22.05.2017. LVMI “Silava”

**NB NORD seminārs “Meža atjaunošanas darbu mašinizācija”**

*27.04.2017.*

2017. gada 12. maijā notiks NB NORD, LVMI “Silava”, a/s “Latvijas valsts meži” un M-planter organizētais informatīvais seminārs “Meža atjaunošanas darbu mašinizācija”.

Semināra darba kārtība pievienota relīzes pielikumā.

Reģistrācija dalībai seminārā, rakstot uz e-pastu dagnija.lazdina@silava.lv līdz š.g. 5. maijam.

*22.05.2017.*

NB NORD, a/s “Latvijas valsts meži”, LVMI “Silava” un M-planter rīkotajā seminārā piedalījās gan meža pētnieki, gan apsaimniekotāji, gan meža zinību pasniedzēji no Latvijas, Lietuvas Igaunijas un Somijas, kā arī mežsaimniecisko darbu pakalpojumu sniedzēji, kopumā ap 80 dalībnieki.

Prezentācijas materiāli (prezentācijas pievienotas relīzes pielikumā):

1. Gediminas Čapkauskas (Institute of Forestry, Lithuanian Research Centre for Agriculture and Forestry) Forest regeneration practise in Lithuania
2. Toomas Väät (State Forest Management Centre (RMK), Estonia) Mineralization & mechanized regeneration
3. Timo Saksa (Natural Resources Institute, Finland) Mechanization of scarification, planting and cleaning – Finland
4. Marek Metslaid, Sigitas Girdziušas (Estonian University of Life Sciences, Institute of Forestry and Rural Engineering) Forest regeneration and management of young stands in Estonia
5. M-Planter Oy
6. Dagnija Lazdiņa (LVMI “Silava”) Forest regeneration mechanization in Latvia
7. Mārtiņš Gūtmanis (a/s “Latvijas valsts meži”) Kāpēc mežkopis šodien domā par darbu mašinizāciju?

M-planter 120 demonstrācijas video:

- skats no kabīnes;
- skats no malas.

Informācija www.laukos.lv: Kā atjaunosim mežus nākotnē? Inovatīva stādīšanas ierīce darbībā

LRCAF

LITHUANIAN RESEARCH CENTRE FOR AGRICULTURE AND FORESTRY

# Forest regeneration practise in Lithuania

PhD Gediminas Čapkauskas
Institute of Forestry,
Lithuanian Research Centre for Agriculture and Forestry

**NB NORD workshop & seminar „Forest regeneration mechanization“**
**12 May 2017, Latvia, Riga**

# Physico-geographical characteristics of the country

- Lithuania belongs to the temperate climate zone.
- It lies in the western part of East European Plain and includes middle-course and delta regions of Nemunas river basin.
- Lithuanian landscape was shaped by various geomorphological processes (the main process which shaped Lithuania‘s landscape was movement and melting of glaciers).
- The main geomorphological types of Lithuanian landscape:

  clayey plains – 55 %;

  moraine hills – 21 %;

  sandy plains – 18 %;

  river valleys – 3 %;

  coastal plains – 2 %.

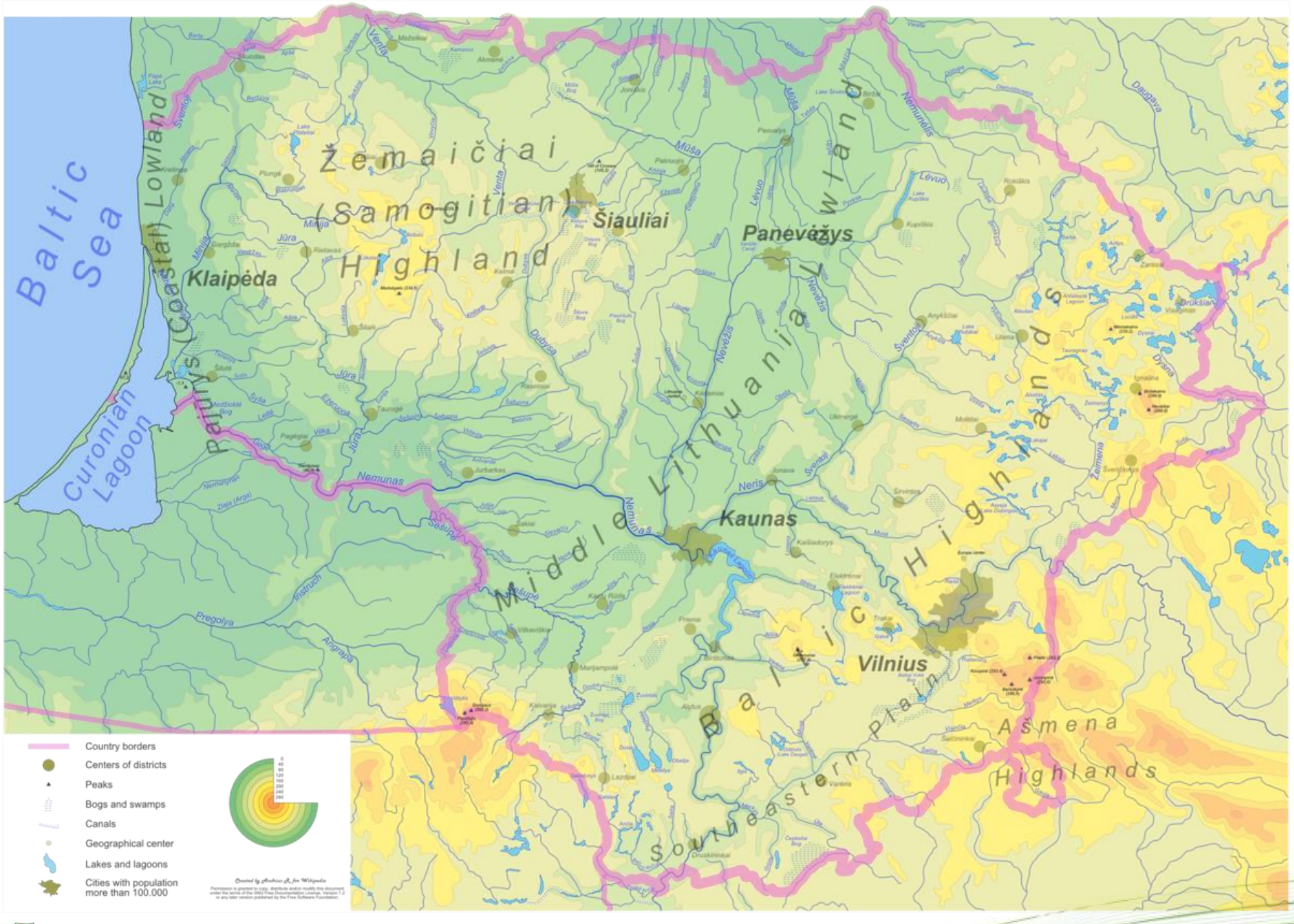



**Fig. 1** Physico-geographical map of Lithuania (created by A.Česnulevičius)

# Main regions with different soil types

A. Baltic sea coastal area with aeronosols and fluvisoils;

B. Žemaičiai Upland with albeluvisols and luvisols;

C. Middle Lithuania Lowland with cambisols and luvisols;

D. Baltic Upland with albeluvisols and luvisols;

E. South-Eastern sandy Plain with arenosols and podzols;

F. Švenčionys-Breslauja area with albeluvisols and luvisols.

G. Old uplands with albeluvisols and planosols.

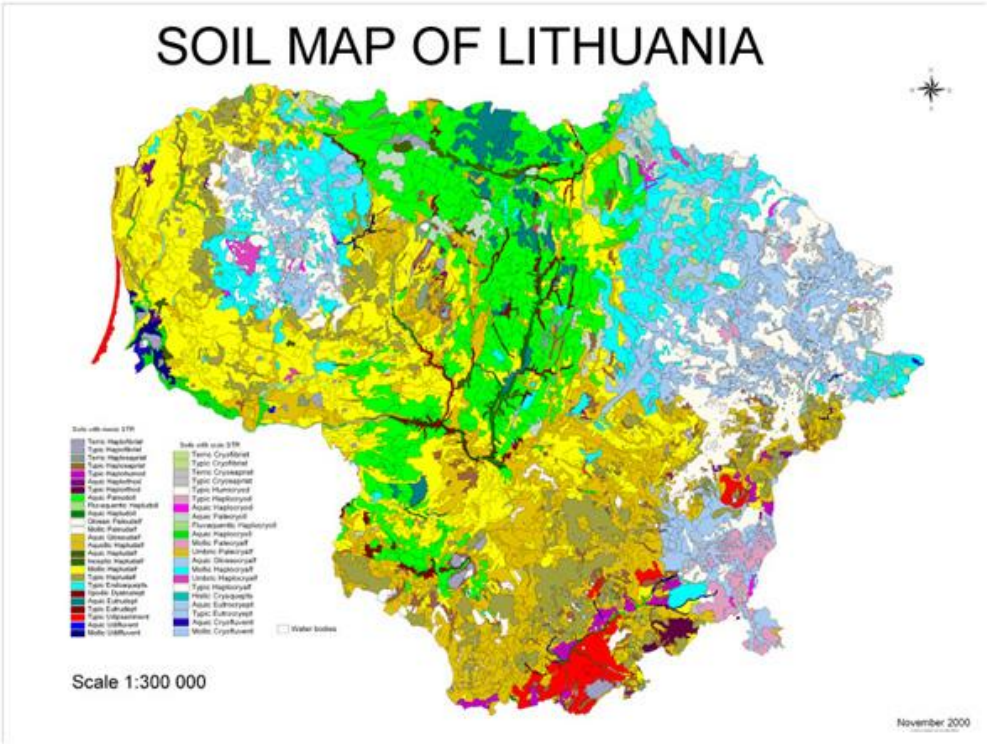



**Fig. 2** Soil map of Lithuania

# The habitats moisture index by national hydrotops classification

N – mineral soils of normal moisture;

L – temporarily overmoist mineral

(gley) soils;

U – permanently overmoist mineral (gley) soils;

P – organic peatland soils (Vaičys, 2006).

