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Expediting High-resolution, Geo-Spatial Crop Simulation Modelling using HOLOS platform

A Use Case by Tamil Nadu Agricultural University (TNAU)

Process-based Cropping System Models (CSMs) have become an essential tool for agricultural monitoring, seasonal crop forecasting, climate change impact assessment and adaptation planning. They are being increasingly used to simulate crop yields at the regional, national, sub-national and global scales. The effective use of available high resolution spatial and temporal data can increase the applicability of crop models and improve prediction accuracy of the simulations while implementing them operationally at a regional scale.

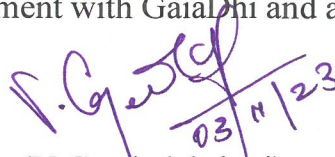
CSMs are point based, and extending them to be geo-spatial (gridded) has been a complex, manual, and diligent effort. It requires significant dedicated effort and time to prepare the input files (weather, identifying the closest soil ID, etc) manually for the model to perform simulations. Incorporation of high resolution data is often limited due to the intricate processes involved in creating the input files in the model using the available spatial information. As an example, weather data usually needs to go through a bias process for localization. This step can be automated but the entire pipeline is still manual.

GaiaDhi's geo-spatial platform "Holos" efficiently integrates soil and weather input data on demand, enabling execution of multiple CSM simulations at any spatio-temporal resolution rapidly. It ingests input data from various sources, formats, resolutions automatically reducing time spent by researchers on ingestion pipeline. On the output side, Holos generates a succinct summary spreadsheet that is used for analysis at large area levels rather than parsing and analysing complex CSM outputs.

TNAU has used Holos to simulate the impact of climate change on cotton yield over all of Tamil Nadu, covering 24 districts, and 10M hectares. Approximately 190,000 simulations were performed, covering 90 years (30 years of past as baseline, and 60 years of future). Using Holos, TNAU were able to complete those simulations in 3 days resulting in a 8x to 15x speedup. On top of the actual simulation time, time taken to parse through the various output files was reduced to parsing the single spreadsheet that Holos generates.

We, at TNAU, are very happy with our collaborative engagement with GaiaDhi and are reaping the benefits of their platform.

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(V.Geethalakshmi)