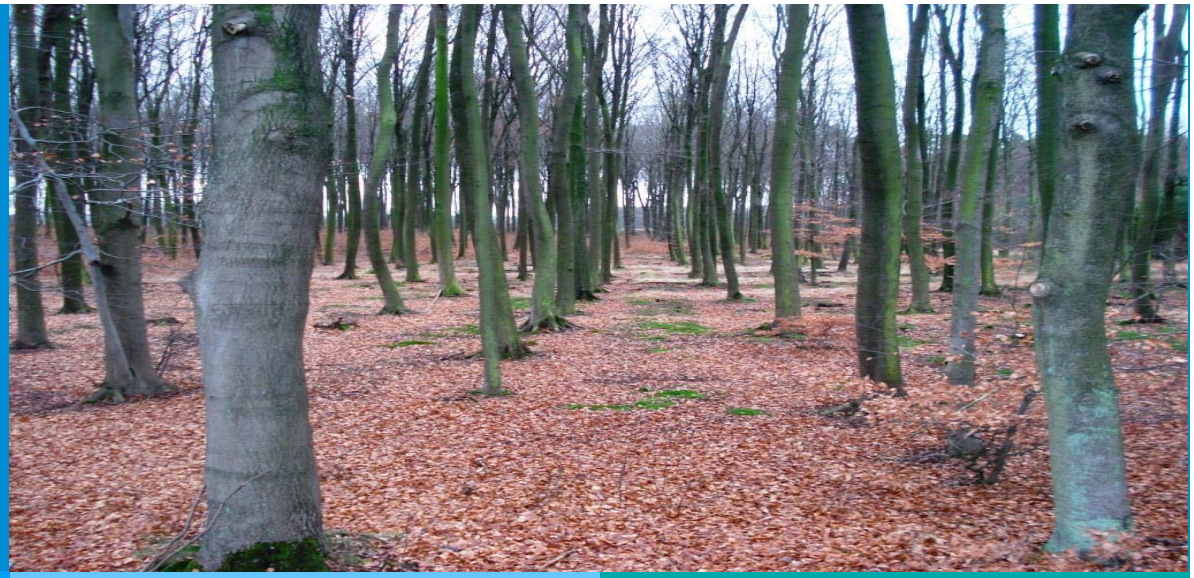
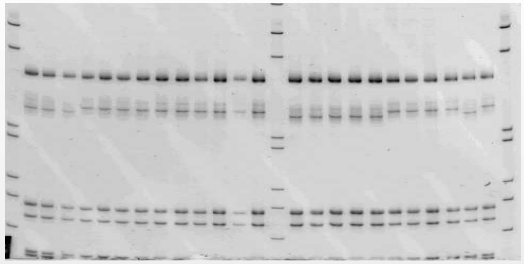
Prospects of tree improvement in Germany

Mirko Liesebach
Thünen Institute of Forest Genetics



Bernkastel-Kues,
05. June 2013

Thünen Institute of Forest Genetics



Locations:
Großhansdorf and Waldsieversdorf

Research areas:
- Provenance Research and Tree Improvement
- Pathogen Resistance and Seed Quality Research
- Ecological Genetics
- Genom Research

Structure

1. Current silviculture
2. Tree improvement in Germany
3. Results of tree improvement
4. Contribution of tree improvement
5. Critical judgement

1. **Current silviculture**
2. Tree improvement in Germany
3. Results of tree improvement
4. Contribution of tree improvement
5. Critical judgement

1. Current silviculture

Increasing timber demand for material resources and energy generation

-20 Mio. m^3 in 2020

(Mantau 2012)

On 5 % of the forest area in Germany (10 % of the public forests, respectively) natural forest development without any use until 2020

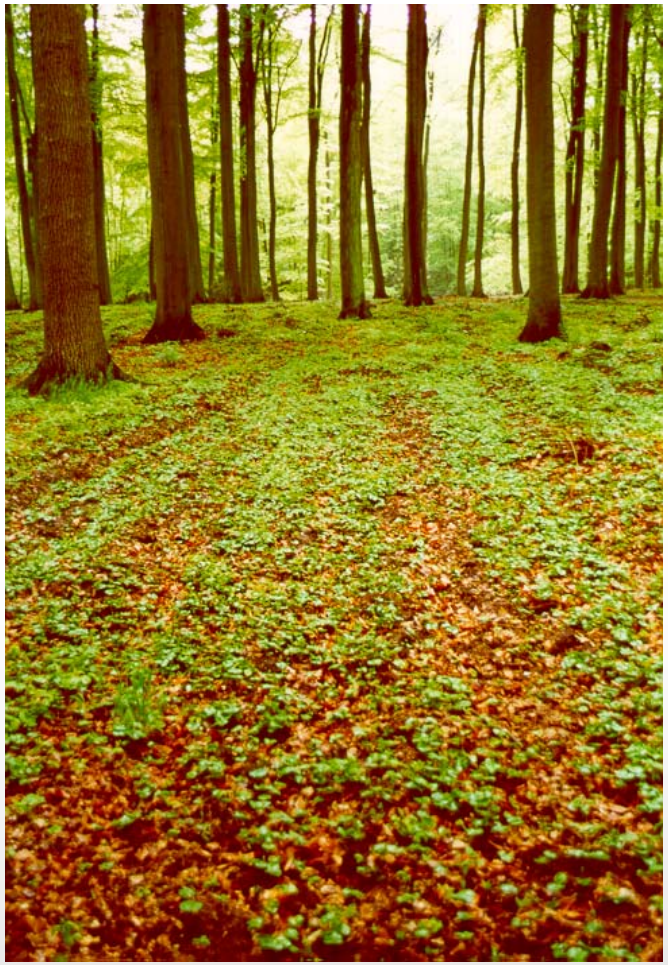
(National Strategy of Biodiversity, 2007)

1. Current silviculture

Regeneration

Natural regeneration:
- more than 70 %

Planting:
- afforestation
- missing natural regeneration
- change in tree species
- adding additional species
- after external events (storm, fire)
- change of provenance
  (eg. increase in growth / quality)



1. Current silviculture

Natural regeneration per se?

