

Regional artificial intelligence platform to estimate and forecast rainfed yield potential at field scale

ARGENTINA, COLOMBIA, ECUADOR, ESTADOS UNIDOS, HONDURAS, NICARAGUA, PANAMÁ, PARAGUAY, PERÚ, URUGUAY, VENEZUELA



Webstory



Technological solution

Measuring yield potential in the field across thousands of plots is not feasible, and the two routes to estimating it leave a gap: studies built on a few sites with quality data are robust but lack granularity, and those built on global gridded data cover the whole territory with biases that limit their local usefulness. Even with a good estimate, moreover, the information rarely reaches the user in a form that supports a decision during the season. Crop simulation at reference sites supplies the biophysical rigor. Machine learning supplies high-resolution extrapolation and, through the area of applicability, a measure of where the prediction can be trusted. The national gridded databases reduce the bias of global sources. And the platform, co-designed with users from the three countries, turns the result into a field-level query, a pre-planting comparison, and a forecast that updates during the season.



Technological description

The technology is a modular, open-source, freely accessible regional digital platform that delivers estimates and forecasts of rainfed yield potential (Yw) for maize, wheat, and soybean at field scale in Argentina, Colombia, and Uruguay. It integrates three pieces. The first is a set of locally calibrated and validated crop simulation models that compute Yw and its year-to-year variability at reference sites from daily weather series longer than fifteen years, soil profiles, and management practices. The second is a set of national gridded databases of climate and soil variables, at a resolution finer than 10 kilometers for climate and 250 meters for soil, built from public information. The third is a set of machine learning models that extend the site estimates across the entire cropped area and quantify their uncertainty. The interface allows users to explore maps and time series, query at field scale, and download data and metadata in open formats.



Impacts and results

The integrated solution is expected to advance from technology readiness level (TRL) 4 to 7, with modules moving at different rates: spatial scaling by machine learning from 4 to 8, and in-season forecasting, the most novel one, from 2 to 7. The platform will count as operational once its five critical functionalities are in place, seven crop-and-country modules are integrated, availability reaches 95% or better during the pilot seasons, and usability (SUS) reaches 70 or above, after two versions are tested with users. Expected outputs include annual Yw maps for the seven combinations, with uncertainty mapped across 100% of the target area and at least 95% within the validated area of applicability; six open-access databases with metadata; six validation pilots; at least 5,000 unique visitors and 1,000 downloads; and twenty documented management decisions. In the pilot fields, nitrogen use efficiency and emissions per tonne will be estimated with and without use of the platform.



150

Expected number of scientific-technical personnel trained



+ 3

Expected gain in TRL levels



6

Expected number of sites and/or pilots



1

AI-based predictive platform developed and validated



6

Open access integrated databases published



5000

Expected beneficiaries

PARTICIPATING ORGANIZATIONS



MAIN DONORS

