German Seed Industry

ISTA-Congress 2010

Dr. Carl-Stephan Schäfer, BDP
Topics

1) Plant production in Germany
2) German plant breeding in key figures
3) Future challenges
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Plant production in Germany

General overview

German agriculture as a branch of the economy

Output of agriculture, forestry, fisheries as well as sales of important other industries in Germany in 2008, in billion euros (excluding VAT)

- Agriculture, forestry, & fisheries: 54.2 billion euros
- Paper industries: 36.1 billion euros
- Textiles & apparel industries: 23.7 billion euros
- Mining & quarrying of stones & earth: 15.9 billion euros
- Production of office & IT appliances: 15.0 billion euros

Plant production in Germany

General overview

Output of German Agriculture in 2009

Total output value*: EUR 42.9 billion

Crop farming total: EUR 21.2 billion

<table>
<thead>
<tr>
<th>Crop Production</th>
<th>Value (EUR billion)</th>
<th>Change %</th>
<th>Value (EUR billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cereals</td>
<td>5.4</td>
<td>-33%</td>
<td></td>
</tr>
<tr>
<td>fodder plants</td>
<td>4.8</td>
<td>-14%</td>
<td></td>
</tr>
<tr>
<td>flowers, shrub, trees</td>
<td>2.6</td>
<td>-4%</td>
<td></td>
</tr>
<tr>
<td>vegetables</td>
<td>1.9</td>
<td>-2%</td>
<td></td>
</tr>
<tr>
<td>oilseed rape &amp; other oil plants</td>
<td>1.7</td>
<td>-13%</td>
<td></td>
</tr>
<tr>
<td>potatoes</td>
<td>1.5</td>
<td>-5%</td>
<td></td>
</tr>
<tr>
<td>grape vine</td>
<td>1.2</td>
<td>+0%</td>
<td></td>
</tr>
<tr>
<td>fruit</td>
<td>0.8</td>
<td>+0%</td>
<td></td>
</tr>
<tr>
<td>sugar beet</td>
<td>0.6</td>
<td>+5%</td>
<td></td>
</tr>
<tr>
<td>others</td>
<td>0.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Animal farming total: EUR 19.8 billion

<table>
<thead>
<tr>
<th>Animal Production</th>
<th>Value (EUR billion)</th>
<th>Change %</th>
<th>Value (EUR billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>others</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eggs</td>
<td>0.5</td>
<td>-2%</td>
<td></td>
</tr>
<tr>
<td>poultry</td>
<td>1.9</td>
<td>+3%</td>
<td></td>
</tr>
<tr>
<td>cattle</td>
<td>3.5</td>
<td>-7%</td>
<td></td>
</tr>
<tr>
<td>pigs</td>
<td>6.2</td>
<td>-6%</td>
<td></td>
</tr>
<tr>
<td>dairy</td>
<td>7.1</td>
<td>-26%</td>
<td></td>
</tr>
</tbody>
</table>

Source: BMELV (German Ministry of Agriculture)

AMI – www.marktundpreis.de 010/211g
*estimation as of March 2010
Plant production in Germany

Utilization of Cultivation area in 2009

16.9 million ha cultivation area
(all figures in million ha)

<table>
<thead>
<tr>
<th>Category</th>
<th>Area (m ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>6.9</td>
</tr>
<tr>
<td>Fodder</td>
<td>2.3</td>
</tr>
<tr>
<td>Oil plants</td>
<td>1.5</td>
</tr>
<tr>
<td>Root &amp; Tuber</td>
<td>0.7</td>
</tr>
<tr>
<td>Fallow</td>
<td>0.2</td>
</tr>
<tr>
<td>Vegetables/Pulses/Others</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Source: Federal Agency for Statistics, © AMI – marktundpreis.de 2010/201a
Topics

1) Plant production in Germany

2) German plant breeding in key figures

3) Future challenges
German Plant Breeding in Key Figures

Plant breeding is not confined to national borders

- **Global players with international operations**
  - Product development in multiple countries
  - Seed production in various climate zones
  - Central seed processing, treatment, enhancement and distribution
  - Global seed marketing

- **Seed moves frequently across international borders**
  - Germplasm for R&D
  - Experimental lines and hybrids for screening
  - Basic seed for multiplication
  - Commercial varieties for marketing
Example: breeding, production, marketing of tomato

