Plan Overview

A Data Management Plan created using DMPonline

Title: Stress Evolution Simulation and Space-Air-Ground Digital Twin Precision Management for Maize under Combined Stress in High-Temperature and Arid Regions

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Project abstract:

Compound high-temperature and drought stress has emerged as a critical bottleneck constraining high and stable maize yields in both China and Brazil. However, existing stress prediction approaches are largely confined to isolated analyses of single-scale features and static discrimination of stress states at single time points, making it difficult to achieve prospective extrapolation of stress dynamics and regionalized precision management. To address the challenges of unclear spectral feature evolution mechanisms under compound stress and undefined cross-scale dynamic extrapolation mechanisms, the following research will be conducted: A causal chain of “environmental driving–physiological mediation–spectral response” will be constructed to quantify the marginal contributions of stress factors to physiological processes and spectral responses, thereby elucidating the spectral feature evolution mechanisms dominated by compound stress. The mechanisms will be encoded as structural constraints embedded in the underlying network architecture, coupled with meteorological forecast data to drive predictive model extrapolation, constructing compound stress state diagnostic and trend extrapolation models. By integrating maize growth models with stress response mechanisms, a generative intelligent management twin extrapolation model will be developed, enabling temporally sequenced and variable decision-making for stress mitigation measures. Phenotyping equipment and a digital twin platform will be developed to establish an integrated precision management technology system encompassing “monitoring–diagnosis–decision-making.” The outcomes will advance the understanding of compound stress evolution mechanisms in maize across typical production regions in China and Brazil, establish an integrated “Space-Air-Ground” digital twin precision management technology system, and provide critical theoretical and technical support for safeguarding global food security.

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Data Collection

What data will you collect or create?

Datasets of stress conditions in maize in semi-arid conditions

How will the data be collected or created?

through computer vision sensing

Documentation and Metadata

What documentation and metadata will accompany the data?

Datasets available in open access institutional repositories - REDU-UNICAMP: https://redu.unicamp.br/

Ethics and Legal Compliance

How will you manage any ethical issues?

No problem with ethics because are photoes of plants.

How will you manage copyright and Intellectual Property Rights (IPR) issues?

through support from Unicamp's innovation office: INOVA-UNICAMP (https://www.inova.unicamp.br/)

Storage and Backup

How will the data be stored and backed up during the research?

They will be stored in REDU-UNICAMP.

How will you manage access and security?

REDU-UNICAMP team

Selection and Preservation

Which data are of long-term value and should be retained, shared, and/or preserved?

REDU-UNICAMP team.

What is the long-term preservation plan for the dataset?

perpetual

Data Sharing

How will you share the data?

open-access

Are any restrictions on data sharing required?

It depends on which data will be considered sensitive intellectual property of Unicamp.

Responsibilities and Resources

Who will be responsible for data management?

Daniel Albiero - Professor Unicamp and
INOVA-UNICAMP and
REDU-UNICAMP team

What resources will you require to deliver your plan?

Call FAPESP/NSFC