

TEMPORAL AND SPATIAL VARIABILITY OF NITROGEN USE EFFICIENCY ACROSS LANDSCAPE POSITIONS IN SOUTHERN HIGH PLAINS

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ABSTRACT

Optimizing nitrogen use efficiency (NUE) is crucial for enhancing crop productivity, managing resources effectively, and promoting environmental sustainability. In response to the growing significance of sustainable agriculture, this research rigorously explores the temporal and spatial dynamics of NUE in the unique agroecosystem of the Southern High Plains. With a focus on precision nitrogen management tailored to the region's distinctive conditions, the study aims to provide valuable insights crucial for advancing sustainable agricultural practices. The first objective involves a meticulous analysis of nitrogen data collected during 2023 in a dryland field and an irrigated field in Lynn County, Texas. Employing a randomized complete block design with three nitrogen rates (0, 30, and 60 lb/ac in dryland and 30, 60, and 90 lb/ac in irrigated), this analysis seeks to discern temporal patterns in NUE. By shedding light on seasonal variations and identifying factors contributing to efficiency fluctuations, this objective lays the groundwork for a nuanced understanding of the temporal dynamics of nitrogen utilization. The second objective focuses on the spatial evaluation of NUE across various landscape positions within dryland and irrigated fields. Implementing a detailed assessment, the study aims to pinpoint areas characterized by high or low NUE, unraveling landscape-specific factors influencing nitrogen utilization. Through this spatial perspective, the research seeks to enhance precision nitrogen management strategies, enabling more targeted and effective applications. This research not only advances comprehension of nitrogen dynamics in both dryland and irrigated environments but also holds significant implications for sustainable agriculture practices. Anticipated outcomes are poised to guide precision nitrogen management strategies, promoting resource-efficient and environmentally conscious approaches. By contributing to the development of sustainable agricultural practices tailored to the unique conditions of the Southern High Plains, the study strives to bridge the gap between heightened productivity and ecological responsibility in this vital agricultural region.