1. Breeding of parental lines: EUROPE - State 1
2. Production of basic seeds: EUROPE - State 2
3. Treatment and manufacturing of basic seeds: EUROPE - State 1
4. Production of hybrid seeds: CHINA
5. Treatment and manufacturing of commercial hybrid seeds: EUROPE - State 1
6. Commercial packaging: USA
7. Final sale and use: MEXICO
German Plant Breeding in Key Figures

Plant breeding companies

- 130 plant breeding and seed trading companies (of which 60 breeding companies with own breeding programmes)
- Seed market volume EUR 1.5 billion, EUR 650 m (43.7 %) of which abroad
- 12,000 workforce (breeding and seed production)
- 16.1 % R&D-to-turnover ratio
- 4,400 ha breeding nurseries
- 130,000 m² greenhouse area
German Plant Breeding in Key Figures

Companies/Institutions with own breeding programmes

- Cereals: 26
- Oil & Protein Plants: 10
- Fodder Plants: 7
- Fodder Plants: 11
- Vegetables: 4
- Potatoes: 15
- Maize: 6
- Sugar Beet: 6
## The German Plant Breeding Industry

### Plant Variety Registration with the German PVO in 2009

<table>
<thead>
<tr>
<th>Variety Category</th>
<th>Varieties listed in 2009</th>
<th>Total Varieties listed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agricultural Varieties</strong></td>
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<td></td>
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<tr>
<td>Cereals (excluding maize)</td>
<td>40</td>
<td>368</td>
</tr>
<tr>
<td>Maize</td>
<td>30</td>
<td>244</td>
</tr>
<tr>
<td>Potatoes</td>
<td>15</td>
<td>198</td>
</tr>
<tr>
<td>Fodder Plants (Fodder plants/Forage grasses)</td>
<td>84 (21/63)</td>
<td>875(157/718)</td>
</tr>
<tr>
<td>Oil &amp; Protein Plants</td>
<td>34</td>
<td>273</td>
</tr>
<tr>
<td>Sugar Beets</td>
<td>39</td>
<td>207</td>
</tr>
<tr>
<td><strong>Horticultural Varieties</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Vegetables)</td>
<td>17</td>
<td>518</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>2</td>
<td>113</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>261</td>
<td>2,796</td>
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</table>
German Plant Breeding in Key Figures
Network of the German plant breeding companies

GFP
German Federation of Private Plant Breeding Research (Gemeinschaft zur Förderung der privaten deutschen Pflanzenzüchtung e.V.)
- Co-ordination of applied research projects
- Procurement of research from scientific institutions
- Fund raising of external funds for co-financing schemes with GFP members
- Transposition of research findings into practical breeding

STV
Seed Trust Administrative Company (Importeur-und-Vertriebsgesellschaft mbH)
- Monitoring of licence contracts
- Legal actions against infringements upon PVRs
- Implementation of the farm saved seed regulations
- Services for the seed industry

GMS
Society for the Acquisition and Utilization of Property Rights (Gesellschaft für Erwerb und Verwertung von Schutzrechten mbH)
- Representation of patent interests of its members
- Plant Innovation Agency (PIA)
- Licensing for commercial exploitation and other IP related services for members and research institutes
- Acquisition and commercial exploitation of plant variety rights

BDP
German Plant Breeders’ Association (Bundesverband Deutscher Pflanzenzüchter e.V.)
- Representing the interests of German plant breeders in politics, economy and administration
- Closely following up with legislation processes
- Campaigning and public relations
- Protection of intellectual property
- Promotion of new breeding technologies

SFG
Society for the Promotion of Varieties (Sortenförderungsgesellschaft – SFG mbH)
- Variety testing services
- Official VCU testing agency accredited by the German Plant Variety Office
- Testing of varieties registered in other EU member states under German cultivation conditions
- Projects designed to improve variety testing methods
German Plant Breeders’ Association

Core Activities

- Opinion formation on fundamental issues within the plant breeding companies
- Internal and external representation of common positions
- National and international representation of the interests of plant breeders and seed traders towards politics, authorities, economy, NGOs (environmentalists)
- Promotion of new breeding technologies
- Organisation of research and variety development projects
The long road to a new variety

