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Fate of fertiliser-N in sugarcane agroecosystems

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Summary In the 1990s, sugarcane fertilization practices shifted from ammonium sulfate to urea, both in La Réunion and globally. At the same time, the cessation of pre-harvest burning and the adoption of mechanization led to the widespread implementation of trash blanketing. More recently, the sharp increase in fertilizer prices following the war in Ukraine has renewed interest in recycling organic residues within a circular economy framework. This presentation examined the implications of these evolving agronomic practices for nitrogen (N) losses and nitrogen use efficiency (NUE), with a particular focus on fertilizer types. A long-term, intensively monitored environmental research observatory was established in La Réunion to assess the impacts of organic fertilizers on crop performance, soil fertility, atmospheric emissions, and water quality. Comprehensive tracking of nitrogen fate revealed that urea application leads to high ammonia volatilization, low NUE, minimal water contamination, and moderate contributions to soil N fertility. Similarly, low NUE was observed for organic fertilizers such as pig slurry and sewage sludge, largely due to high volatilization rates under the region's mulchy, windy, and hot conditions. A complementary study conducted at 10 sites across the island showed that, on average, 37% of applied nitrogen was lost (ranging from 25% to 54%), 38% was recovered in the sugarcane crop (from 25% to 50%), and 25% remained in the soil (from 14% to 40%). In conclusion, reducing nitrogen volatilization is a key challenge for improving NUE in sugarcane systems. Finally, the different agronomic strategies and their limitations were presented.