

MODELING FOR OPTIMIZING NITROGEN FERTILIZER RATES FOR MAIZE IN DRY ZONE OF SRI LANKA UNDER CURRENT AND FUTURE CLIMATE SCENARIOS

H. Uduwawala¹, S.H.N.P. De Silva² and W.C.P. Egodawatta¹

¹*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Anuradhapura.*

²*Department of Crop Sciences, Faculty of Agriculture, University of Peradeniya, Peradeniya.*

Maize (*Zea mays* L.) is the most vital upland cereal and a cornerstone of food security in Sri Lanka. Despite its extent of cultivation within the dry zone, a region highly vulnerable to climate change vulnerabilities, the current nitrogen (N) fertilizer recommendations often lack climate-specific optimization, leading to inefficiencies in yield and environmental impacts. The objectives of this study were to model and optimize N fertilizer rates for maize, under current and projected climate conditions for 2050 and 2100 by testing different nitrogen management scenarios by utilizing the agricultural production systems simulator (APSIM). The analysis incorporated Department of Agriculture recommendations, present-day data, and climate projections, for examining yield, nitrogen leaching, and fertilizer rates across the *Maha* and *Yala* seasons under rain-fed conditions. Findings indicated that under current conditions, applying 345 kg ha⁻¹ of N in the *Maha* season yields 2,625.10 kg ha⁻¹ with a median leaching value of 11.3 kg ha⁻¹. In *Yala*, 435 kg ha⁻¹ of N achieves 3,174.46 kg ha⁻¹ yield and 0.4 kg ha⁻¹ leaching. As per anticipated alterations in climate scenarios for 2050, a slightly increased optimal yield is expected with similar N rates. In 2100, particularly in *Yala*, the simulated yield increased with higher N rates (375 kg ha⁻¹ in *Maha* and 465 kg ha⁻¹ in *Yala*), despite increased leaching. The study emphasized the importance of climate-responsive N management to sustain yield optimization and mitigate environmental impacts over time. This research provides data-driven insights for policymakers and extension services, highlighting the value of climate-resilient N management strategies for sustainable maize production. These tailored recommendations would help Sri Lankan farmers to navigate the challenges of climate change, promoting agricultural productivity and environmental sustainability in the dry zone of Sri Lanka.

Keywords: APSIM maize model, Climate change, Climate-specific optimization, Leaching, Nitrogen management