Selection on adaptability
(„survival of the fittest“)

Not growth or quality

1. Current silviculture

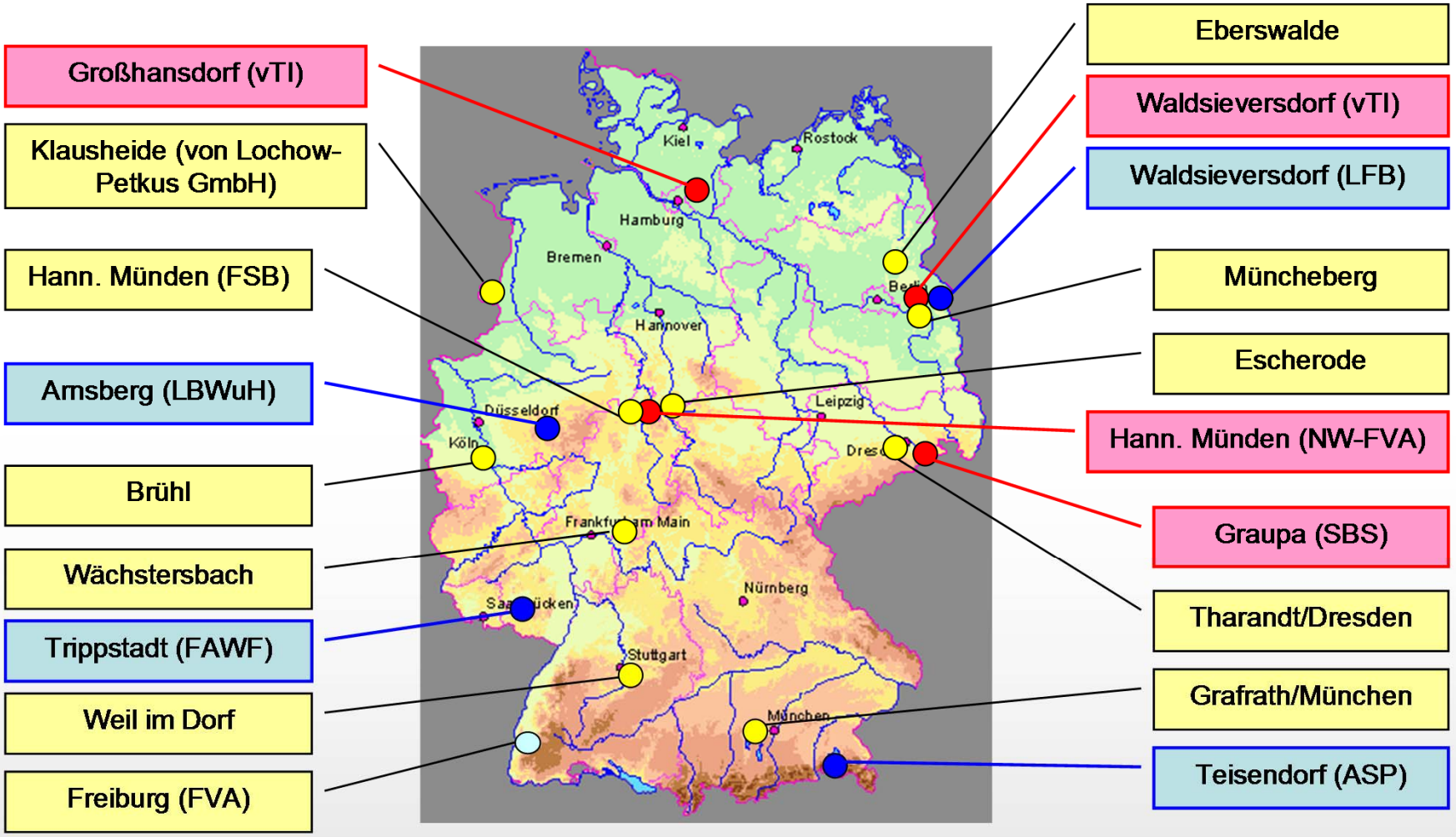
Management (final stand) -> regeneration

