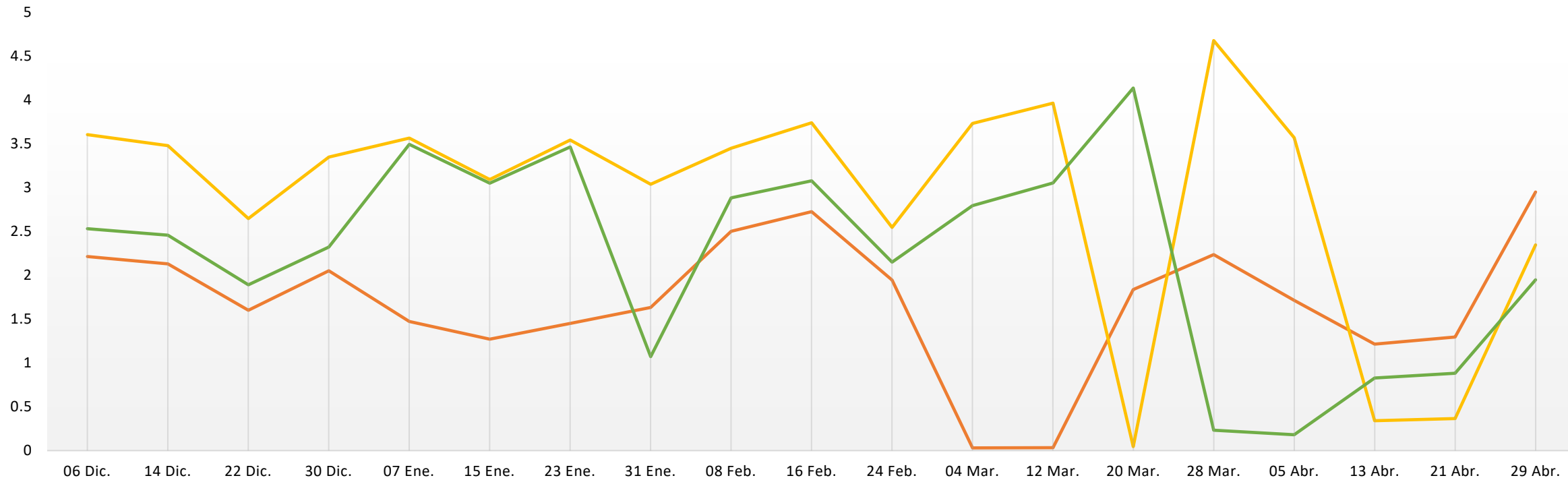
Universidad de Panamá
Facultad de Ciencias Agropecuarias
Carrera de Ingeniería en Manejo de
Cuencas y Ambiente



Evapotranspiración de referencia (ET_o)
de Diciembre 2020 - Abril 2021

Elaborado por: Karoline C. Castillo

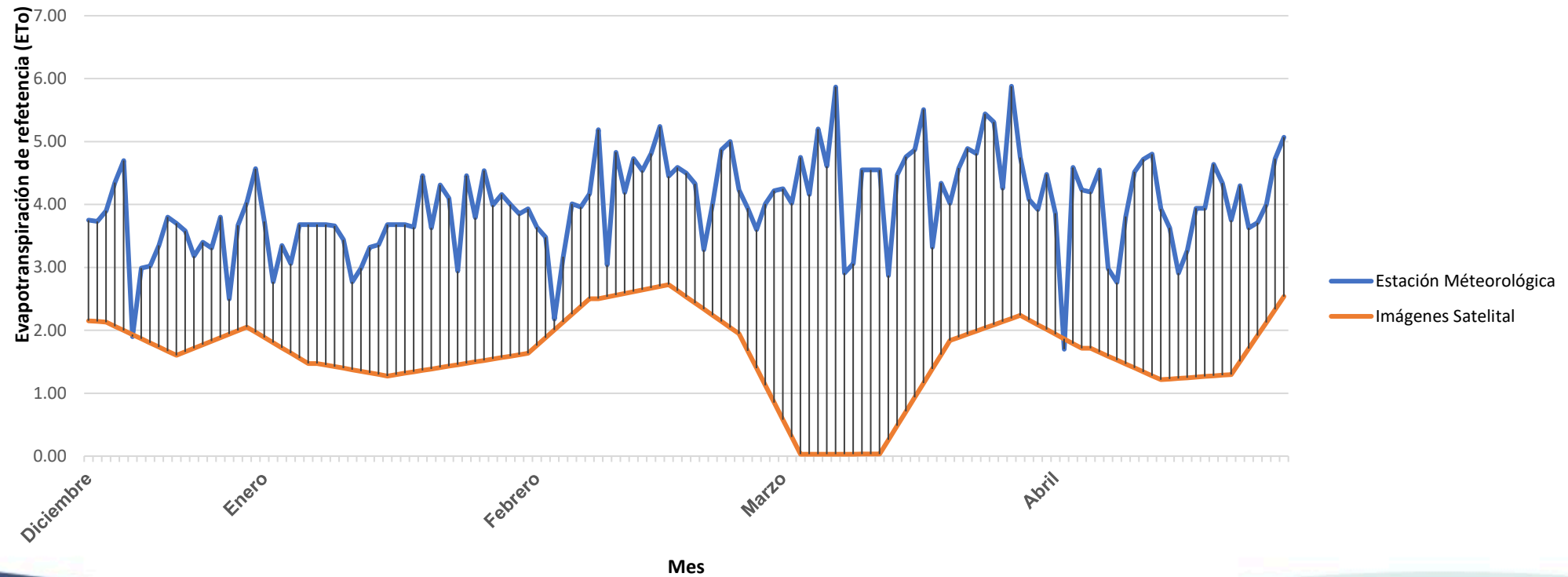
Reference evapotranspiration (mm/day)