1. Fundamental research (model organisms) - 5 years

2. Applied research: genomic research of agricultural crops - 5 years

3. Applied public-private partnership research: development of materials, breeding methods - 3 years

4. Company Research: Selection of parent lines, cross-breeding - 2 years

5. Variety development: selection, testing for several years at several locations - 8 years

6. Official variety testing - 3 years

7. Listing, Plant Variety Protection - 2 years

8. Seed production - 5 years

5 years

3 years

2 years

8 years
GABI - Genome Analysis within the Biological System of Plants

- joint research programme on plant genome research
- supported by
  BMBF (Federal Ministry for Education and Research)
  by a consortium of private companies (WPG)
  “public - private – partnership”
- initiated in 1999
- more than 350 scientists involved
  in more than 40 research institutions and companies
International Co-operation

"GABI-Génoplante" → "Trilateral Activities" → "Plant KBBE"

<table>
<thead>
<tr>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
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<th>2006</th>
<th>2007</th>
<th>2008</th>
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<th>2010</th>
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<td></td>
<td></td>
<td>Call 1</td>
<td>Call 2</td>
<td>Call 3</td>
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fundamental research

PUBLIC PRIVATE PARTNERSHIP

fundamental research

PUBLIC PRIVATE PARTNERSHIP

consortia for applied research

industry-driven consortia

[€m]

20
15
10
5
Cereal yields Germany 1952 - 2005

Source: Ahlemeyer and Friedt

"Besondere Ernteermittlung (BEE)“, Germany 1952 - 2005

- Winter Wheat: gain = 1.05 dt/ha/y, r² = 0.95
- Winter Barley: gain = 0.72 dt/ha/y, r² = 0.90
- Rye: gain = 0.66 dt/ha/y, r² = 0.88
- Spring Wheat: gain = 0.66 dt/ha/y, r² = 0.95
- Spring Barley: gain = 0.49 dt/ha/y, r² = 0.96
- Oats: gain = 0.51 dt/ha/y, r² = 0.84
Plant production in Germany: Maize

Continuous Increase in Grain Maize Yields in Germany

Average Annual Yield Increase
3.8 %

Source: BDP, DMK
© DBV, Situationsbericht 2010 – Gr18-4
Milestones & market development in Germany

Oilseed Rape

1973
0-varieties
oil quality

1986
00-varieties
oil and groat quality

1996
hybrids
1st & 2nd generation

2008
hybrids
3rd generation

Source: Norddeutsche Pflanzenzucht
### Oilseed Rape in EU-27: Cultivation Area & Yield

#### Cultivation Areas / Yields in Oilseed Rape within EU-27

| Country      | 2009 | 2010* | Total EU-27
|--------------|------|-------|-----------------
| Germany      | 1,471| 1,494 | 4.8
| France       | 1,471| 1,475 | 6.5
| Poland       | 749  | 820   | 6.1
| UK           | 572  | 650   | 6.8
| Romania      | 441  | 530   | 2010*
| Czech Rep.   | 355  | 355   | 4.8
| Hungary      | 267  | 290   | 21.3
| Lithuania    | 193  | 190   | 15.6
| Denmark      | 178  | 160   | 160
| Slovakia     | 168  | 165   | 168

*Source: Eurostat – national statistics AMI*

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*estimated*
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Global Market and the importance of plant breeding

Food for the World
9 billion people need to be fed in 2050 → agricultural productivity is to double until 2050, whereas arable land is limited

Climate Change
Winter temperatures will fall below zero much less frequently. Precipitation will increase in winter and decrease in summer. This will ensue the spreading of new pests.

Sustainability
Resistance breeding gives plants resilience against diseases or pests. Innovative plants feature more efficient nutrient and water uptake and utilization ("low input"); they help preserve soil fertility.

International Markets
Free agricultural international markets are causing price volatility.

Plant breeding is a key to enhancing the productivity and to improving sustainable agriculture.
Future Challenges

Specific issues of the sector

- return on investment
  - effective IP protection for plant innovation
  - remuneration for use of farm saved seed
  - coexistence of patents and PVP (with priority on PVP)

- free movement of seed
  - seed quality (standards, certification, testing)
  - treated seed (dust abrasion, approval of plant protection products)
  - phytosanitary (need for harmonisation, priorities)

- rules for adventitious presence of GMO
  - approval
  - thresholds
  - harmonised and practicable testing methods
Thank you very much for your attention!