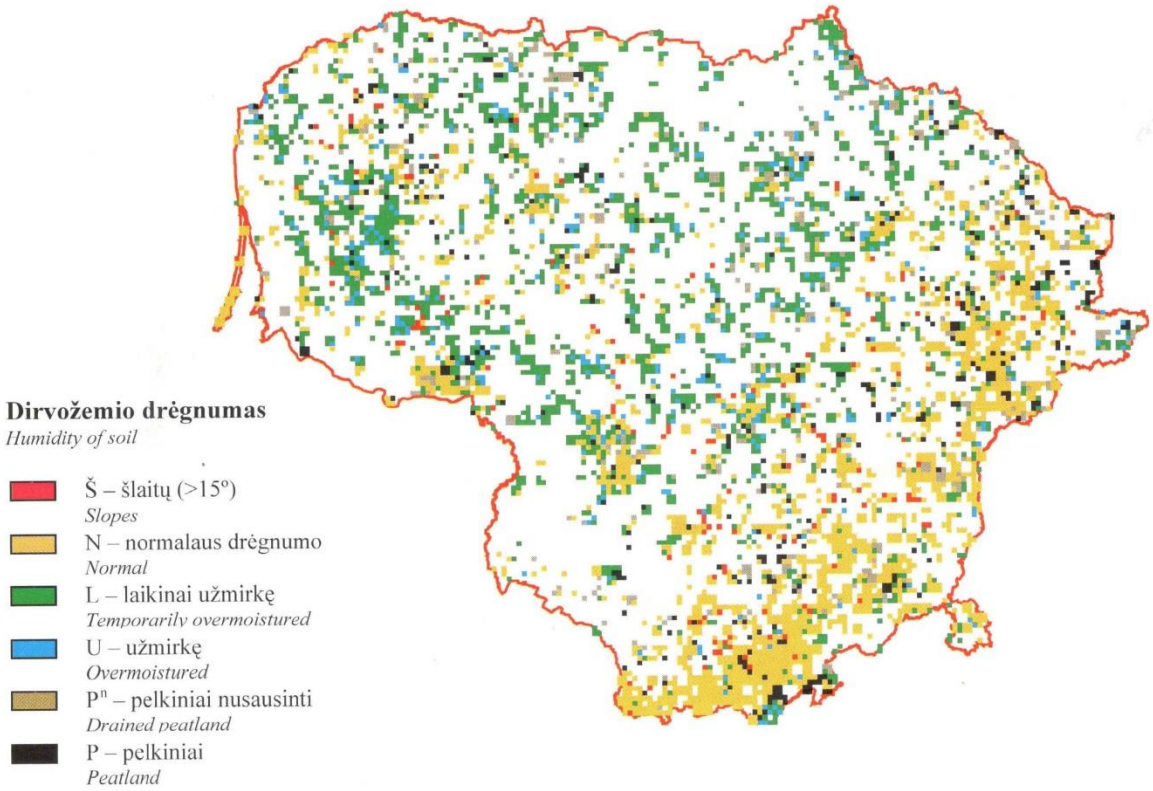



**Fig. 3** Forest land by soil moisture (Kuliešis et at., 2007)

# Forests in Lithuania

Image source: S.Stankevičius

# Forests in Lithuania

- Lithuania is on the edge of maritime and continental sectors of the mixed zone of broad-leaved and spruce forests.
- The largest forests are pine-woods, while smaller areas can be covered by birch, spruce, aspen, black alder forests.

# Forests in Lithuania

Forests by dominating tree species are:

- Pine-woods – 37,6 %;
- Spruce – 24,0 %;
- Birch – 19,5 %;
- Alder – 5,6 %;
- Black alder – 5,6 %;
- Ash – 2,7 %;
- Aspen – 2,6 %;
- Oak – 1,8 %;
- Other – 0,6 %.

The largest Lithuania‘s forested areas are:

- Dainavos forest – 1450 $km^2$;
- Labanoro-Pabradės forest – 911 $km^2$;
- Kazlų Rūdos forest – 587 $km^2$;
- Karšuvos forest – 427 $km^2$;
- Rūdninkai forest – 375 $km^2$.

# According the national legislation and the regulations of reforestation...

- The soil should be prepared continuously (plowing, milling, cultivation) or partial (plowing up furrows, making sites, mounds and so on.) depending on the area of planting conditions.
- We can not prepare the soil in permanenty overmoist and undrained peatland forest sites, 35 ° and steeper slopes.

# The main methods of afforestation in agricultural areas

Plowing in the forest or stand of trees in an area where there was no previous tree cover. Trees are planted in the bottom of the furrow.

# The main methods of reforestation in clear cut areas

Milling in clear cut areas the process of restoring and recreating areas of forests that may have existed long ago but were deforested or otherwise removed at some point in the past.
Trees are planted in the bottom of the furrow.

# The main methods of reforestation in clear cut areas

In the temporarily overmoist mineral (gley) soils are formed hill of the soil. Trees are planted at the top of the hill.

# Tree planting machine RZS-2

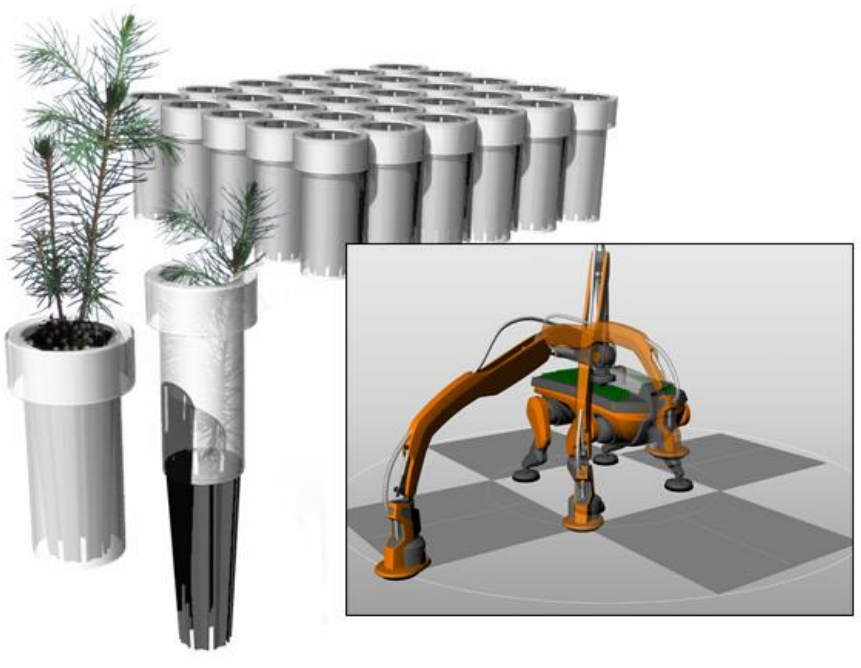
Planting by one or two employees. One of them can control hydraulic distributor and to lift mechanism at the stumps.

# The most popular forest regeneration practise in Lithuania

# The most important thing in forest regeneration is ...

...human resources.

# What will be in future?



Source: Anna-Karin Bergkvist

May this tree planting robot can save the earth?

