Alternatives to Silage Maize

Performance in one of its Favoured Regions in Bavaria

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The Intention of the Project

The aim is to obtain

- data about the high yield
- the parameters of quality of fodder crops

which could be an alternative to maize for the feeding of animals in an immigration area of the Western Cornroot Worm (*Diabrotica virgifera virgifera* LeConte; WCR) in Lower Bavaria.
Requirement for the Locations

- Field plots lying in the contaminated area of the WCR
- The test should be performed in the district Passau
- Geological differences of the soils, to cover the variability in this area
### Rotthalmünster

- **Altitude (above sea level):** 360 m
- **Rainfall per year:** 800 - 850 mm
- **Average temperature/year:** 7-8°C
- **Soil type:** sL4D
- **BWZ:** 70
- **AZ:** 68
- **Geology:** Tertiary hills
- **pH-Value (2009):** 6.7
- **P$_{2}$O$_{5}$ (mg/100g Soil):** 14
- **K$_{2}$O (mg/100g Soil):** 12

### Egglfing

- **Altitude (above sea level):** 322 m
- **Rainfall per year:** 800 - 900 mm
- **Average temperature/year:** 8°C
- **Soil type:** sL7Al
- **BWZ:** 60
- **AZ:** 59
- **Geology:** Sediments of flood plain
- **pH-Value (2009):** 7.2
- **P$_{2}$O$_{5}$ (mg/100g Soil):** 23
- **K$_{2}$O (mg/100g Soil):** 7

### Kirchham

- **Altitude (above sea level):** 335 m
- **Rainfall per year:** 800 - 900 mm
- **Average temperature/year:** 8°C
- **Soil type:** SL6Alg
- **BWZ:** 36
- **AZ:** 36
- **Geology:** Inn teraces gravel
- **pH-Value (2009):** 6.7
- **P$_{2}$O$_{5}$ (mg/100g Soil):** 54
- **K$_{2}$O (mg/100g Soil):** 27
# Tested Alternative Cultures to Silage Maize

**Forage Crops**
- **15 Mixtures**
  - **2 Intensities**
    - "intensive" → "quality"
    - "extensive" → "quantity"

**Sorghum and Millets**
- **6 Varieties**

**Silage Maize**
- **3 Varieties**

**Grain Whole Plant Silage**
- winter rye
- winter triticale
- winter wheat
- **2 Varieties of each**
# Forage Crops

<table>
<thead>
<tr>
<th>Plot</th>
<th>Title of Mixture</th>
<th>Origin</th>
<th>Species Composition and Percentages</th>
<th>Seeding Rate</th>
<th>Rate</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>WD</td>
<td>WB</td>
<td>WV</td>
</tr>
<tr>
<td>1</td>
<td>FM 3-K</td>
<td>BQSM</td>
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<td></td>
<td></td>
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<tr>
<td>2</td>
<td>FM 4-K</td>
<td>BQSM</td>
<td>30</td>
<td>15</td>
<td>37</td>
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<tr>
<td>3</td>
<td>FM 4</td>
<td>BQSM</td>
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<td>15</td>
<td>33</td>
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<tr>
<td>4</td>
<td>A 3</td>
<td>Ref. EVA II</td>
<td>43</td>
<td>26</td>
<td>31</td>
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<tr>
<td>5</td>
<td>A 3 mit Klee</td>
<td>Ref. EVA II</td>
<td>29</td>
<td>20</td>
<td>20</td>
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<tr>
<td>6</td>
<td>FE 1</td>
<td>BQSM</td>
<td>19</td>
<td>43</td>
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<tr>
<td>7</td>
<td>FE 3-K</td>
<td>BQSM</td>
<td>46</td>
<td>51</td>
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<tr>
<td>8</td>
<td>FE 2</td>
<td>BQSM</td>
<td>10</td>
<td>20</td>
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<tr>
<td>9</td>
<td>Agravit 040R</td>
<td>Advanta</td>
<td>75</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>MG8 Standard</td>
<td>Freudenberger</td>
<td>17</td>
<td>50</td>
<td>10</td>
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<tr>
<td>11</td>
<td>Country 2052</td>
<td>DSV</td>
<td>30</td>
<td>10</td>
<td>10</td>
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<td>12</td>
<td>Landgreen KG 550</td>
<td>BSV</td>
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<tr>
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<td>Intensivmischung Kleegras</td>
<td>Andreae</td>
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<td>23</td>
<td>20</td>
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<tr>
<td>14</td>
<td>Tetrafix intensiv mit Klee</td>
<td>Stroetmann</td>
<td>60</td>
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<td></td>
</tr>
<tr>
<td>15</td>
<td>Mehrjähr. Kleegras m. Luzerne High Quality</td>
<td>Dehner</td>
<td>10</td>
<td>15</td>
<td>10</td>
</tr>
</tbody>
</table>

