Nitrogen Rate Management for Mitigation of Nitrous Oxide Emissions from Rainfed and Irrigated Row-crops

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How Does Nitrogen Fertilizer Rate Impact Nitrous Oxide Emissions and Yield in Irrigated and Rainfed Row-Crops?

Nitrous oxide emissions from corn using automated chambers

N\textsubscript{2}O emissions (mg N m\textsuperscript{-2} hr\textsuperscript{-1})

- 0 kg N ha\textsuperscript{-1}
- 246 kg N ha\textsuperscript{-1}

Month 2011

May | June | July | Aug | Sep | Oct | Nov | Dec

- Side-dress N
- Planting Starter N
- Harvest
Nitrous oxide emissions from corn and wheat crops increase in a non-linear manner with increasing N rate.
Nitrous oxide emissions increase dramatically at N rates beyond where crop N requirements are met.
Nitrous oxide emissions can be lowered by decreasing N fertilizer rates without reducing yield.
Nitrous oxide mitigation on cropland can be incentivized using Carbon Markets

- Crop yields do not increase beyond a N rate threshold
- $\text{N}_2\text{O}$ emissions increase non-linearly with increasing N rate
- A decrease in N fertilizer rate decreases $\text{N}_2\text{O}$ emissions

- $\text{N}_2\text{O}$ emissions reductions are converted to carbon dioxide equivalents ($\text{CO}_2\text{e}$)
- Carbon credits are generated (more with larger N rate reduction) and traded

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<tr>
<th>N fertilizer rate (lbs per acre)</th>
<th>Yield (Bushels per acre)</th>
<th>$\text{N}_2\text{O}$ emissions (Pounds N per acre)</th>
<th>Carbon Credit (Tons $\text{CO}_2\text{e}$ per acre)</th>
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N$_2$O mitigation protocols developed by KBS

N$_2$O mitigation project in Michigan

http://www.deltanitrogen.org/

Carbon credit payment to Myron Ortner on his Tuscola farm