Shelterwood system

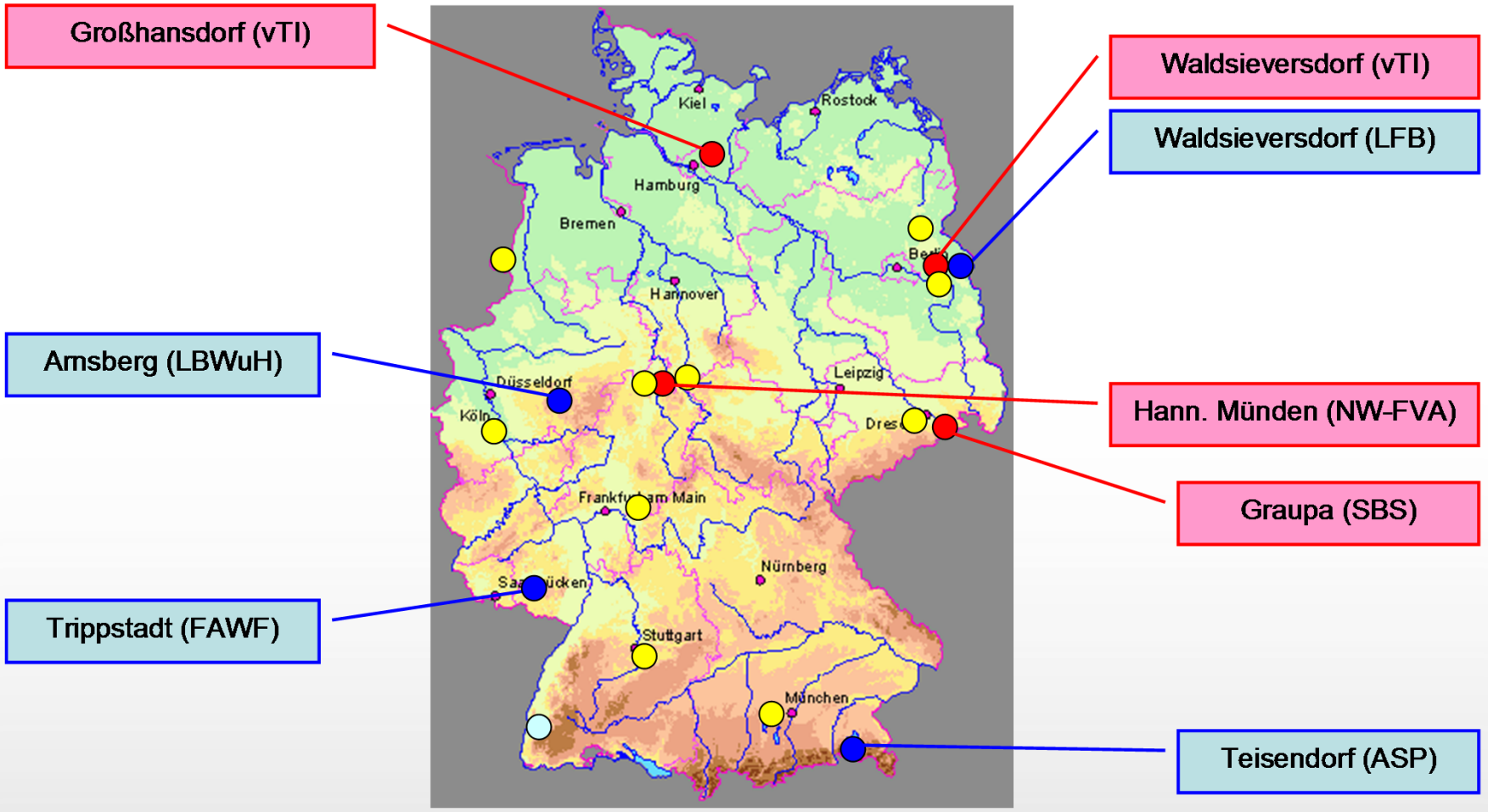
Girth limet felling

1. Current silviculture
2. **Tree improvement in Germany**
3. Results of tree improvement
4. Contribution of tree improvement
5. Critical judgement

2. Tree improvement in Germany - formerly



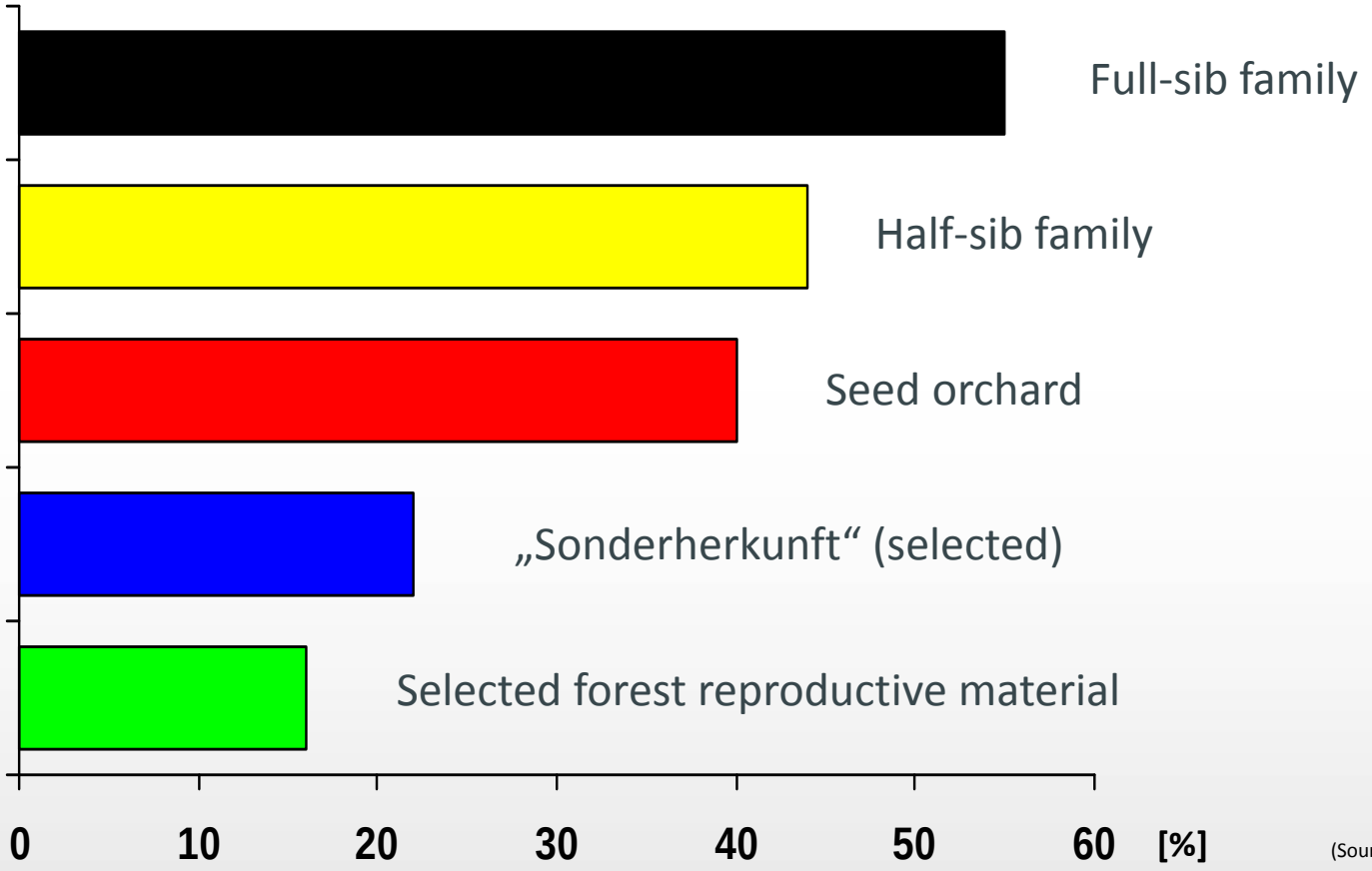
2. Tree improvement in Germany - currently



