Manure spreading: Mitigation, co-benefits and net costs

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Sources of agricultural ammonia

Agriculture is responsible for 98% of Ireland's ammonia emissions - Limit 116kT NH₃

Research: Land-spreading techniques, clover systems, housing

- Land spreading - 48%
- Housing - 35%
- Manure storage - 8%
- Grazing - 9%

Background
The effect of various climatic conditions on ammonia emissions

TS versus SP: Overall reduction = 28%
Net costs of trailing shoe:
NFRV & Fertilizer value vs. adoption costs

- Fertilizer N price = €1.20 / kg N
- Cost of trailing shoe adoption
  - Assumptions:
    - All slurry applied by contractor
    - Purchase cost differential = €25,000
    - Machine 400 hours per year, spreading 30m$^3$/hr
    - Work-rate equivalent
    - N fertilizer value = only benefit
      - Spreading distribution $\rightarrow$ P & K FRV = 100% in both cases
      - Grass contamination flexibility & odour reduction not included

$\rightarrow$ €0.77 / m$^3$ slurry

- More expensive in reality
  $\rightarrow$ farmer-owned equipment
SP $\rightarrow$ TS
= €0.77 /m³

Splashplate

June
€0.43
€0.83
€0.47

Trailing Shoe

April
€1.26
€0.42
€1.68

€1.25
€0.90
Irish conclusions

• Consistently lower emissions associated with trailing shoe (average reduction = 28.9%)

• At early spreading dates there was no significant difference between emissions from Splashplate and Trailing shoe
Ammonia emission reductions appear to transfer to increased FRV

Economic benefit of FRV increase is marginal

Spring application is more effective at no extra cost

Specific to Ireland

Policy proposal → encourage spring (weather dependant) application
  - TS proliferation will occur naturally
  - Odours
  - Grassland management & flexibility
Comparision of ammonia emissions from conventional slatted sheds to out-wintering pads - ferm tubes and ADMS
Out-Wintering Pad
Teagasc Grange Co. Meath

Lagoon
Results

Ammonia emissions from cattle in a slatted shed vs. cattle on an OWP

NH$_3$ emissions per animal

Date

OWP

shed

Dec-06 Jan-07 Jan-07 Feb-07 Feb-07 Mar-07 Mar-07

Pad cleaned
Slatted sheds vs. OWP’s

Average ammonia emission per animal per day over the winter

<table>
<thead>
<tr>
<th>Housing Type</th>
<th>g NH₃ hd⁻¹ d⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shed</td>
<td>75 (±5)</td>
</tr>
<tr>
<td>OWP</td>
<td>50 (±3)</td>
</tr>
<tr>
<td>owp+lagoon</td>
<td>50 (±3)</td>
</tr>
</tbody>
</table>

23% reduction