# **Special Issue**

# Nitrogen Cycling and Efficient Utilization Mechanisms in Agricultural Field Ecosystems

# Message from the Guest Editors

Nitrogen (N) underpins crop productivity but is also a primary contributor to agricultural air and water pollution and a major source of nitrous oxide (N2O). Since the mid-20th century, synthetic fertilizers and intensified livestock systems have expanded the global reactive N pool, improving yields while amplifying losses through ammonia volatilization, nitrate leaching, denitrification. and runoff. Decades of research-from whole-farm N balances and 15N tracer studies to process-based modeling-have clarified key pathways; yet, spatial and temporal uncertainties persist, especially under climate variability and changing management methods. This Special Issue seeks integrative science and solutions that (a) advance mechanistic understanding of N cycling from rhizosphere to region, and (b) deliver practical, scalable strategies to boost N efficiency while reducing losses. We welcome the submission of crossdisciplinary work that links soil processes, plant physiology, microbial ecology, agronomy, hydrology, and socio-economic dimensions, with clear implications for farm management and policy. We welcome submissions that are rigorous, transparent, and practically informative.

#### **Guest Editors**

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## Deadline for manuscript submissions

30 June 2026



an Open Access Journal by MDPI

Impact Factor 3.4 CiteScore 6.7



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