Contribution ID: **32**   Type: **not specified**

Simulating Impact of Climate Variables and Soil Health Dynamics for Enhanced Production of Bell Pepper Species in Nigeria's Coastal Niger Delta Region

Tuesday, 22 July 2025 14:50 (15 minutes)

The study conducted in the Niger Delta region explored the potential of simulation-based modeling to understand the interactive influence of climate variables and soil health dynamics on bell pepper (Capsicum species) growth in coastal Nigeria. By integrating agrometeorological datasets and soil diagnostic indicators, the study simulated key production scenarios under projected climatic shifts. The results showed that advanced environmental modeling platforms can examine temperature thresholds, soil organic matter variation, and moisture availability as critical drivers of phenological behavior in bell pepper cultivars. The study emphasized the importance of climate-smart agronomic strategies such as precision irrigation, organic soil amendments, and controlled-environment agriculture in stabilizing yield outcomes amidst environmental stressors. The simulated framework incorporated bio-indicator response profiling to detect early signs of abiotic stress, providing a basis for tailoring site-specific interventions. The findings promise to inform adaptive agripreneurial practices, contribute to climate-resilient food systems, and support evidence-driven policy decisions. The study demonstrated the effectiveness of simulation-based modeling in enhancing productivity and sustainability in vulnerable agroecosystems. By bridging environmental diagnostics with smart cultivation, the study provides a dynamic blueprint for improving agricultural practices. The positive outcomes can inform policy decisions and support the development of climate-resilient agricultural systems. The study's findings have significant implications for agricultural productivity and sustainability in the Niger Delta region. Adopting climate-smart agronomic strategies and using simulation-based modeling can help farmers and policymakers improve crop yields, reduce the impact of climate change, and promote sustainable agricultural practices.

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Session Classification: Contributed Talk

Track Classification: Computing: Artificial Intelligence and Machine Learning