

Building Resilient Agroecosystems in a Changing Climate: Linking Soil, Water, Crop Responses, and Ecosystem Function

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Crop and forage production in the semi-arid agroecosystems of the southern Great Plains is increasingly threatened by declining water availability, recurring droughts, and projected warmer and drier conditions. Building resilient agroecosystems therefore requires an integrated understanding of how soil properties, water dynamics, crop responses, and ecosystem processes interact across spatial and temporal scales. In this seminar, I will highlight our team's research examining these interactions and evaluating management strategies to improve the resilience and sustainability of agricultural systems.

Our work combines field observations, process-based modeling, and emerging data-driven approaches to investigate how changes in climate, soil properties, land use, and management influence water availability, crop productivity, soil health, water quality, and ecosystem services. I will discuss our research evaluating regenerative practices—including no-tillage, cover crops, crop rotation, pasture cropping, and adaptive grazing—and their effects on soil properties, hydrologic processes, crop production, and ecosystem services. We have also examined the potential impacts of climate change on crop phenology, yield, and water requirements and evaluated adaptation strategies to sustain crop production under increasing environmental stress. In addition, our research has explored growth-stage-based irrigation strategies to improve crop water productivity and developed decision-support tools to support more effective irrigation management.

I will conclude by discussing opportunities to integrate ecological knowledge, advanced modeling, and emerging technologies to develop management strategies that enhance agroecosystem resilience while conserving water resources, improving soil health, sustaining crop and forage production, and maintaining ecosystem function in a changing climate.

Brief Bio:

Dr. Srinivasulu Ale is a Professor of Agrohydrology at the Texas A&M AgriLife Research Center at Vernon. He is also affiliated with the Department of Biological & Agricultural Engineering at Texas A&M University, College Station. He is an internationally recognized researcher for his outstanding contributions in the areas of agricultural water management, regenerative agriculture, and climate impact assessment. He has published 122 journal articles and delivered more than 200 scientific presentations. He has over 3800 Google Scholar citations with a h-index of 37 and the i10-index of 80.