# MINERALIZATION & MECHANIZED REGENERATION

Toomas Väät

Head of division
Silviculture division
State Forest Management Centre (RMK)

# RMK in brief in 2016

| | |
|---|---|
| ✓ Forest land | 970 000 ha |
| ✓ Turnover / profit | 178,5 M € / 50,6 M € |
| ✓ To the state budget | 24,5 M € |
| ✓ Selling volume | 4,0 M $m^3$ |
| ✓ Employees | 688 |
| ✓ Partners employees | 6000 |
| ✓ Cost to forest improvement | 23,5M € |
| ✓ Used plants | 20,2 M |
| ✓ Young stand cleaning | 43 300 Ha |
| ✓ Renewed forest area | 9800 Ha |
| ✓ Average clearcut area | 1,5 Ha |
| ✓ Reforestation of clearcut areas | Average 4,4 years *(pine: min 1500 pc, H=0,5 m)* |
| ✓ Forest sowing | 272 Ha |
| ✓ Soil scarification | 7820 Ha |
| * Mounds | 370 Ha |
| ✓ Silviculture division | 3 regions / 32 silviculture manager |
| ✓ Forest renewal works | Average 1 964 ha / manager |

# MINERALIZATION

Skider: John Deere 648GIII
Disk trencher: Bracke S35A
Sower: Sigma Seeder

# MINERALIZATION

Skider: John Deere 648GIII
Mounder: Bracke M26A

# MINERALIZATION

Valtra Valmet 6350 Hitech
Disk trencher and sower: TPF

# MINERALIZATION

Forwarder: Logset 4F / Valmet 840
Disk trencher: Bracke T21 / UOT 3000
Sower: Sigma II

# MINERALIZATION

Excavator: JCB 130 LC

1. Wet sitetypes 45 %

2. Hard to access / distributed (average forwarding 650m)

3. Excavator mounding 3 years experience (expensive but saves 1 year cleaning costs)

4. Lack of machinery and service providers on the market for procurement

toomas.vaat@rmk.ee

# Mechanization of scarification, planting and cleaning -Finland

Timo Saksa
Natural Resources Institute Finland

NB NORD workshop & seminar
Riga 12.5.2017

# Mechanized soil preparation

Timo Saksa



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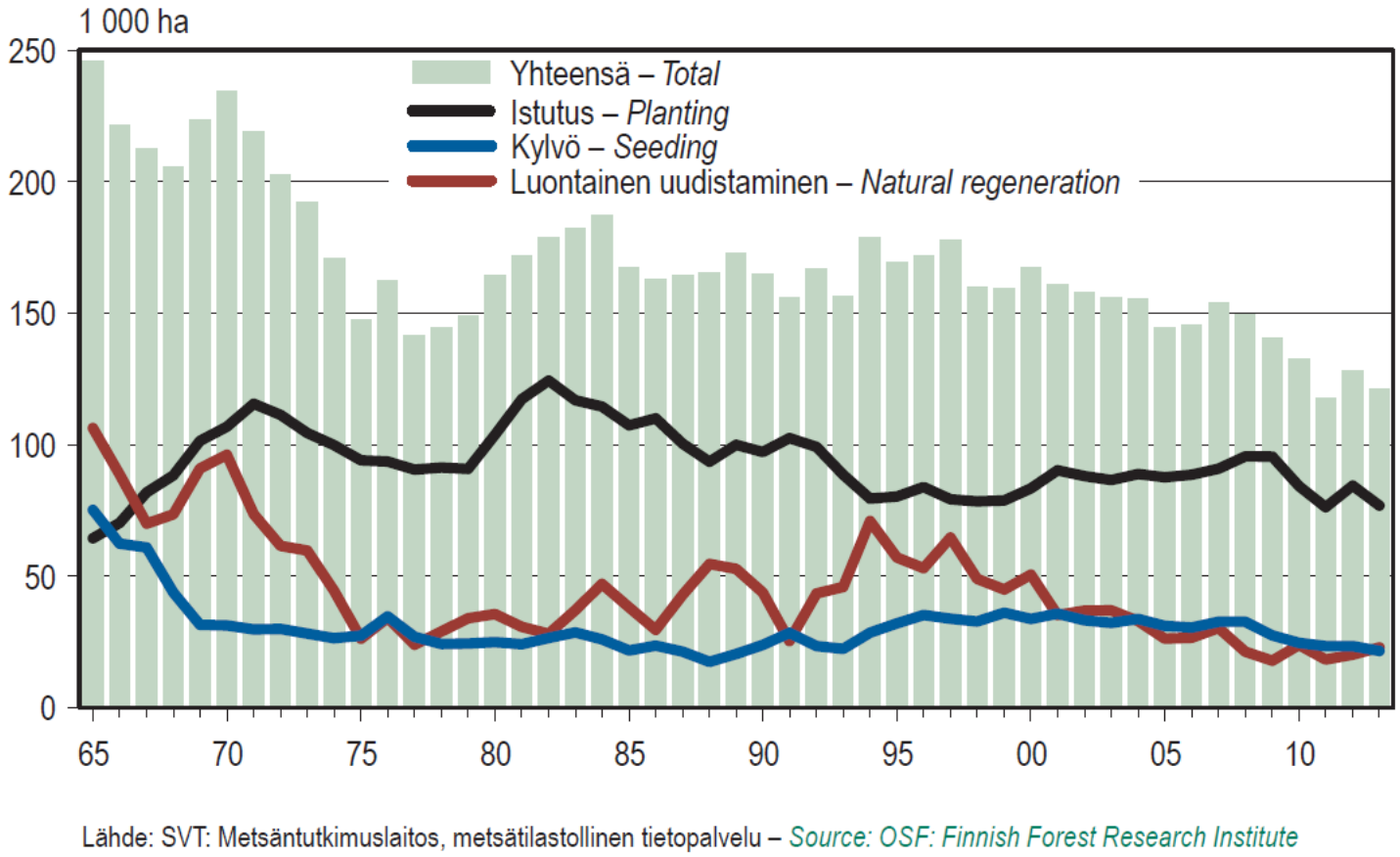
# Forest regeneration in Finland




Lähde: SVT: Metsäntutkimuslaitos, metsätilastollinen tietopalvelu – *Source: OSF: Finnish Forest Research Institute*

In the last years 120 000 ha /year

After 2000: natural regeneration 20 %, direct seeding 20 %, planting 60 %



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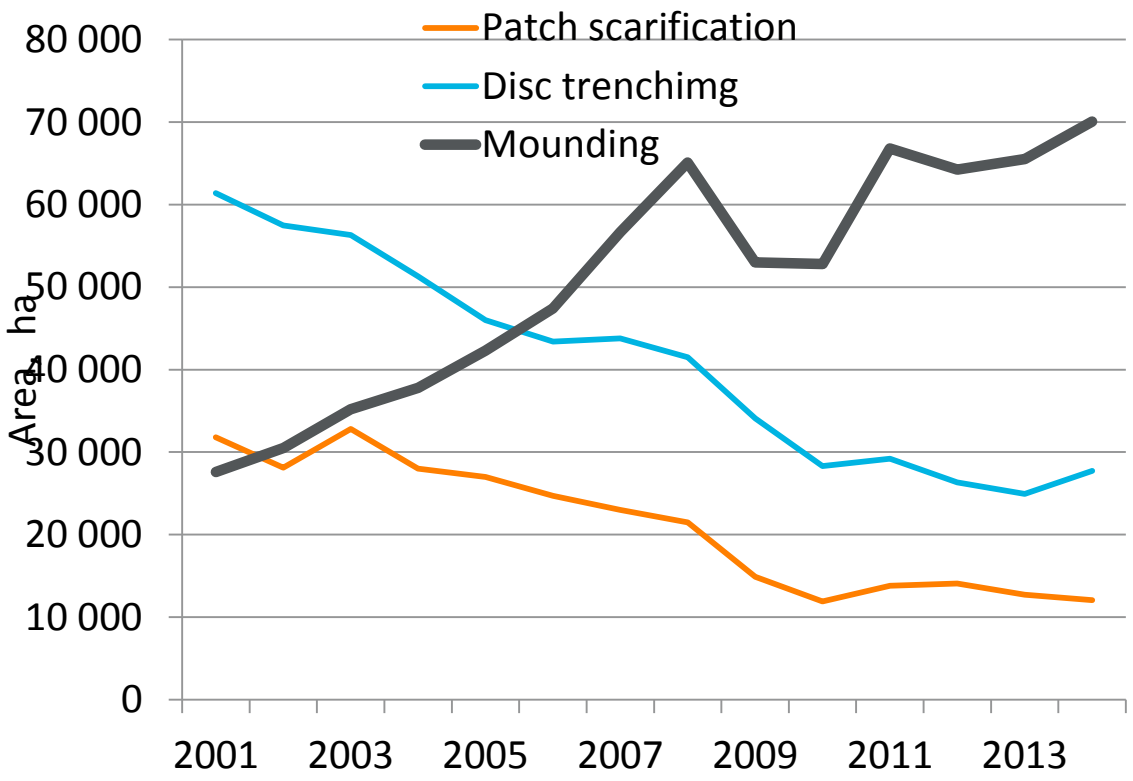
# Soil preparation

Total forest regeneration area about 120 000 ha yearly.

Soil preparation area 100 000 – 110 000 ha yearly.

Nearly all planting sites are soil prepared.

Today mounding is most common soil preparation method especially on planting sites.



# Selection criteria for soil preparation method

Fertility of site (competition from ground vegetation)
- poor sites → just open the soil surface
- fertile sites → elevated position for planted seedling

Soil texture (frost heaving)
- fine textured soils → minimize frost heaving (cut capillary water movement with soil preparation)

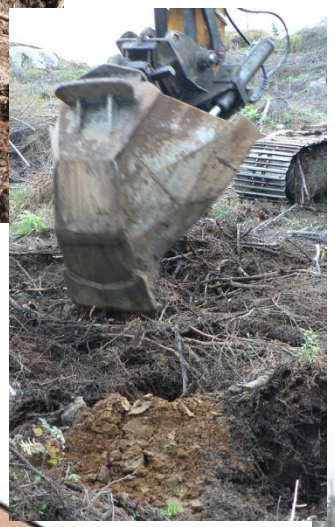
Watertable
- adjust soil preparation method with ditching operations

Tree species
- density of soil preparation tracks according to the tree species in question

The special properties of the regeneration site
- stoniness, declination, water protection etc.

