Improving the economic viability of biogas* fermentation

Joachim Pheiffer (PhD),
Biopract GmbH

*renewable natural gas
Biogas in Germany - Facts 2016/17*

- ~ 9,000 Plants
- 4,200 MW installed capacity
- 49 TWh power generation 2016
- 43,000 jobs
- Turnover ~ € 8.3 bio.

* Source: German Biogas Association
Significant increase from 2009 to 2012, triggered by attractive feeding in tariffs guaranteed by the German Renewable Energy Law (EEG)
Economic viability of renewable energy sources

Estimated cost of power generation in Germany beyond 2020\(^1\)

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Cost Range (ct / kWh)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown Coal</td>
<td>5.9 - 9.1</td>
<td>(including CCTS)(^2)</td>
</tr>
<tr>
<td>Black Coal</td>
<td>7.5 - 13.3</td>
<td>(including CCTS)(^2)</td>
</tr>
<tr>
<td>Windpower</td>
<td>4.5 - 10.9</td>
<td></td>
</tr>
<tr>
<td>Solarpower</td>
<td>7.9 - 16.6</td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td>10.0 - 15.0</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Agency for Renewable Energy 2014 - comparison of 9 longterm studies

\(^2\) CCTS: Carbon Capture and Storage

The dilemma is obvious: Biogas is hardly competitive, cost must come down.
Biogas substrates in Germany 2016

Can enzyme supplementation improve the economic viability of biogas?

Source: Power generation from biomass, DBFZ (2015)
Model of the plant cell wall

- Complex and rigid
- Different substructures interact with each other
- Sites for enzymatic attack can be shielded by other cell wall components

Model of the primary cell wall
Pectin
Hemicellulose
Cellulose
Lignin
Structural (Extensin-like) Proteins

Plant cell wall degradation

(Oxidorereductases)

Pectinases
Proteases
Cellulases
Hemicellulases
Medium flow on inclined channels after enzyme treatment

- Effect: lowering viscosity
- Target:
  Substrate mixes containing, e.g.
  - grass silage
  - rye / wheat green silage
  - weed silages
  - dung

Enzyme blends increase medium fluidity
Field Study UltraPract® P2 - Biogas plant 1 MW

- Input reduction 1.8 t oDM per day,
- Savings of 5 - 6 t corn silage per day

11% increase of power output per t of oDM
Biogas Enzyme Generation 2.0

Thank you very much for your attention!

Contact:
Dr. Joachim Pheiffer
Magnusstrasse 11
D-12489 Berlin
Germany

Mail: joachim.pheiffer@bioprac-ABT.de