Volatilisation

What is volatilisation?

Broadcast urea can be degraded quickly in the right conditions. When this happens, significant amounts of nitrogen are lost to the atmosphere as ammonia (NH_3) gas. This process is called volatilisation. It is driven by urease enzymes which are found in soils and plants.

Volatilisation occurs in the first 48 hours after application and conditions during this time are critical to the amount of nitrogen that is lost. Conditions that lead to greater volatilisation include; warm and windy weather, moist and drying soils, high residue levels, high soil pH, no rainfall after application to wash the urea into the soil, low soil exchange capacity, and high application rates.

Losses can be as high as 60% of the applied nitrogen in hot, windy conditions.

Side-dressing maize with urea.

Minimising volatilisation

Application practices can minimise N losses from urea.

- Where possible, broadcast urea should be worked into the soil. If it is being banded on, ensure that the application slot is completely covered and the fertiliser is not exposed to the air.
- If incorporation is not possible, try to apply the urea immediately before rain or apply a light irrigation to wash it in. The water will wash the ammonia released from the urea into the soil. A minimum of 6-8mm of rainfall is required. Less than 6mm of rain will enhance volatilisation.
- Volatilisation will be high if the urea is applied after rain. Moisture increases the rate of ammonia formation and volatilisation.
- Dew enhances volatilisation. It provides enough moisture to start the process, but too little to wash the nitrogen into the soil.
- Applying urea under cool/cold temperatures reduces the rate of breakdown and ammonia volatilisation.
- Applying urea onto surface residues can accentuate volatilisation because of higher urease activity and reduced movement into the soil.

Should I swap to another N formulation?

Urea applications can still be the best value for money, even when conditions are favouring volatilisation. Assume that 30% of the N might be lost.

Then; if the alternative source of nitrogen costs 30% more per kg of available N, than the cost of N supplied by urea, then urea is the most economical option. However, perhaps not the best option for the environment!

For example:

1T of urea @ $794/T supplies 460 Kg of nitrogen. Each Kg of N costs $1.73

1T of CAN @ $742/T supplies 270 kg of nitrogen. Each Kg of N costs $2.75

The nitrogen supplied by the CAN is 64% more expensive, but less likely to be lost.