

What is the Role of Nitrogen (N) in Plants?

Nitrogen is an essential plant nutrient being a component of amino acids, nucleic acids, nucleotides, chlorophyll, enzymes, and hormones. N promotes rapid plant growth and improves grain yield and grain quality through higher tillering, leaf area development, grain formation, grain filling, and protein synthesis. N is highly mobile within the plant and soil.

Why Apply N Fertilizers to Rice?

Nitrogen is the most limiting element in almost all soils. Thus, proper application of N fertilizers is vital to improve crop growth and grain yields, especially in intensive agricultural systems. Insufficient and/or inappropriate fertilizer N management can be detrimental to crops and the environment. Optimal N management strategies aim at matching fertilizer N supply with actual crop demand, thus maximizing crop N uptake and reducing N losses to the environment.

How to Manage N?

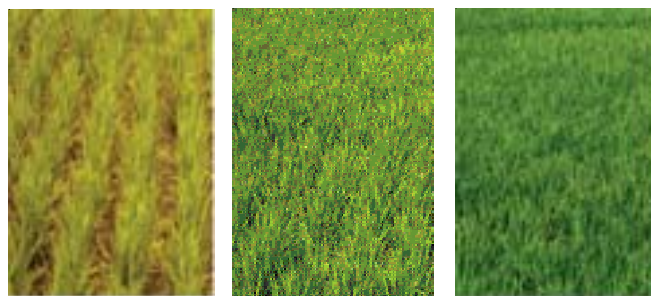
- **N deficiency symptoms.** Stunted plants with small yellowish green leaves and fewer tillers; lower yield due to less panicles per unit area and less grains per panicle.
- **Occurrence of N deficiency.** Almost all soils are deficient in N; coarse textured acid soils with low organic matter content (less than 0.5% organic C); acid sulfate, saline, poorly drained, and P-deficient soils with low N mineralization and biological N fixation capacity; calcareous and alkaline soils with low soil organic matter level and a high potential for ammonia volatilization.
- **How much N to apply?** Inorganic fertilizer is the common source of supplemental N, and it is typically more profitable for farmers than purchased organic N fertilizers. Organic N sources available on-farm such as farmyard manure and compost can be effective and financially attractive in partially meeting the N requirement of rice. Apply 40-50 kg N ha⁻¹ as inorganic fertilizer for every ton of additional grain yield over yield without N. At optimum levels of nutrition, the rice crop (straw plus grain) takes up around 16 kg N per ton of grain yield (10 kg N in grain + 6 kg N in straw).
- **When to Apply N Fertilizers?** Leaf color and crop appearance indicate the plant N status and help determine the need for N fertilizer application. See Fact Sheets on i) Leaf Color Chart (LCC) for crop need-based N management, and ii) Nitrogen split applications for growth stage-based N management using the LCC.

What are the Sources of N?

- Ammonium sulfate (21% N, 24% S)
- Urea (46% N)
- Diammonium phosphate or DAP (18% N; 44-46% P₂O₅).



Applying N fertilizer (Urea) during the growing season. Photos: Dobermann & Fairburn (2000).



Nitrogen deficient rice plants on left compared with plants with sufficient N.

Further information

Fairhurst T, Witt C. editors. 2002. Rice: A practical guide to nutrient management. Singapore and Makati City: Potash & Phosphate Institute, Potash & Phosphate Institute of Canada (PPIC) and International Rice Research Institute (IRRI). p 1-89.

For information on site-specific nutrient management, visit <http://www.knowledgebank.irri.org/ssnm>.

For keys to diagnose problems in the field, visit <http://www.knowledgebank.irri.org/ricedoctor>.

For an overall view of crop management practices, visit <http://www.knowledgebank.irri.org/tropRice>.

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