# Choice of soil preparation method






Wet

Water table

Dry

Mounding with drainage ditches

Mounding with small ditches

Spot mounding

Inverting

Disc trenching
Patch scarification

Fine

Medium coarse

Coarse

Soil texture





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# Choice of soil preparation method

**Dry sites (***Cladonia* , *Vaccinium* forest site types**)**

Scots pine as domidant species
- -natural regeneration
- - direct seeding
- - (planting)

Competition from ground vegetation is rather low

Open the mineral soil or move the raw humus layer away

→ Disc trenching or patch scarification


# Choice of soil preparation method

**Fertile sites** (*Myrtillus and Oxalis-Myrtillus* forest site types)

Norway spruce, Silver birch

Scots pine on the most barren sites

- planting

Competition from ground vegetation is high

The planting point should be a bit higher than the ground level

→ mounding

- mounding method should be chosen according to water relations on the site


# Spot mounding

Water relations should be in good condition.



# Inverting

Water relations should be in good condition.



# Mounding with small ditches


Small ditches have only a very local drainage effect .

# Mounding with drainage ditches


The site needs real drainage and excess of water have to be transfered away from site.






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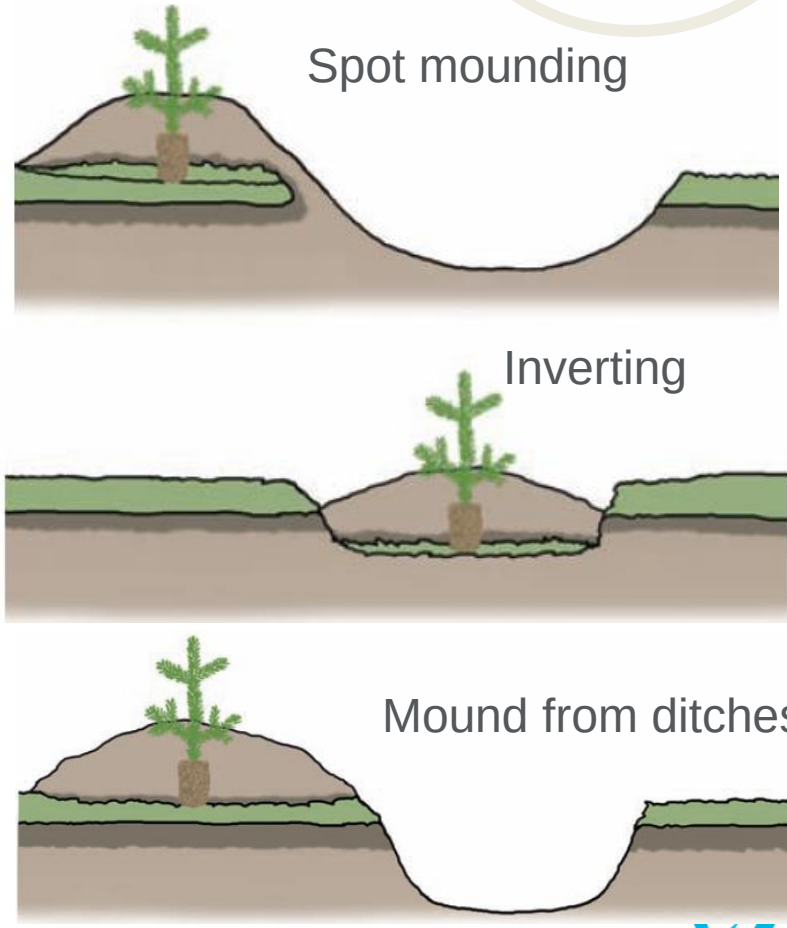
# Optimum mound

**In spite of mounding method the seedling should be planted so that its roots will reach the humus layer inside or below the mound.**

**Planting depth should be at least 5 cm because erosion makes the mound lower.**



# Mechanized planting

Timo Saksa



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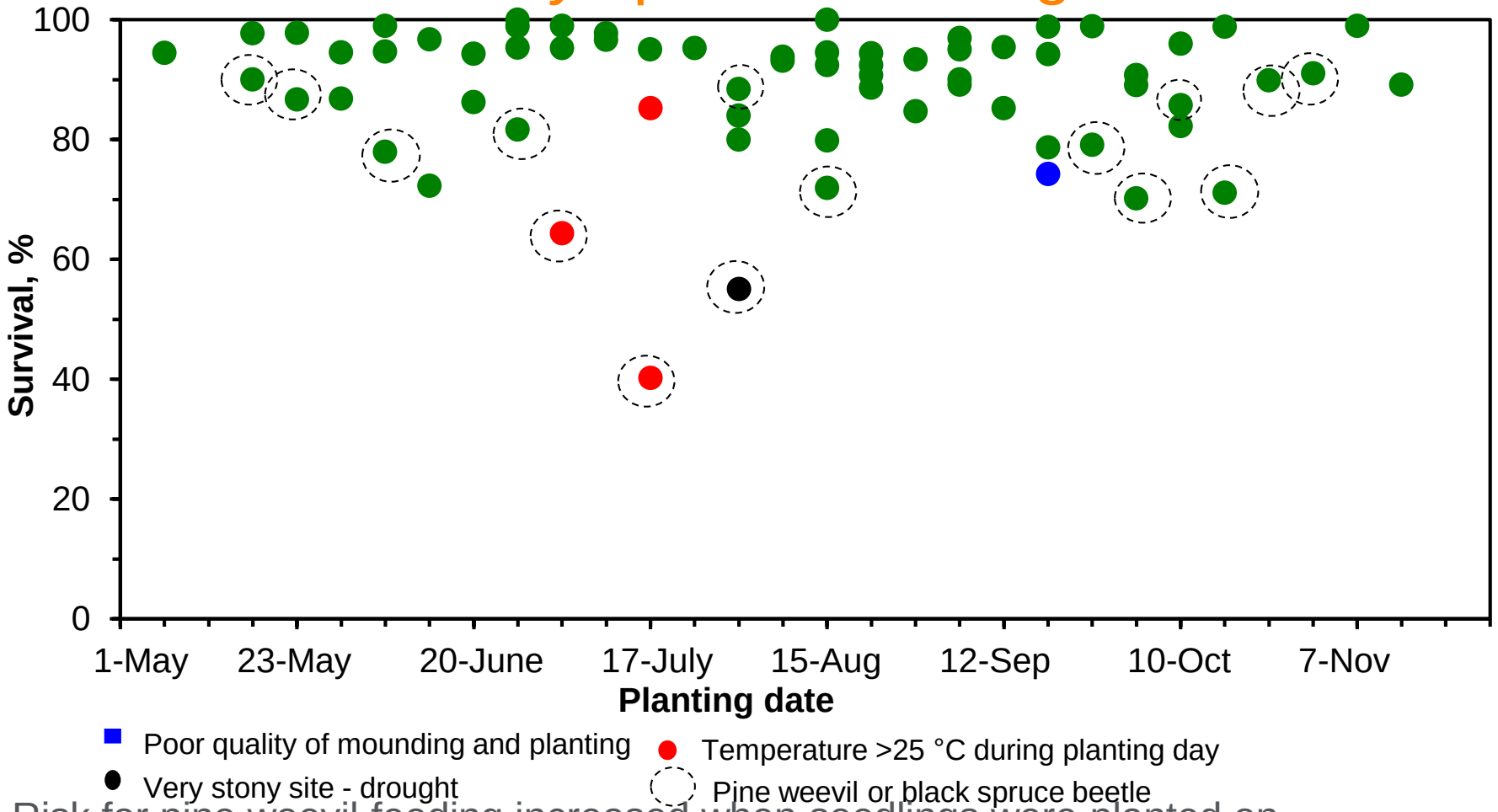
# Three planting machines models, same working principle

## Bracke, M-Planter, Risutec




About 40 devices in Finland, 3-4 % of seedlings are planted with machines.
Planting period from beginning of May to beginning of October.

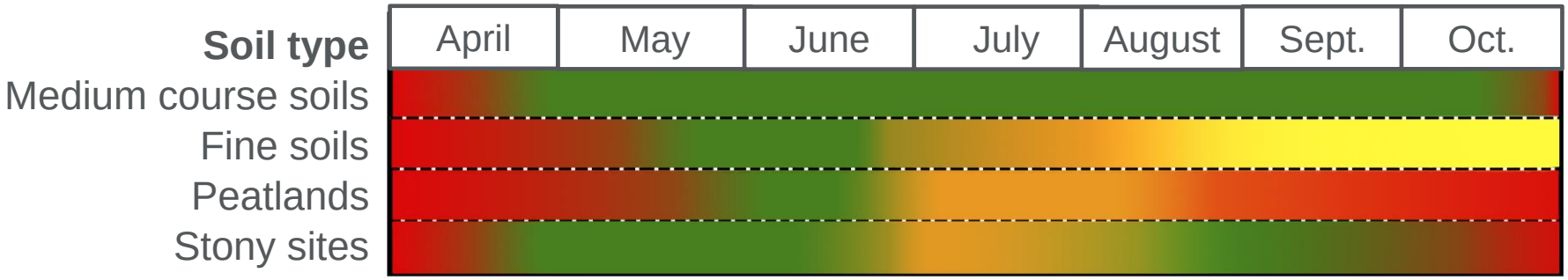
# Effect of machine planting or planting date on survival of Norway spruce seedlings were minor




Risk for pine weevil feeding increased when seedlings were planted on humus-dominated mounds or seedlings suffer drought just after planting

Based on Luoranen, J., Rikala, R. & Smolander, H. 2011. Machine planting of Norway spruce by Bracke and Ecoplanter… Silva Fennica 45(3): 341-357.

