

Supplementary information

Evaluation of the most scalable, accurate and cost trade-offs machine learning framework to estimate the Mediterranean wood-pasture yield

Precision Agriculture

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A demo of the best machine learning model could be viewed here <https://agronomofiorentini.shinyapps.io/ECPA2025/>

S1: Machine Learning Models error metrics table related to the train dataset.

Train / Test	Model	RMSE	MAE	R ²
Train	RF	826.78 (± 770.32)	577.63 (± 550.4)	0.94 (± 0.06)
Train	XGB	447.33 (± 829.02)	301.55 (± 560.52)	0.96 (± 0.07)
Train	EL	620.99 (± 722.41)	434.09 (± 492.63)	0.96 (± 0.06)

S2: Dataset error metrics table related to the train dataset.

Dataset	RMSE	MAE	R ²
Thermo-Pluviometric & Sentinel 1 & Sentinel 2 & Soil Pasture Classification	208.51 ($\pm$ 271.41)	144.78 ($\pm$ 188.25)	0.99 ($\pm$ 0.01)
Sentinel 2 & Soil	269.83 ($\pm$ 326.21)	191.67 ($\pm$ 230.03)	0.99 ($\pm$ 0.01)
Thermo-Pluviometric & Sentinel 1 & Sentinel 2 & Soil	270.29 ($\pm$ 258.43)	183.29 ($\pm$ 177.12)	0.99 ($\pm$ 0.01)
Thermo-Pluviometric & Soil & Pasture Classification	282.11 ($\pm$ 330.10)	191.34 ($\pm$ 225.82)	0.99 ($\pm$ 0.01)
Thermo-Pluviometric & Soil	325.26 ($\pm$ 311.47)	221.63 ($\pm$ 216.09)	0.99 ($\pm$ 0.01)
Sentinel 2 & Pasture Classification	328.64 ($\pm$ 355.98)	229.74 ($\pm$ 245.65)	0.99 ($\pm$ 0.01)
Sentinel 1 & Sentinel 2 & Pasture Classification	328.88 ($\pm$ 343.81)	230.09 ($\pm$ 237.84)	0.99 ($\pm$ 0.01)
Thermo-Pluviometric & Sentinel 2 & Pasture Classification	334.95 ($\pm$ 296.24)	223.56 ($\pm$ 195.07)	0.99 ($\pm$ 0.01)
Sentinel 2 & Soil & Pasture Classification	337.39 ($\pm$ 310.71)	238.34 ($\pm$ 223.60)	0.99 ($\pm$ 0.01)
Sentinel 1 & Soil	342.57 ($\pm$ 395.37)	245.82 ($\pm$ 284.12)	0.99 ($\pm$ 0.01)
Sentinel 1 & Sentinel 2	351.44 ($\pm$ 350.72)	245.19 ($\pm$ 243.75)	0.98 ($\pm$ 0.01)
Sentinel 2	356.40 ($\pm$ 347.37)	246.80 ($\pm$ 238.88)	0.98 ($\pm$ 0.02)
Sentinel 1 & Soil & Pasture Classification	360.07 ($\pm$ 375.18)	256.71 ($\pm$ 269.59)	0.99 ($\pm$ 0.01)
Thermo-Pluviometric & Sentinel 2	426.22 ($\pm$ 299.69)	283.90 ($\pm$ 195.18)	0.98 ($\pm$ 0.01)
Soil & Pasture Classification	524.18 ($\pm$ 443.85)	353.26 ($\pm$ 312.84)	0.98 ($\pm$ 0.02)
Soil	594.90 ($\pm$ 512.24)	398.91 ($\pm$ 350.62)	0.97 ($\pm$ 0.02)
Thermo-Pluviometric & Sentinel 1 & Pasture Classification	797.35 ($\pm$ 506.55)	558.15 ($\pm$ 356.06)	0.94 ($\pm$ 0.02)
Sentinel 1 & Pasture Classification	831.94 ($\pm$ 680.12)	596.35 ($\pm$ 489.35)	0.95 ($\pm$ 0.03)
Sentinel 1	1099.81 ($\pm$ 922.85)	784.33 ($\pm$ 664.75)	0.92 ($\pm$ 0.05)
Thermo-Pluviometric & Sentinel 1	1163.07 ($\pm$ 912.87)	802.05 ($\pm$ 622.31)	0.91 ($\pm$ 0.05)
Thermo-Pluviometric & Pasture Classification	1621.71 ($\pm$ 1375.25)	1099.65 ($\pm$ 924.63)	0.83 ($\pm$ 0.11)
Thermo-Pluviometric	1658.01 ($\pm$ 1400.97)	1135.68 ($\pm$ 956.35)	0.82 ($\pm$ 0.11)
Pasture Classification	1715.69 ($\pm$ 1381.95)	1207.25 ($\pm$ 967.46)	0.82 ($\pm$ 0.10)