Quality of regeneration in private forests in South-Finland

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Regeneration methods in South-Finland

7. ETELÄ-POHJANMAA

8. KESKI-SUOMI

9. POHJOIS-SAVO

6. ETELÄ-SAVO

3. HÄME-UUSIMAA

2. LOUNAI-SUOMI

1. POHJOIS-SAVO

PROPORTION OF AREA, %

Planting  Seeding  Natural
Quality of regeneration in private forests in South-Finland

<table>
<thead>
<tr>
<th>SURVEY DATA (2000-2006)</th>
<th>Area, ha</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plantations, planting year 1997-2003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine planted</td>
<td>3366</td>
<td>63</td>
</tr>
<tr>
<td>Spruce planted</td>
<td>9258</td>
<td>28</td>
</tr>
<tr>
<td>Silver birch planted</td>
<td>1153</td>
<td>9</td>
</tr>
<tr>
<td>Direct seeding, seeding year 1996-2002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine seeded</td>
<td>5434</td>
<td></td>
</tr>
<tr>
<td>Spruce seeded</td>
<td>289</td>
<td></td>
</tr>
<tr>
<td>Silver birch seeded</td>
<td>326</td>
<td></td>
</tr>
<tr>
<td>Natural regeneration, Site prepared 1995-2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine natural</td>
<td>1446</td>
<td></td>
</tr>
<tr>
<td>Spruce natural</td>
<td>337</td>
<td></td>
</tr>
<tr>
<td>Birch natural</td>
<td>181</td>
<td></td>
</tr>
</tbody>
</table>
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Where do these regeneration results come from?

Survey on young regeneration areas:
- 3-year old plantations,
- 4-year old seedings and
- 5-year old natural regeneration areas.

What does regeneration result tell in these young stands?

Quality of regeneration operations:
regeneration method, site preparation method
plant or seed material, planting or seeding work
What was measured of determined in the survey?

In each plantation, regeneration result was systematically measured on 15–20 temporary sample plots (20 m²). All seedlings were counted and site fertility, site preparation method, soil texture class, stoniness and wetness was determined on every sample plot.

What can be analysed from the survey data?

The mean value and the variation in regeneration result inside and between regeneration areas. Some reasons behind the variation.
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How the regeneration result was measured?

In pine or spruce plantations the result was based on the number of good conifer seedlings (main stems; both planted and naturally regenerated).
Minimum distance 1 m from seedling to another / max. 6 seedlings/sample plot (3000 seedlings/ha).

On seeded or naturally regenerated areas the result was based on the total amount of seedlings in question.
Minimum distance 30 cm from seedling to another / max. 20 seedlings/sample plot (10 000 seedlings/ha).
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### Quality of Regeneration Result

<table>
<thead>
<tr>
<th>Method</th>
<th>Good</th>
<th>Tolerable</th>
<th>Unsuccessful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spruce or pine planting</td>
<td>≥ 1800</td>
<td>1400-1799</td>
<td>&lt; 1400</td>
</tr>
<tr>
<td>Mean stand density, main conifer stems /ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver birch, planting</td>
<td>≥ 1400</td>
<td>1000-1399</td>
<td>&lt; 1000</td>
</tr>
<tr>
<td>Mean stand density, main stem /ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine, spruce or birch seeding or natural</td>
<td>≥ 3000</td>
<td>2000-2999</td>
<td>&lt; 2000</td>
</tr>
<tr>
<td>Mean stand density, pine, spruce or birch seedlings /ha</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Main results; Spruce planting

→ 43% of stands fulfilled the target density (1800 ha⁻¹)
→ the proportion of unsuccessful cases was 23%
Main results; Spruce planting

Mounding gave better results than patching or disc trenching;
50% good,
16% unsuccessful results on mounded areas.
Main results; Spruce planting

Planted spruces survive better on mounds than in patch or disc trench tracks. There are much less pine weevil damages on mounded sites than on disc trenched or patched ones.

Mounded areas had about 100 – 150 planted seedlings/ha more than others.
Main results; Pine planting

→ **55 %** of stands fulfilled the target density (1800 ha⁻¹)
→ **19 %** of stands was in unsuccessful condition
Main results; Pine planting

Disc trenching 57%
patching 19%,
and mounding 20% of area.

Best results on mounded areas also with pine planting.
Proportion of good results over 63% on mounded areas.
Proportion unsuccessful result with disc trenching 25%.
Main results; Pine planting

Mean number of planted seedlings was lowest on patched areas, 200-300 seedlings ha⁻¹ lower than on disc trenched or mounded ones.

What will be wood quality of pine stems on mounded areas especially on fertile site (MT) ??
Main results; Pine direct seeding

→ 45% of stands fulfil the target density (3000 pines ha⁻¹)
→ 28% of stands will be too sparse for good wood quality
Main results; Pine direct seeding

Fertile site (MT) 45 %, dryish site (VT) 50 % and dry site (CT) 5 % of area.

Propability to get a good regeneration result (>3000 pines ha⁻¹) with direct seeding was low on fertile sites (MT). On more dryer sites direct seeding gave reliable results.
Main results; Pine direct seeding

Mechanical seeding gave better results than manual seeding.

Reasons for this difference:
amount of seed, time of seeding, mechanical seeding is connected with site preparation.
Main results; Pine direct seeding

Mean number of pine seedlings in different years (mechanical seeding)

There is variation in direct seeding results between different years but it is not the main reason behind the variation.
Main results; Pine natural

→ **34 %** of stands fulfilled the target density (3000 pines ha\(^{-1}\))
→ **44 %** of stands will be too sparse for good wood quality
Main results; Pine natural

Fertile site (MT) 42 %, dryish site (VT) 49 % and dry site (CT) 9 % of area.

Propability to get a good regeneration result (>3000 pines ha-1) was only 20 % on fertile sites (MT). Even on dry sites (CT) the risk of failure in natural regeneration was 20 %.
Main results; Pine natural

There is variation in emergence of seedlings between different years but it is not the main reason behind the variation.
Conclusions

Site preparation method has a significant effect on the survival of planted spruce and pine seedlings
→ on most fertile (OMT) and fertile sites (MT) mounding gave best results

Propability to get a good regeneration result (>3000 pines ha⁻¹) with direct seeding or natural regeneration of pine in Southern Finland is only 15-25 % on fertile sites (MT).

On dryier sites (VT, CT) direct seeding and natural regeneration more reliable results but the risk of failure was 20 - 30 %.
What does quality mean in future?

What will be the tree species composition in spruce plantation with different regeneration results?

Comparation between good regeneration result and unsuccessful one.
What does quality mean in future?

Number of conifer main stems on sample plot level

Assumptions:
Supplement of broad-leaved trees is needed if stem number is 1500 or less. The target stem number is 2000/ha.

Proportion of broadleaves will be
→ 13% if regeneration result was good
→ 47% if regeneration result was unsuccessful
Conclusions

A good start helps in future – two metres in six years