1. Current silviculture
2. Tree improvement in Germany
3. **Results of tree improvement**
4. Contribution of tree improvement
5. Critical judgement

3. Results of tree improvement

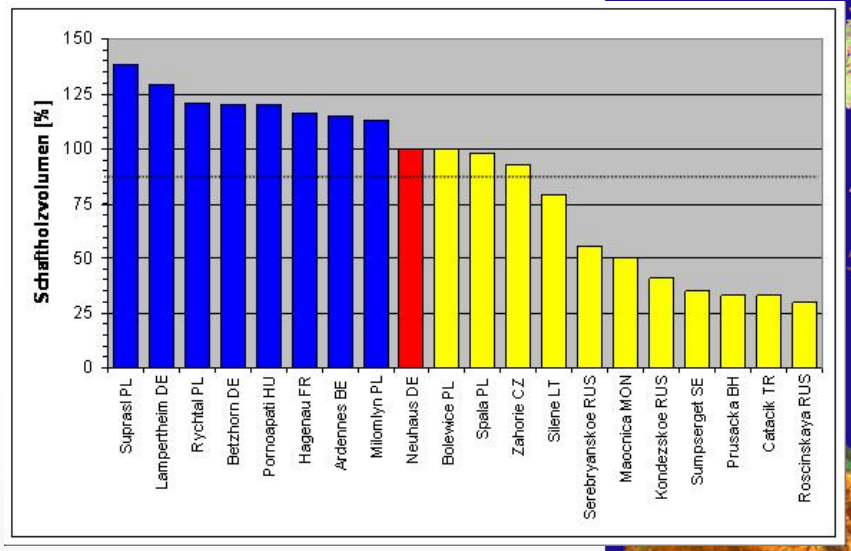
3.1 **Scots pine** (age 25): frequency of straight trunks



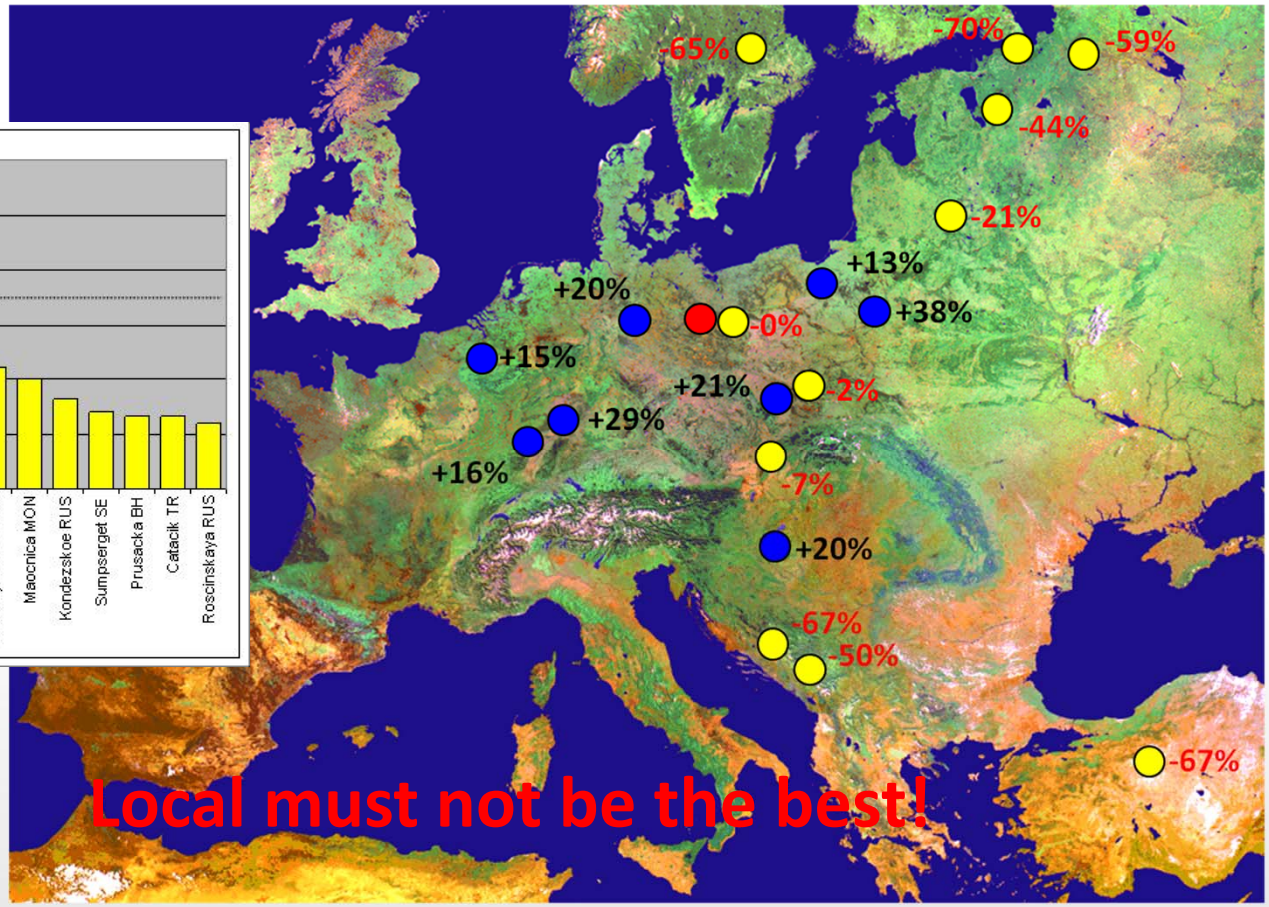
(Source: Rau, changed)

