Article title	Nitrogen uptake kinetics of key staple cereal crops in different agro-ecological regions of the world
Keywords	Maize, Rice, Wheat, Fertilizer
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Abstract	The study was undertaken to assess the effect of environmental, management, and stress factors on nitrogen uptake patterns through the crops' growth cycle and to associate temporal patterns of N uptake with biomass and grain yields. Existing complete experimental data, provided by several institutional databases and through an extensive literature review, were utilized together with crop simulation models (CSMs) to synthesize yield and N uptake profiles of the key staple cereal crops in selected agro-ecologies. Approximately 465 observations were identified for combined maize grain yield and plant N uptake: 156 for rice and 254 for wheat. The Decision Support System for Agrotechnology Transfer (DSSAT), which comprises CSMs and data that integrate capabilities on soils, daily weather, crops, and management, was used in combination with field information to first validate the CERES-maize, -rice, and -wheat models. The most noteworthy results from synthesis of the data set for the three key cereals were as follows: (a) N uptake continued to increase with time until physiological maturity with adequate N supply; (b) significant effect of soil N status on N uptake kinetics was observed at zero N; (c) N uptake profile was also influenced by the planting date, with the summer planting showing higher uptake than other planting dates; (d) field methods of N application influenced N uptake kinetics: a one-time injected or subsurface-applied urea continued to provide an adequate amount of N throughout the crop growth phase that was comparable or even higher than with broadcasting multiple splits; (e) N uptake was also dependent on crop cultivars, including stages of vegetative and reproductive phases, with shorter vegetative and longer reproductive phases showing continuous N uptake and lesser dependence on N remobilization; and (f) predictions suggested that modest changes in ambient temperature and atmospheric carbon dioxide (CO_2) concentrations would not significantly alter the N uptake kinetics, with the uptake rate expected to increase under future climate change scenarios. The combined data suggest that no one N uptake kinetic pattern fits all crops under all environments and management practices.
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