**Abbreviations:**

- BQSM Bavarian Quality seed mixture
- EVA II forage mixtures used in Project "EVA II"

**Perennial mixture = yield period from the year of seeding and two years further**

**Two year mixture = yield period the year of seeding and one additional year**
## Selection of Varieties of Maize, Sorghum/Millet and Whole Plant Silage

<table>
<thead>
<tr>
<th>Silage Maize</th>
<th>Variety</th>
<th>Maturity Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES Bombastic</td>
<td>maturity group</td>
<td>S240</td>
</tr>
<tr>
<td>Torres</td>
<td>maturity group</td>
<td>S250</td>
</tr>
<tr>
<td>PR 39 F 58</td>
<td>maturity group</td>
<td>S260</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sorghum/ Millet</th>
<th>Variety</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sucrosorgo 506</td>
<td>Sorghum bicolor</td>
<td></td>
</tr>
<tr>
<td>Branco</td>
<td>Sorghum bicolor</td>
<td></td>
</tr>
<tr>
<td>Sorghum spezial</td>
<td>diverse Sorghum-species</td>
<td>Sorghum sudanense x S. bicolor, Sorghum sudanense x S. bicolor</td>
</tr>
<tr>
<td>Inka</td>
<td>Sorghum bicolor</td>
<td></td>
</tr>
<tr>
<td>Mitril</td>
<td>Sorghum sudanense x S. bicolor</td>
<td>Sorghum sudanense x S. bicolor</td>
</tr>
<tr>
<td>Energiemischung II</td>
<td>S. bicolor x S. sud. + S. bicolor</td>
<td>S. bicolor x S. sud. + S. bicolor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Whole Plant Silage</th>
<th>Variety</th>
<th>Crop Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visello</td>
<td>winter rye</td>
<td></td>
</tr>
<tr>
<td>Balistic</td>
<td>winter rye</td>
<td></td>
</tr>
<tr>
<td>Benetto</td>
<td>winter triticale</td>
<td></td>
</tr>
<tr>
<td>Massimo</td>
<td>winter triticale</td>
<td></td>
</tr>
<tr>
<td>Akratos</td>
<td>winter wheat</td>
<td></td>
</tr>
<tr>
<td>Inspiration</td>
<td>winter wheat</td>
<td></td>
</tr>
</tbody>
</table>
Comparision of dry matter content

Dry Matter Content (dt/ha)

- Silage Maize
- Sorghum
- Forage Cr int
- Forage Cr ext
- WPS

Year:
- 2009
- 2010
- 2011
Comparision of dry matter content

Plot 15 at three locations in 2010
Clover grass, high quality with lucerne
August 2010

Rotthalmünster  Kirchham  Egglfing
Dry matter content under 25% and over 35% results in problems while compression the substrate. Storage of substrate with a dry matter content under DM of 30% is not allowed in a fieldsilo because of production of silo effluent.
Netto Energy Lactation (NEL)

MJ NEL/kg DM


Forage int. Forage ext. Silage Mais Sorghum WPS

No WPS in 2009 No laboratory tests
Crude Protein

Forage int. Forage ext. Silage Mais Sorghum WPS

No WPS in 2009 No laboratory tests
## Conclusion

<table>
<thead>
<tr>
<th>Silage Maize</th>
<th>Sorghum/Millets</th>
<th>WPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Was the most profitable culture in this field test with the most reliable yields</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yield varied in a low range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Good establishment after seeding in the beginning of June</td>
<td>• Yield on the niveau of the forage entries, with a wide range of variation. In future more adapted varieties are necessary =&gt; task for the breeders</td>
<td></td>
</tr>
<tr>
<td>• Produced 25 % - 50 % less DM yield than maize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Dry matter content lied under 27 %, too low for a storage in a field silo (production of effluent)</td>
<td></td>
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</tr>
<tr>
<td>• Yield of rye in 2010 was below average (kinked grain shafts, had to be harvested earlier)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Very satisfying yield in 2011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Suitable previous crop for Sorghum at the beginning of the project</td>
<td></td>
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</tr>
</tbody>
</table>
## Conclusion

**WPS**
- Increases in the practice in combination with undersown grass crops the use in biogas plants

**Forage Crops**
- Reached in the first year (2009) the expected approx. 70% of the full yield and in the following two years a comparable yield niveau to the millet and Sorghum varieties
  - Dry matter content was suitable for ensiling
  - Loss of the legumes at 2 locations because of the mineralizing soils
  - Supports soil health
  - Possible component of concentrated feed and protein source in the cattle feeding
  - Undersown grass crops in combination with WPS as substrate for biogas plants
  - But: High demand factor on performance for 4 to 5 cuttings per year
Thank You for Your Attention!

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    AQU 4
    AVB

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