Rice provides more than 20% of the world population’s dietary energy. In some areas where poverty abounds, rice has been reported to provide more than 70% of the daily calories. The USA is a major exporter of rice, though it only produces about 2% of the world’s production. Rice production in the USA is concentrated in the South, where the climate, soil, and water availability support high-yielding production systems. Much like cotton, corn, and soybean, rice production is intensively managed. In the drill-seeded, delayed-flood production system that is utilized in much of the southern USA, approximately 25% of the variable cost of production is due to N fertilization. Improving N recovery efficiency can pay dividends to producers and is environmentally sustainable. The use of N fertilizers is expected to increase as the world’s population increases. Understanding N dynamics in a variety of soils and conditions is vitally important for maximizing yields and reducing N losses.

In the delayed-flood system, it would be ideal for N to be applied in a time period from planting up to flooding, with N existing in the ammonium form until after permanent flood establishment. However, N is subject to nitrification if a permanent flood is not established within five days, and nitrate is not stable in flooded environments. Therefore, the common practice in the southern USA is to apply an ammoniacal N fertilizer, typically urea, and establish a flood as soon as possible. Depending on field size and irrigation capacity, flood establishment can take 7 to 10 days or more, with nitrification and subsequent denitrification losses.

Researchers at Mississippi State University’s Delta Research and Extension Center recently conducted experiments to quantify nitrification/denitrification losses. Laboratory experiments were conducted to determine the nitrification potential of seven soils with a history of rice production and to evaluate the effectiveness of the nitrification inhibitor dicyandiamide (DCD) at reducing nitrification in clay soils. Field research was performed to evaluate the effectiveness of DCD and a sulfur-polymer coated urea (Agrium XCU) compared with urea alone.