# Any restrictions when selecting sites to different planting windows?




**Green** color is the recommended window for a soil type

**red** for windows with ground frost (deeply frozen, slow thawing)

**orange** for sites and windows with high drought risk

**yellow** for sites and windows with high risk of frost heaving

Avoid to plant

- easily drying sites in summer (course, stony)
- fine textured soils in autumn

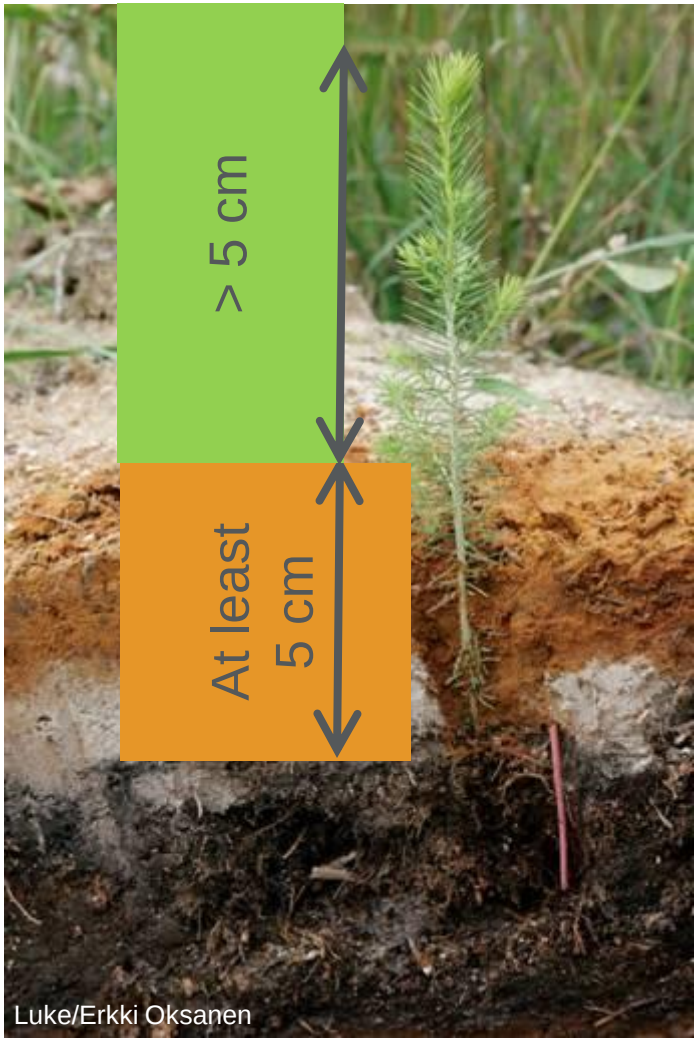
Plant tree species suitable for site type: not spruce in too dry sites


Risto Rikala

# Requirements of seedlings in machine planting

- Tree species: spruce, pine, deciduous species (at least silver birch in Finland)
- Same origin and healthy criterion as for manual planted seedlings
- Developmental stage of seedling material is suitable for planting window
- Root binds the peat plug, but roots have not grown from plug to plug or root density within a plug is not too high
- Seedling size is suitable to used growing density and cell volume

# Target size of machine planted seedlings 11–20 cm for pine, 14–30 cm spruce




**At least a half of shoot should be above the soil surface:** Enough green biomass above the soil surface to ensure good growth and survival of seedlings

Uniform mineral soil layer on the mound have to be approximately 5 cm thick

Root plug have to be planted into the double humus layer in the middle of mound

- drought
- frost heaving

# Mechanized PCT

Timo Saksa



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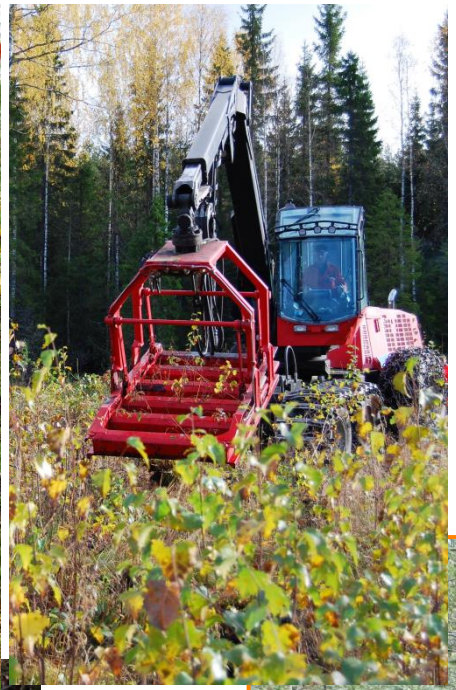
# Mechanized PCT



**A recent estimate suggested that machines account for less than 1 % of the early cleaning and pre-commercial thinning work in Finland.**

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# Uprooting

# Naarva uprooter (Pentin Paja Oy)

## Working principle

Uprooting device is attached to harvester boom tip and use hydraulic jaws to grip and lift unwanted trees from the ground and break their roots.

Afterwards these uprooted broadleaved trees will not sprout again which means that there is no need for later pre-commercial thinning in the young stand.

# Naarva uprooter

**Young plantations**

**The timing of uprooting operation is essential. The height of crop trees should not be much more than one meter.**

**According to studies 3%-6% of crop seedlings are seriously damaged during the uprooting operation.**

**Uprooting can be used also in direct seeded Scots pine stands as early cleaning device.**

# Naarva uprooter

## Productivity

**According to time consumption studies the measured mean time consumption of uprooting was 6.3 pwh/ha for Naarva P25 device.**

**Productivity decreased as the number of broadleaved saplings and their height increased.**





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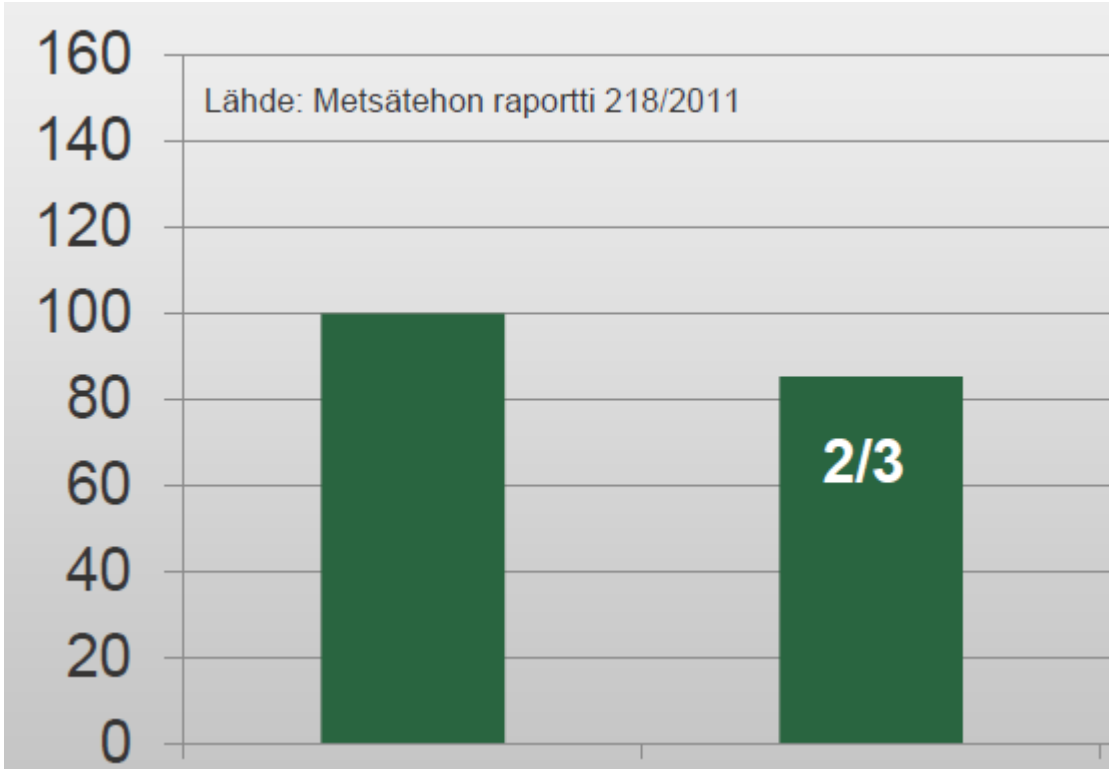
# Naarva uprooter

**Competitiveness**

**If no later pre-commercial thinning is needed (in 2/3 of cases), cost-efficiency can reach the level of the motor-manual work.**

**Worksite selection for mechanized uprooting and right timing of the work are the key factors.**




EC= early cleaning, PCT=pre-commercial thinning

# New innovation:
# Biocontrol of sprouting after early PCT

*Chondrostereum. purpureum* fungus was sprayd trough the cutting device on the new stump in order to prevent sprouting.

First practical level experiments ongoing.