3. Results of tree improvement

3.2 **Scots pine** (age 28): volume production of provenances

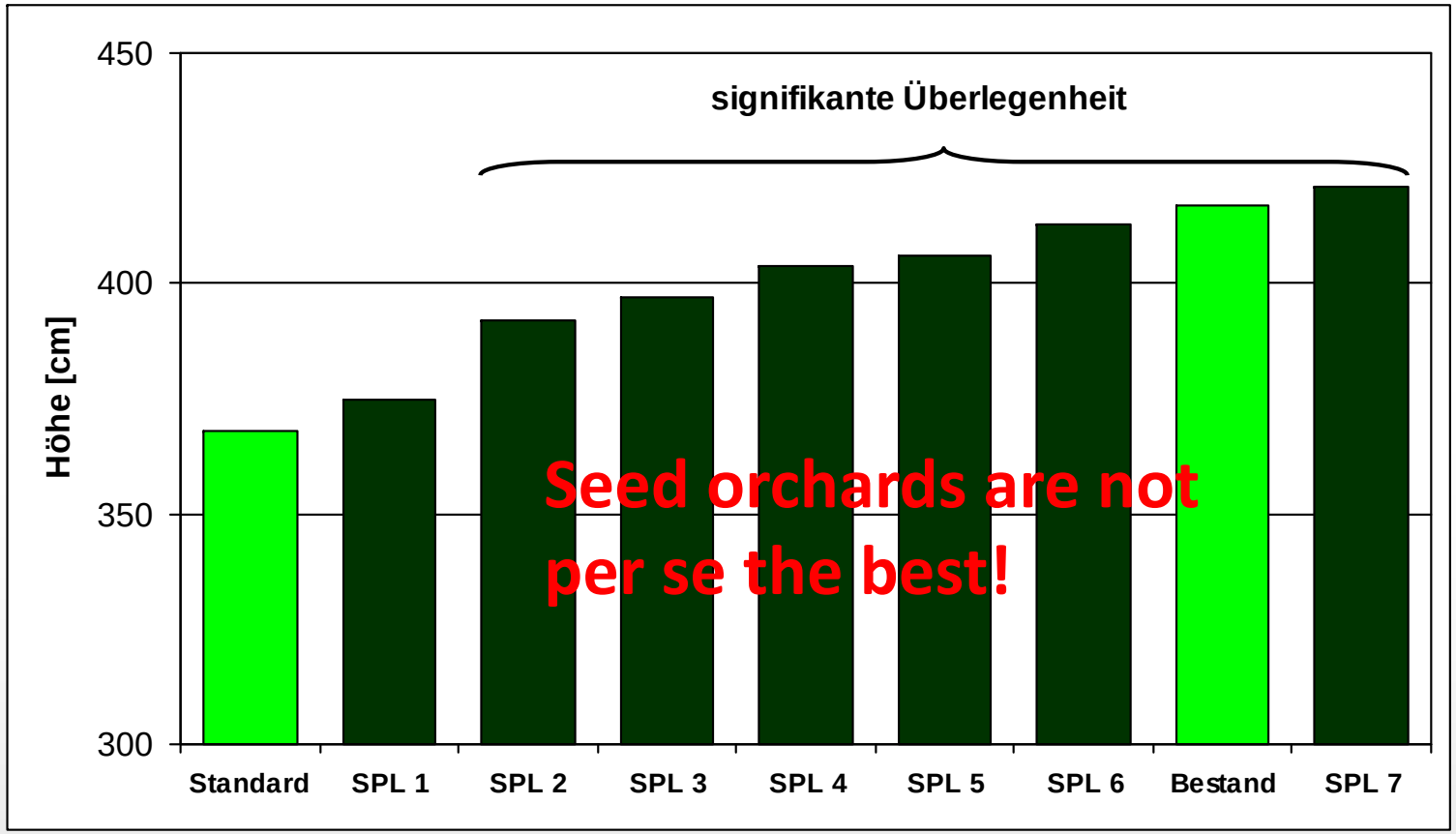


(Source: Schneck & Liesebach 2010)



