Seed orchard management in Germany
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Content

• Regulations
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• Management recommendations
• Examples
• Tested seed orchards
German Act for Forest Reproductive Material

- in accordance with the EC Directive on the marketing of forest reproductive material 1999/105

- 26 species and one genus

- seed orchards in categories “qualified” and “tested”

- minimum requirements are regulated
A new seed orchard has to be authorised by the responsible authority

➢ this authority checks:
  • purpose (forestry, gene conservation ...)
  • genetic diversity (number of clones, ramets per clone)
  • isolation (more than 400 m to populations of poor phenotype)
  • design (similar number of ramets/clone, good cross pollination, no selfing)
  • location

Scots pine graft  (Photo: D. Schneck)
Selection of plus trees for seed orchards

Requirements:

• age → 20 years (Poplar) to 70 years (fir, beech, oak)
• well adapted, good health status, resistance
• superior volume growth
• wood quality (e.g. no spiral growth)
• good stem form
• crown architecture (branching, no forks, branch angle)
Area of seed orchards in Germany - conifers

- Abies alba
- Abies grandis
- Larix decidua
- Larix kaempferi
- Larix x eurolepis
- Picea abies
- Picea sitchensis
- Pinus nigra
- Pinus sylvestris
- Pseudotsuga menziesii

Diagram showing the total area and mean area for each species in hectares [ha].

- Total area [ha] for each species is indicated by the blue bars.
- Mean area [ha] is indicated by the red bars.

Date: 2013-04-05
Area of seed orchards in Germany - broadleaves

![Bar chart showing the area of seed orchards for various tree species in Germany. The chart includes species such as Acer platanoides, Alnus glutinosa, Betula pendula, Carpinus betulus, Fagus sylvatica, Fraxinus excelsior, Populus tremula, Prunus avium, Quercus petraea, and Robinia pseudoacacia. The x-axis represents the tree species, and the y-axis shows the total area and mean area in hectares.]
Percentage of different categories of FRM for seed yield 2003/04 to 2011/12 - conifers

Abies alba  | Abies grandis  | Larix decidua  | Larix kaempferi | Larix x eurólepis  | Picea abies  | Picea sitchensis  | Pinus nigra  | Pinus sylvestris  | Pseudotsuga menziesii

- selected
- qualified
- tested SO
- tested stands
Percentage of different categories of FRM for seed yield 2003/04 to 2011/12 - broadleaves

- Acer platanoides
- Acer pseudoplatanus
- Alnus glutinosa
- Alnus incana
- Betula pendula
- Carpinus betulus
- Castanea sativa
- Fraxinus excelsior
- Populus spp
- Prunus avium
- Quercus rubra
- Quercus petrea
- Robinia pseudoacacia
- Tilia cordata
- Tilia platyphyllos

Legend:
- Source identified
- Selected
- Qualified
- Tested SO
- Tested stands
Recommendations for management of seed orchards – Example Brandenburg I

- spacing 5 x 5 m, 8 x 4 m
- fencing
- new established orchards – tillage and mowing within and between the rows
- after 3 years mowing and cutting of naturally regenerated plants if necessary
- top pruning starts if trees become taller than 2 m
- limitation of tree height (< 6 m), reduce longer branches
- no pruning for fir, Douglas fir and (spruce)
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Recommendations for management of seed orchards – Example Brandenburg II

• combination of pruning and seed harvest
• fertilization only after foliar and/or soil analysis
• no treatments for flower stimulation
• documentation
• category “tested”
• established 1988
• 24 clones
• 7.8 ha
• seed yield 2009 and 2010 – about 10 kg/ha
Seed orchard European larch - pruning
Douglas fir seed orchard „Kahlenberg – Humptulips“

- plus trees selected in an old IUFRO-provenance trial
- 37 clones of provenance „Humptulips“
- established 1990 under a shelter of poplars (against frost)
- grafts and cuttings
- 2.3 ha
- first harvest 2004
- 2011 seed yield 14 kg /ha
- since 2011 planting of a new orchard with the same material
Norway spruce – conservation seed orchard

• conservation of an autochthonous population of lowland spruce from Lower Lusatia
• established 1995/96
• 60 clones
• seed production has started
Small-leaved lime
Black locust

- established 2005
- 25 clones
- special design and management
- since 2010 seed production
Tested seed orchards

two ways:

• comparative testing

• evaluation of components

Comparative testing:

• seed orchards have to flower and produce seeds 8 – 15 years

• seed harvest, plant production, trial establishment 3 – 7 years

• measurement and analysis 10 – 20 years
Comparative Testing of offspring of Scots pine seed orchards

• orchards established between 1978 and 1985

• seed harvest 1995-1997 → 8 orchards, 2 stands

• plant production 1997-1998

• test plantations 1999 → 3 sites,

• measurement and analysis 2008/09

• approval of 7 orchards in the category tested 2010
Comparative Testing of offspring of Scots pine seed orchards

height growth after 10 years

<table>
<thead>
<tr>
<th>Location</th>
<th>Height Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO &quot;East Europe&quot;</td>
<td>110%</td>
</tr>
<tr>
<td>SO &quot;Güstrow&quot;</td>
<td>110%</td>
</tr>
<tr>
<td>Stand Waldsieversdorf</td>
<td>113%</td>
</tr>
<tr>
<td>SO &quot;Niesky&quot;</td>
<td>112%</td>
</tr>
<tr>
<td>SO &quot;Taborz&quot;</td>
<td>108%</td>
</tr>
<tr>
<td>Control (stand)</td>
<td>100%</td>
</tr>
<tr>
<td>SO &quot;Dobritz&quot;</td>
<td>114%</td>
</tr>
<tr>
<td>SO &quot;Suprasl&quot;</td>
<td>102%</td>
</tr>
<tr>
<td>SO &quot;Rychtal&quot;</td>
<td>107%</td>
</tr>
</tbody>
</table>
**Description:**

- 1955/56 selection of plus trees of *Larix decidua* in natural stands in the Alps and in secondary stands
- Establishing of a clonal archive with 435 different plus tree clones of *Larix decidua*
- 1965-1986 production of hybrid seeds without isolation of female flowers and artificial pollination
- 81 progenies (*L. decidua* x *L. kaempferi*), 8 mixed stands, 21 stands pure *L. decidua* or *L. kaempferi*
- 1972-1989 planting of 30 progeny tests
Means of relative performance of selected progenies in comparison to a control

Legend:
- ◆: increment of basal area
- ☢: height increment
- ▲: well-formed trees
Hybrid larch – example I

Description:

• 1950-1965 selection of plus trees and establishing of two clone archives with 970 different plus tree clones (780 L. decidua and 190 L. kaempferi)

• 1968-1989 three series of controlled crossings mostly between L. decidua and L. kaempferi (250 combinations – incomplete dialles)

• 1974 three trials with 81 progenies

• 1986 two trials with 49 progenies

• 1992 five trials with 42 progenies
Progeny test hybrid larch 1974 – height 2005

relative height [%]

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