# Thank you!

Luke
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INSTITUTE FINLAND

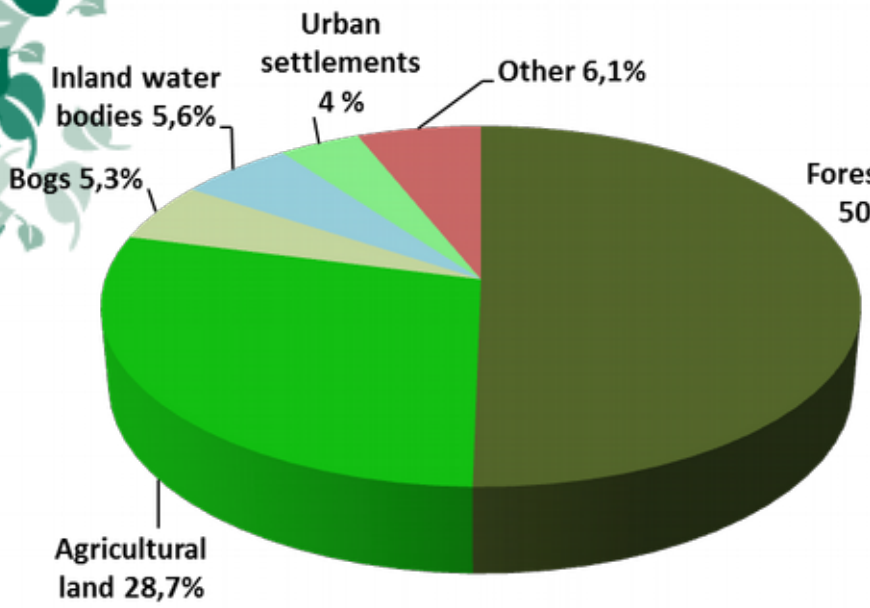
# Forest regeneration and management of young stands in Estonia

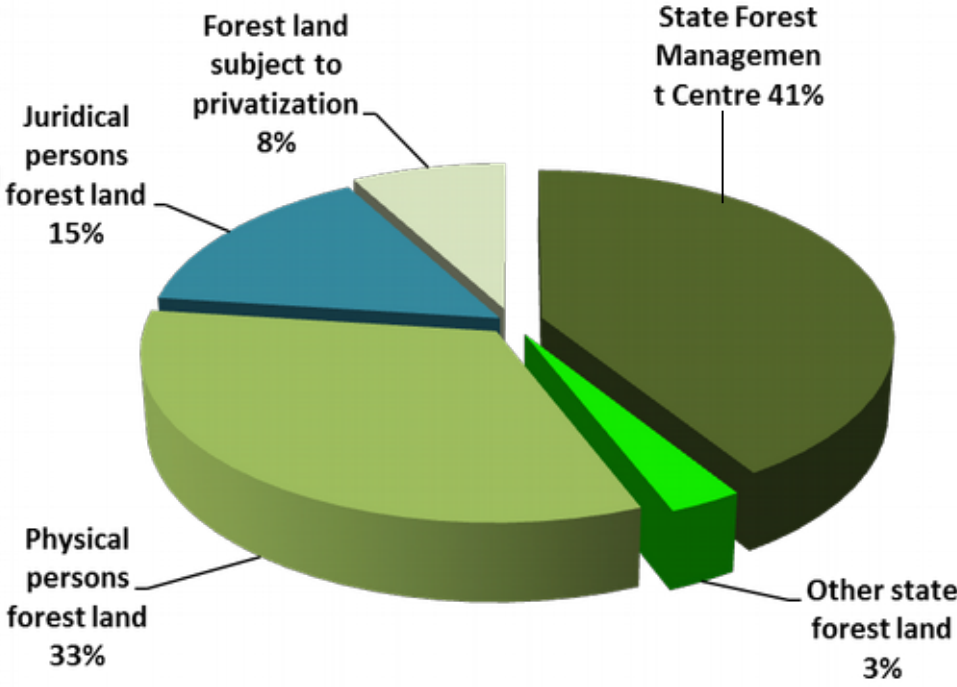
dr. Marek Metslaid,
Sigitas Girdziušas

www.emu.ee
Eesti Maaülikool
Estonian University of Life Sciences
Institute of Forestry and Rural Engineering

12 May, 2017 Riga

# Total area of Estonia by land categories and ownership categories

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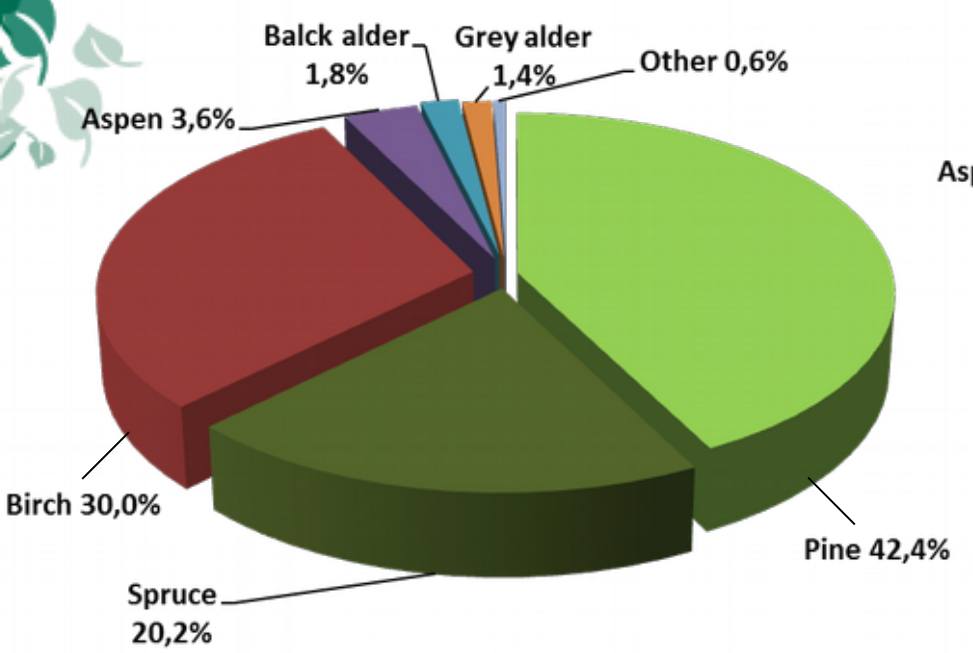
EMU Estonian University of Life Sciences

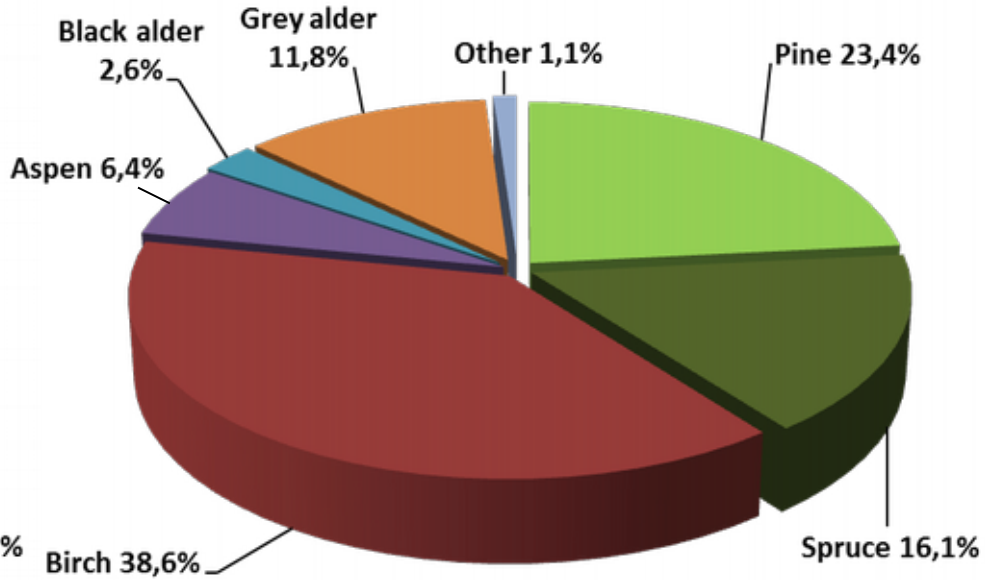
*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Distribution of forest land area by tree species