— El Pantano (Pajonal) — El Alto (El Gallo) — Santa Fe (Alto de Piedra)

Measured VS Modeled ETo

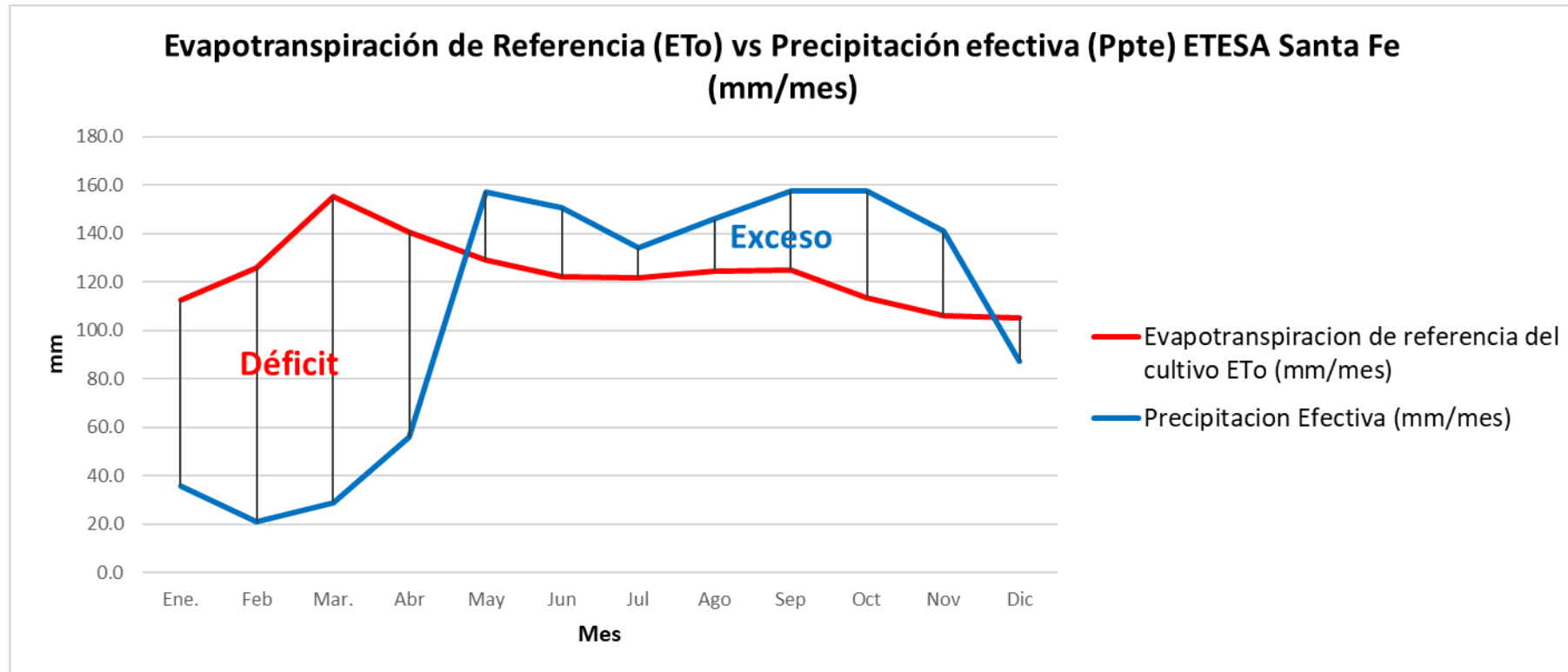
Comparación de data satelital con estaciones meteorológicas en la finca ubicada en el Pantano



$R^2 = 0.38$

Credits: Karoline Castillo

Reference Eto vs effective rainfall (mm/month)



Eto and effective precipitation using weather data from Santa Fe station

Summary

- Modeled ETo from satellite imagery show a difference between the three analyzed coffee farms according to different micro-climate.
- Modeled ETo from satellite imagery and measured showed a low R^2 value (0.38)
- ETo estimations from measured historical data suggest irrigation needs from January to April for the farms in El Gallo and Pajonal, but no irrigation required in Alto de Piedra



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