3. Results of tree improvement

3.3 **Scots pine** (age 11): height growth

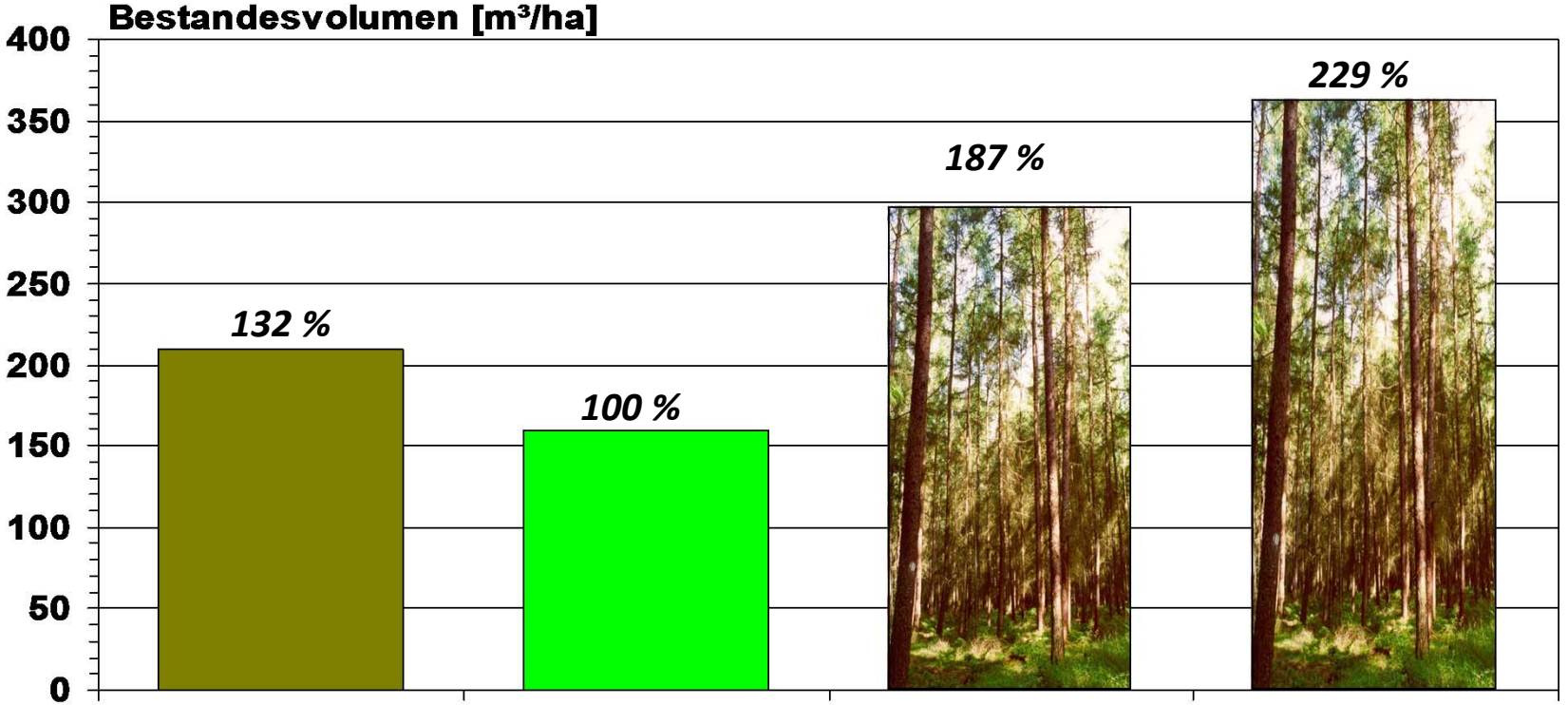


SPL = Seed orchard

(Quelle: D. Schneck)

3. Results of tree improvement

3.4 **Larch** (age 32): cross-breeding, volume production



(Source: V. Schneck)

3. Results of tree improvement

3.5 **Beech**: stumpage value at rotation age

		Wuchsleistung dGZ_{100}		
		schlecht 5,6	7,3	**gut** 9,1
Qualität Stammholzanteil	**gut** 65 %	12.500 €/ha (**78 %**)	18.000 €/ha (**113 %**)	25.500 €/ha (**161 %**)
	50 %	10.000 €/ha (**63 %**)	16.000 €/ha (**100 %**)	22.000 €/ha (**139 %**)
	35 % **schlecht**	6.500 €/ha (**41 %**)	11.000 €/ha (**69 %**)	16.000 €/ha (**102 %**)

(Quelle: Liesebach 1994, 2002; vgl. auch Kleinschmit 2002)

1. Current silviculture
2. Tree improvement in Germany
3. Results of tree improvement
4. **Contribution of tree improvement**
5. Critical judgement

4. Contribution of tree improvement

Fix assumptions in the following 4 scenarios:

- planting

  1/3 good provenance (right choice)

  1/3 substitution of provenance (FRM „selected“) +5 %

  1/3 use of FRM „tested“ +10 %

- Increment calculation for 40 years
  (BWI 2-mean values for broad leaves: 9.70 m³/ha*a and
  for conifers: 14.24 m³/ha*a)

Variable assumptions:

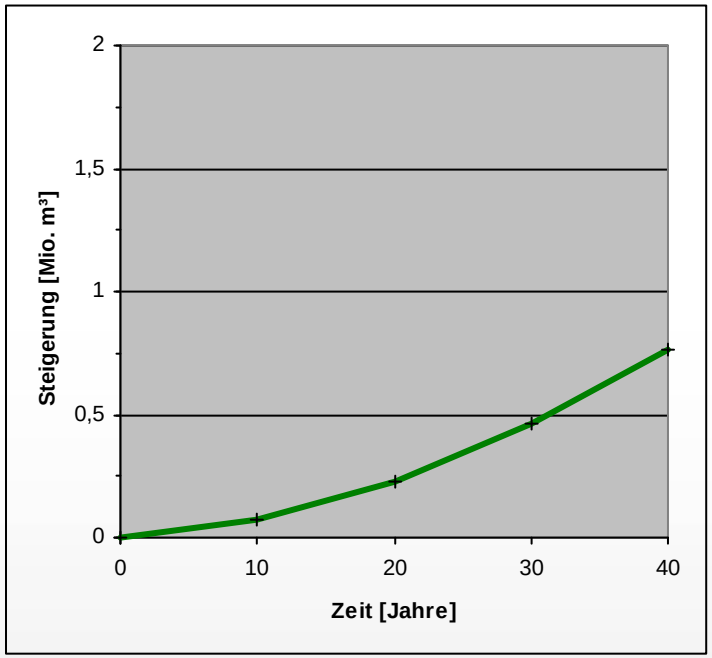
Regeneration area, planting proportion, species proportion