State forest




Private forest

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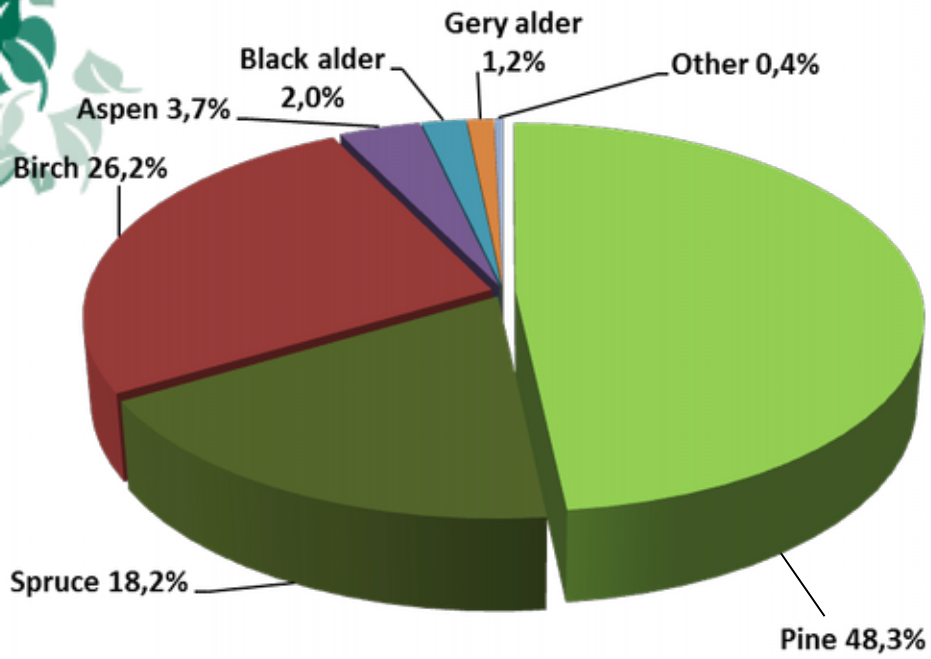
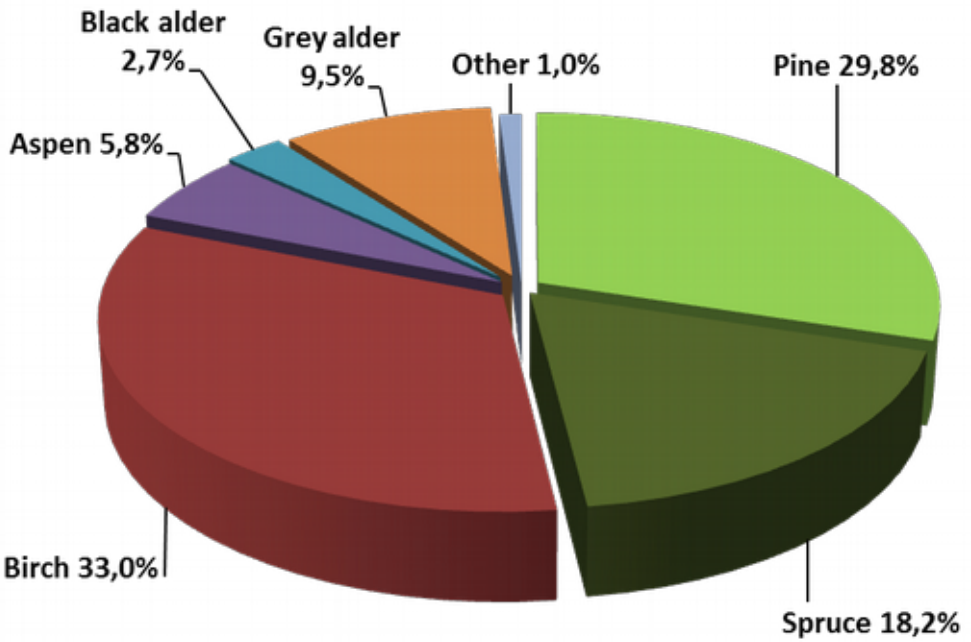
*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Distribution of growing stock by tree species

State forest




Private forest

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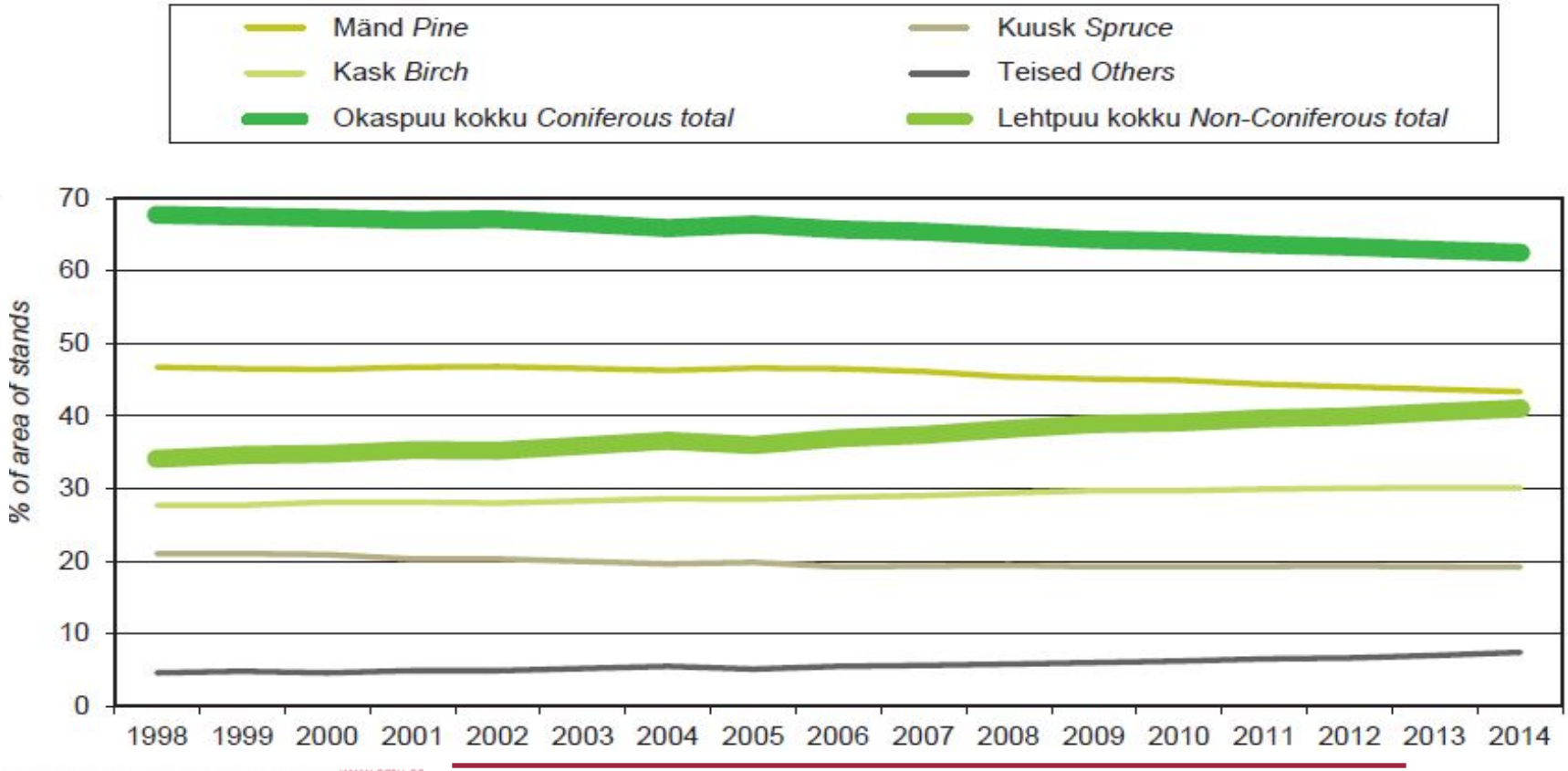
*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Changes in dominant tree species in forests with management plan: State forests

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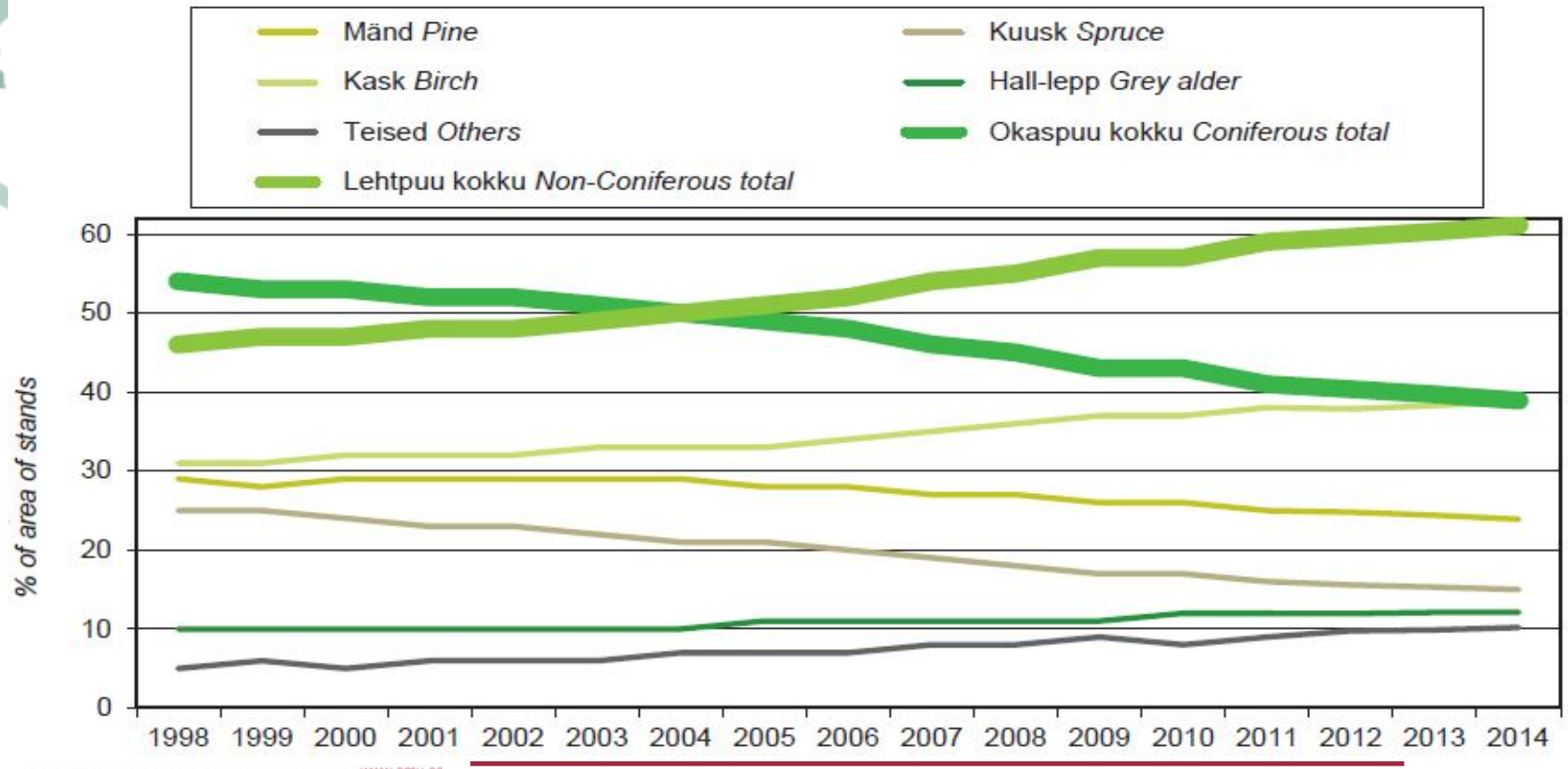
*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Changes in dominant tree species in forests with management plan: private forests

