Simulation Modeling of Arid Grassland Dynamics in Jordan: A 40-Year Analysis of Leaf Area Index Trends

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This study employs the PHYGROW simulation model to assess the 40-year dynamics of arid grassland in Jordan, focusing on the Leaf Area Index (LAI) as a pivotal indicator of vegetation health. The observed results reveal a notable decline in LAI over the study period, with the highest recorded value in 2005 (2.27) and a subsequent reduction to 1.68 in 2021. Rigorous statistical analyses, including regression analysis, confirm the significance of this downward trend, prompting further investigation into potential contributing factors such as changes in climate, land use, and soil conditions.

Interannual variability analysis identifies specific years marked by noteworthy LAI fluctuations, providing insights into the dynamic responses of the arid grassland ecosystem. Comparison with concurrent climate data underscores the intricate relationship between LAI trends and environmental variables. The study emphasizes the importance of continuous monitoring and understanding the underlying drivers of vegetation dynamics in arid regions.

The observed decrease in LAI holds implications for the overall health and resilience of the ecosystem, highlighting the need for informed decision-making in sustainable land management practices. These findings contribute significantly to the broader understanding of arid land dynamics, guiding future research and collaborative efforts with experts in related fields. Such collaborations are essential for enhancing the robustness and applicability of the results, ultimately informing conservation and resource management strategies tailored to the unique challenges of arid environments.