4. Contribution of tree improvement

Scenario I

- Regeneration area:
  mean of last 20 years
  => 64 000 ha/a
- 50 % planting
- Broad leaves : conifers 50 : 50

32 000 ha planting
thereof 1/3
11 000 ha (+5 %)
11 000 ha (+10 %)

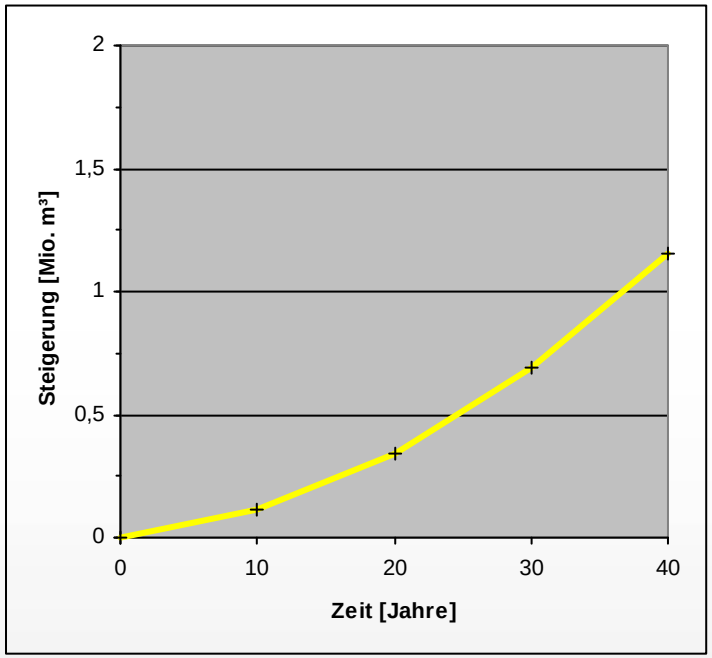


766 000 m³

4. Contribution of tree improvement

Scenario II

- Regeneration area:
  mean of last 20 years
  => 64 000 ha/a
  (like scenario I)
- 70 % planting
- Broad leaves : conifers 40 : 60



44 800 ha planting
thereof 1/3
15 000 ha (+5 %)
15 000 ha (+10 %)

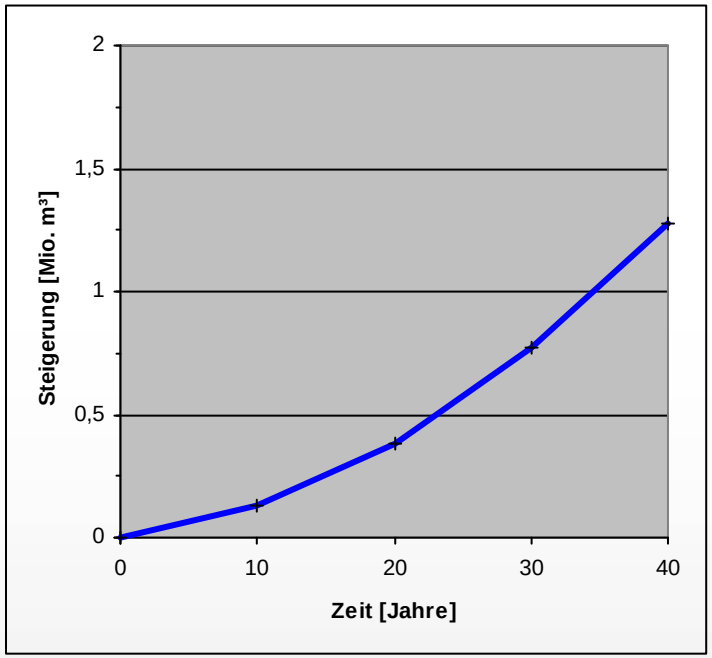
1 152 000 m³

4. Contribution of tree improvement

Scenario III

- Regeneration area:
  1 % of forest area
  => 103 200 ha/a
- 50 % planting
- Broad leaves : conifers 40 : 60

51 000 ha planting
thereof 1/3
17 000 ha (+5 %)
17 000 ha (+10 %)

