Temporary immobilisation promotes high nitrogen use efficiency of irrigated rice

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Background to Riverina rice

- Riverina: 200 - 400 km north of Melbourne
- Fully irrigated, high solar radiation, few pests
- Average yield of medium grain rice 11 t/ha
- Average fertiliser use $\approx 180$ kg N ha$^{-1}$, $\approx \frac{2}{3}$ before flooding
- NUE in farm survey $\approx 60\%$ above-ground N / N applied
- Why is NUE relatively high under these conditions?
Rice yield in response to 200 kg N/ha as urea applied at permanent flood (PF) or panicle initiation (PI)

<table>
<thead>
<tr>
<th></th>
<th>Yield (t/ha)</th>
<th>NUE (%)</th>
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<tbody>
<tr>
<td>0N</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>200N – PF*</td>
<td>13.6</td>
<td>76</td>
</tr>
<tr>
<td>200N – PI*</td>
<td>11.4</td>
<td>39</td>
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Why is pre-flood N application so efficient?

- Hypothesis 1: urea granules are flushed below the depth of denitrification.
Why is pre-flood N application so efficient?

Hypothesis 2: temporary immobilisation of fertiliser followed by remineralisation

Continued crop-N uptake despite low amount of soil mineral N. Was this N remineralised after immobilisation?