Exploitation of biogas digestates to meet nutrient demands of different cultivars in a crop rotation

Beate Formowitz, Maendy Fritz and Franz Heimler

Issues and experimental set-up

- Can stable yields and economic benefits be achieved with biogas digestates as organic fertilizer while arranging them with ecological aims?
- Is a mixed fertilization (50 % mineral-N + 50 % digestate-N) going to show up more practice-oriented, through exploitation of short- and long term N-availability to maximize yields?

Results, discussion and conclusions

Table 1: Yield and protein content of winter wheat per N-treatment in 2009

<table>
<thead>
<tr>
<th>variants</th>
<th>Ascha</th>
<th>Dornburg</th>
<th>Gülzow</th>
<th>Ettlingen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain [t ha⁻¹]</td>
<td>min</td>
<td>mix</td>
<td>min</td>
<td>mix</td>
</tr>
<tr>
<td>6.5</td>
<td>7.9</td>
<td>7.4</td>
<td>7.8</td>
<td>7.7</td>
</tr>
<tr>
<td>Straw [t ha⁻¹]</td>
<td>3.8</td>
<td>4.5</td>
<td>4.7</td>
<td>7.2</td>
</tr>
<tr>
<td>Protein [% DM]</td>
<td>14.9</td>
<td>14.7</td>
<td>13.3</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Discussion

- Provision of N over the whole vegetation period in 50/50-variant ⇒ directly available N (min.-N + digestate-N) plus slowly and gradually released N (digestate-N)
- No incorporation of digestates into the soil when applied to winter crops in spring ⇒ higher risk of volatilization losses
- Higher N use efficiency of directly available N after fertilization in spring through winter crops ⇒ already established vegetation
- General plant growth (e.g. w.wheat in Gülzow) and activity of microorganisms (reduced nutrient mobilization from organic material) were negatively influenced by a drought period
- Difficulties to apply planned amounts of nitrogen due to occasionally strong variations in nutrient contents of digestates

Conclusions

- Digestates can serve as an adequate alternative to mineral fertilizer ⇒ Optimal fertilization especially in 50/50-variant possible
- Without continuous monitoring of nutrient contents difficulties to apply the planned digestate-N-amounts
- High digestate application rates without achieving expected yields carry a higher risk of nitrate leaching after harvest

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