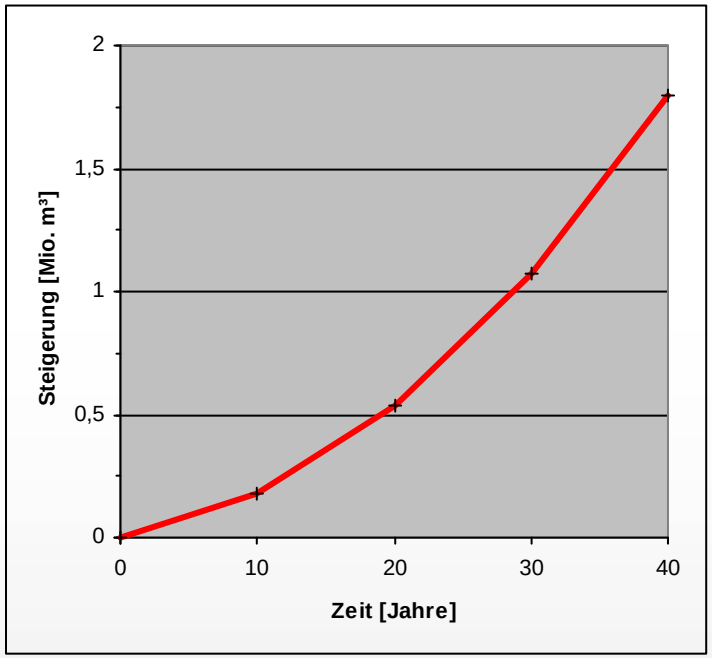


1 276 000 m³

4. Contribution of tree improvement

Scenario IV

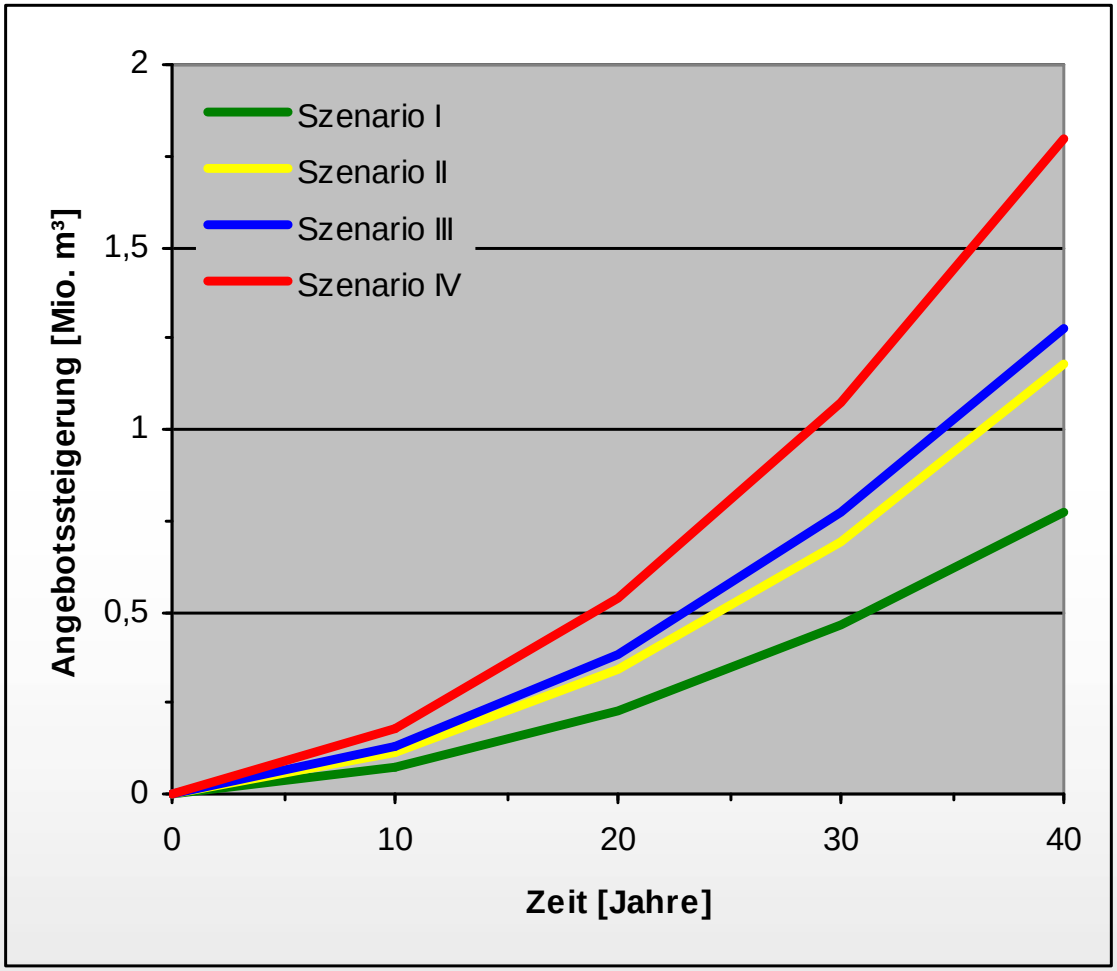
- Regeneration area:
  1 % of forest area
  => 103 200 ha/a
  (like scenario III)
- 70 % planting
- Broad leaves : conifers 40 : 60



72 000 ha planting
thereof 1/3
24 000 ha (+5 %)
24 000 ha (+10 %)

1 795 000 m³

4. Contribution of tree improvement



Additionally annual available in 40 years :

IV: 1.78 Mio. m³

III: 1.28 Mio. m³

II: 1.15 Mio. m³

I: 0.77 Mio. m³

1. Current silviculture
2. Tree improvement in Germany
3. Results of tree improvement
4. Contribution of tree improvement
5. **Critical judgement**

5. Critical judgement

Critical check of each stand before starting natural regeneration
- no uncritical adoption of natural regeneration
- use the full capacity of FRM of the category „selected“ (recommendations)

Check the silviculture treatments (girth limit felling)

Regularly validation of the approved seed collection units

Documentation of the FRM used by planting
- creating a monitoring system

Increase the approval of FRM of the category „tested“
- seed orchards from „qualified“ to „tested“

Establishment of new seed orchards (considering the aspect of biodiversity)

Optimising the approval system of FRM the category „tested“

5. Critical judgement

Forest tree improvement can be a medium-/long-term and sustainable contribution to close the predicted demand of timber.

Tree improvement strategy for 6 species (Douglas fir, larch, sycamore, Norway spruce, Scots pine, oak) developed

Thank you for your attention!