Business Line 20-02-19, p-14

Researchers integrate crop simulation model on cloud

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Thiruvananthapuram, February 19

The Consortium of Researchers for Disruptive Technologies in Agriculture, involving researchers from India and abroad, has successfully integrated a crop simulation model on a cloud platform.

Crop simulation models are analytical frameworks that describe crop growth and development as functions of eco-physiological processes, a researcher involved in the project told *BusinessLine*.

These models are primarily used as decision-making tools for crop management. Sitting on the cloud, they can address challenges of spatial scalability and boost their operational adoption like never before.

Disruptive technologies of data analytics, artificial intelligence and cloud computing converge here to overcome computation limitations and generate advisories scaled down to the plot level.

The consortium has put the 'Monica' (Model for Nitrogen and Carbon in Agro-Ecosystems) on the cloud, said R Jaishanker, Professor, Ecological Informatics, Indian Institute of Information Technology and Management-Kerala. The project was conceived in the context of growing unpredictability in weather, the biggest contemporary challenge with a crucial bearing on crop production. Reliance on ICT-enabled solutions will help farmers overcome the challenges caused by uncertain weather.

Feedback relations

'Monica' simulates the most important processes in soil and plant life and their feedback relations on a daily timescale.

Users may log in and upload various input parameters to simulate crop growth.

Based on the recommendations provided by the model, farmers will now be able to take remedial actions, if required, even at the plot level, Jaishanker said. The main factors deciding crop growth include genetic factors, soil quality, availability of moisture, diseases, and most of all, weather. Simulation models assess all these factors individually and aggregate them.

These models are reasonably accurate in anticipating crop yield at the plot level, depending on the quality of input data from individual farmers. "If the model can capture the local weather well, more than 60 per cent of crop yield variability can be accounted for," observes Jaishanker. So the model has to be validated at the local level.

Such models need a regional crop coefficient that are generally derived for a region. This part can be addressed by agricultural universities/research centres. These may be leveraged effectively by the government to provide farm level advisories.

Model accuracy

"But issues crop up when you scale up this model from a plot to a village, block or district level. This is because the variability of the main deciding factors can change drastically." When variability is high, model accuracy reduces. Satellite data can be of help here, but it cannot be scaled down to the plot level, especially in States like Kerala, which have fragmented crop lands. It is here that parallel evolution in advance of computational sciences technology like ecological computing, and data analysis can be leveraged to good effect.

The only hitch is that a farmer may not be equipped to directly access the system. Here, the Kerala Agricultural University can run the model with validated data with respect to crops.

Consortium members

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The Consortium of Researchers in Disruptive Technologies was formed in January 2018.

Apart from R Jaishanker, other India members are AS Nain, GB Pant University of Agriculture and Technology; RR Nidamanuri, Indian Institute of Space Science and Technology (IIST); and Subin John Mathew and SC Rajan, researchers, Indian Institute of Information Technology and Management-Kerala (IIITM-K).

International members include Claas Nendal and Kurt Christian Kersebaum (Leibniz Centre for Agricultural Landscape Research, Germany); A Srivastava (University of Bonn, Germany); FJ Behr (UAS, Stuttgart, Germany); and Ajit Govind (International Centre for Agricultural Research in the Dry Areas, Egypt).

VK Dadhwal, Director, IIST, is the mentor.