Plant Related Inventions
Experiences from a seed industry perspective

Dr. Michael A. Kock
Geneva, July 14, 2009

Demand is driven by population growth and land scarcity

World population

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>quire 1950</td>
<td>2.5 billion</td>
</tr>
<tr>
<td>1960</td>
<td>2 people</td>
</tr>
<tr>
<td>2005</td>
<td>6.5 billion</td>
</tr>
<tr>
<td>2030</td>
<td>&gt;8 billion</td>
</tr>
</tbody>
</table>

Source: FAO, World Bank statistics, Syngenta

People fed per hectare

<table>
<thead>
<tr>
<th>Year</th>
<th>People fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>2 people</td>
</tr>
<tr>
<td>2005</td>
<td>&gt;4 people</td>
</tr>
<tr>
<td>2030</td>
<td>&gt;5 people</td>
</tr>
</tbody>
</table>
Increasing Demand – Increased Need for Innovation

Agricultural demand
bn metric tons of grain

- Food, feed & fuel
- Emerging markets GDP growth drives agricultural demand
- Agriculture: intensify, modernize
- Land, climate, infrastructure

Not yet factored in: Climate Change

Source: USDA, Goldman Sachs Commodities Research

Seed Industry: High investments in research and development

Crop Protection
- Improved performance, better environmental friendliness

Seeds
- Improved yield
- Better disease management
- Higher nutritional value
- Farmer and consumer benefits

Business development  Seeds/trait  Crop Protection
Success Factor: Intellectual Property Environment
Dependency of the Seed Industry on IP

What does seed and entertainment industry have in common?

Seed is a high-tech product in an easy to copy form

- Like entertainment industry: Copying by “counterfeiters” and customers
- Like entertainment industry: Strong „shareware“ movement (“free copies”)
- Like entertainment industry: Highly dependent on efficient IP systems

Current Challenges & Suggest Improvements

- **Patents and PVP**
  An issue of „double-protection“?

- **Patents and restriction of germplasm**
  Need for a breeders’ exemptions in patents?

- **Patents and „source / origin of biomaterial**
  New requirements of patentability

- **Patents, „Open Innovation“, „Open Source“, …**
  New models to encourage innovation
**Protection of Plant Varieties**
TRIPs / WTO Requirement

**Article 27 (3) TRIPs**
Members may also exclude from patentability:
(b) plants and animals (...). However, Members shall provide for the protection of plant varieties either by patents or by an *effective sui generis system* or by any combination thereof.

*Sui generis system = Plant variety protection (PVP)*
Union for the Protection of New Varieties of Plants (UPOV)

**Patentability of Plants - Lack of Harmonization**
- **No limitation**: All claims on plants permissible (AU, JP, US)
- **Narrow exception**: No claims on plant varieties, but generic claims on plants (EP)
- **Broad exception**: No claims on any kind of plant or seed
- **Protection gap**: No claims on plants; limited species for PVP (AR, BR, CA, CN...)

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**25 Years Patents on Plants**
Far away from global harmonization

<table>
<thead>
<tr>
<th>Question</th>
<th>AR</th>
<th>AU</th>
<th>BR</th>
<th>CA</th>
<th>CL</th>
<th>CN</th>
<th>EC</th>
<th>US</th>
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</thead>
<tbody>
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<td>1 Are plants protectable ?</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>2 If YES: Are there restrictions ?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Inventive step</td>
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<td></td>
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<tr>
<td>3 Are plant cells or parts patentable ?</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>4 Are plant seeds protectable ?</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>5 Are DNA sequences patentable ?</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>6 If YES: Are there restrictions ?</td>
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<tr>
<td></td>
<td>Only non-natural sequences</td>
<td>NO</td>
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<td></td>
<td>NO</td>
</tr>
</tbody>
</table>

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*Need for Harmonization*
Protection Tools for Plant Related Inventions
Patents & PVP – An Issue ofDouble Protection?

Exclusivity is not Exclusivity
Patents and PVP: Two different, supplementary (but not alternative) tools

Plant Variety Protection:
- **Protects**: New variety described by all its phenotypical characteristics. Only plants with all characteristics are protected.
- **Suitable for**: Traditional, experienced-based breeding.
- **Not suitable for**: Protection of new genes, traits, breeding processes.

