Popular Science Abstract

Thesis: Soil moisture modeling for agricultural needs in Brazil, France, and the U.S.A.

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In the current world scenario of increasing population, eradicating hunger and promoting stable food availability is of chief concern to governments, producers, and societies. One of the critical variables in crop productivity is the available water in the soil for plants to uptake. The solution proposed in this research project enables this soil moisture forecast when inputting rain and temperature forecasts, helping farmers to maximize their productivity, for example, when they want to calculate how much irrigation will be necessary for a plantation field.

Government agencies have been the center of the monitoring and forecast of weather worldwide, but when it comes to soil moisture, the best case up to now is the American agency NOAA reporting monthly past records to the public. It is reassuring to producers to know that the government is on the watch for extreme droughts, but it does not enable them to look ahead and better plan for normal weather variations.

In this project, the goal was to mimic these reported soil moisture values. By inputting the respective daily rain and temperatures into our model, we were able to yield daily results that at the end of each month would match NOAA's values with promising success. This approach was tested in three agricultural powerhouses worldwide: Brazil, France, and the United States, global producers of soy, corn, and wheat.

After producing accurate simulations of past soil moistures, our model can now be input with daily weather forecasts, enabling plans for irrigation in real time, as precise and fast as the weather can be forecasted. The model deployed in this project is the same as used by Thomson Reuters to predict reservoir levels and therefore energy prices on "energy stockmarkets" worldwide, for which they have been a reference for many years. Considering this new demand identified amongst their clients, leading to the development of this thesis in partnership with Lund University, we can expect to see this new application out in the market in a very near future!