Patent:
- **Protects**: Invention (new gene, breeding process). Plants with the inventive feature are protected.
- **Suitable for**: Biotechnology, complex traits, new breeding processes.

**Patent & PVP**
Scope of Protection
Current Challenges & Suggest Improvements

- **Patents and PVP**
  An issue of „double-protection“?

- **Patents and restriction of germplasm**
  Need for a breeders’ exemptions in patents?

- **Patents and „source / origin of biomaterial**
  New requirements of patentability

- **Patents, „Open Innovation“, „Open Source“, …**
  New models to encourage innovation

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**Patents and restriction of germplasm**
Need for a breeders’ exemptions in patents?

**Concern:**
- One patented gene in a plant limits the use of the entire plant
- Accessibility of germplasm is important for further breeding
- Breeding is not covered under a patent “research exemption”

**Current Solutions:**
- **DE, FR, CH:** Free use of a plant with a patented element for breeding and developing (but not commercializing) a new plant variety
- **Problem:** Allows use of genetic background and patented element
  → Erosion of protection (commercial development during patent term)

**Suggestion:**
- Free use to breed, develop, and commercialize plants **NOT** comprising the patented element (access only to genetic background)
Current Challenges & Suggest Improvements

● **Patents and PVP**
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### Patents and „source / origin“ of biomaterial
New requirements for Patentability?

<table>
<thead>
<tr>
<th>Country</th>
<th>Declaration of Source / Origin</th>
<th>ABS¹ Requisite for grant</th>
<th>Link to validity</th>
<th>Sanctions &amp; Fines</th>
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<tbody>
<tr>
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¹ Access and benefit sharing provisions

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Need for Harmonization
Patents and „source / origin“ of biomaterial
Challenges for the Applicant

Uncertainties:
- “Source” vs “Origin”: Can we define the origin of genetic material?
- Scope: More than what is claimed?
- Impact: New prerequisite of patentability beyond Art. 27, 29 TRIPS?

Consequences:
- High burden for applicant to achieve full compliance
- Threat to patent validity; discourage to utilize genetic diversity

Room for Improvement:
- Global harmonization (Budapest Treaty as a model?)
- No link to patent validity (enforcement via the civil legal system)

Current Challenges & Suggest Improvements

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  New models to encourage innovation
Patents, „Open Innovation“, „Open Source“, …
New models to encourage innovation

- Complex challenges require “innovations networks”
  - Limited in-house resources
  - Multi-disciplinary, “out-of the box” input
  - Integration of innovation

- Open innovation networks:
  - Externally posted “Challenge”
  - Open participation
  - Best solution is selected & rewarded
  - Experience: 11 challenges, >3000 solvers (40 countries), 3 rewards

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Patents, „Open Innovation“, „Open Source“, …
New models to encourage innovation

- Certain IP assets are not best utilized by exclusivity
  Germplasm collections, enabling technologies …

- Open source can increase responsiveness and IP utilization

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Continuum of openness
Most IP is neither completely open nor closed

Never Shared  Licensed  Patent Pools  Open Source  Freely Given

What Open Source is NOT

- Free Lunch - No
- Free to Do what I want - No
- Just a way to publish – No
- Public Domain – No
- Viral – Not Necessarily
- Immune from Patent Rights – No
Patents, „Open Innovation“, „Open Source“, ...
New models to encourage innovation

**Syngenta donates maize genetic stocks for public research**
February 29
Syngenta is donating approximately 7500 maize genetic stocks to the Maize Functional Diversity Group. The stocks contain segments of ancestral DNA and the marker data associated with the lines. This donation will help the Group and other researchers advance our knowledge of maize diversity.

**What Open Source requires in the “Patent World”**
- Access & Control
- Incentives to innovate (give’n take)
- Benefit capture, value sharing
- Consent not to “block” further innovation
- **Effective IP system:** Ensure incentives for initial innovator

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Thank you very much!

*Bringing plant potential to life*