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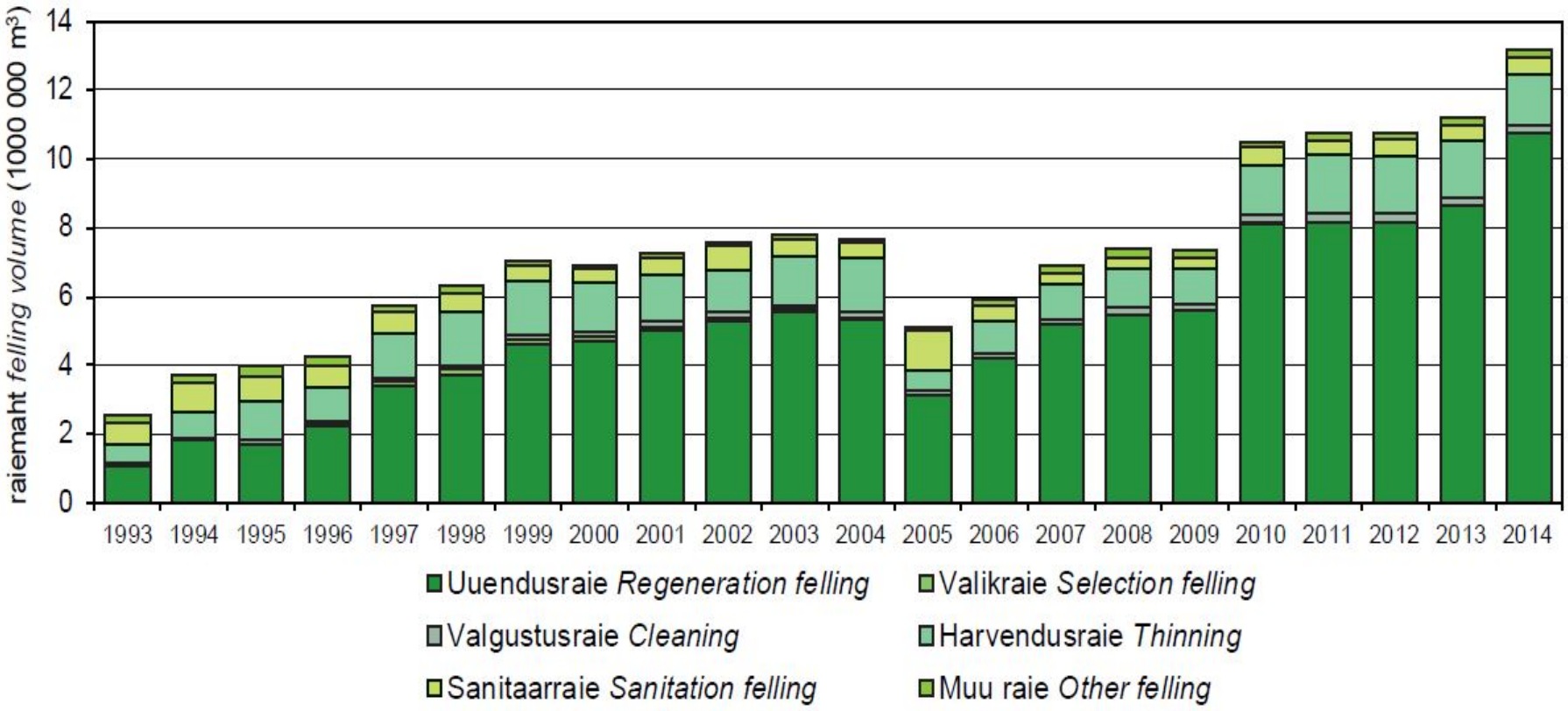
*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Felling volume by felling types in 1993-2014

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*Source: Estonian Environment Agency*
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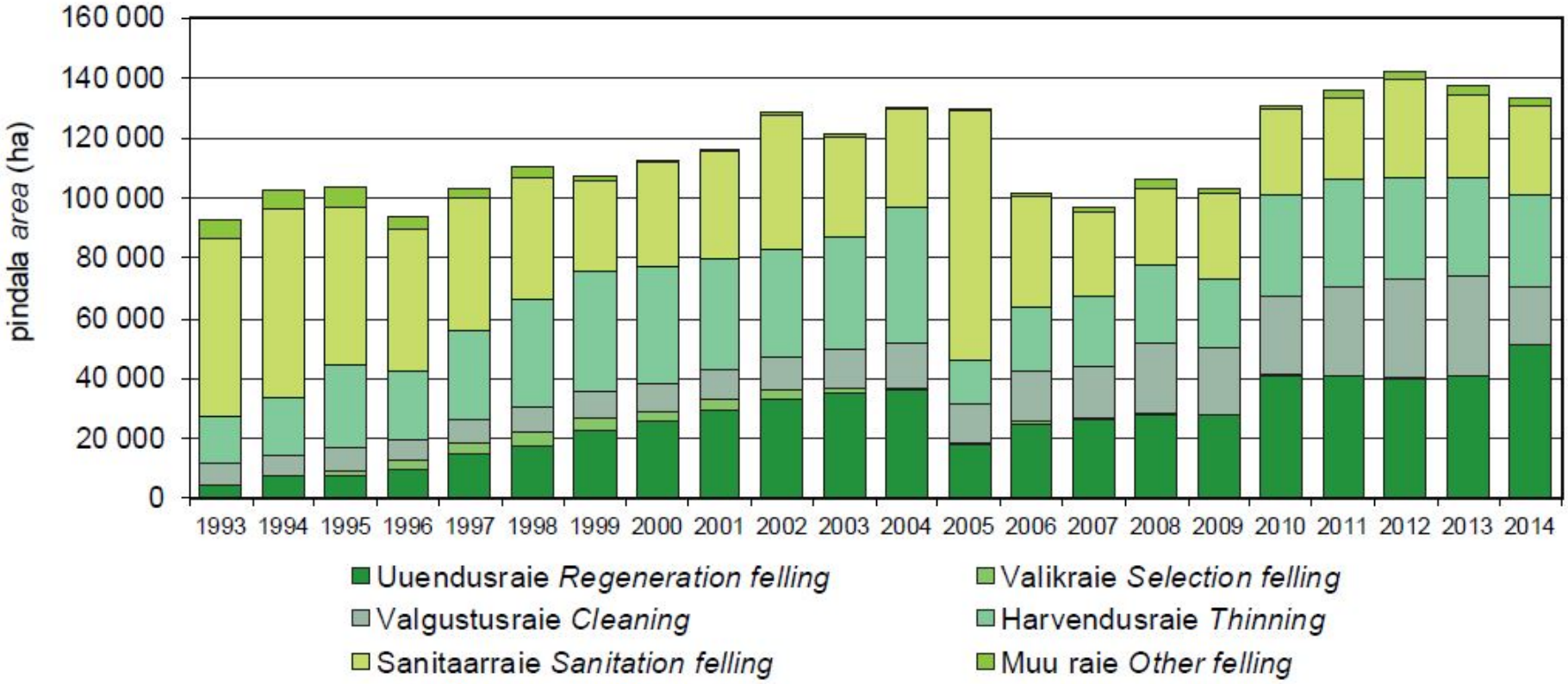
# Felling area by felling types in 1993-2014

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*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Tree nurseries

| Year | Number of forest nurseries | Number of producers | Total area (ha) | Area of greenhouses (m²) |
|---|---|---|---|---|
| 2002 | 144 | 66 | 259.1 | 27 652 |
| 2003 | 133 | 71 | 265.3 | 28 159 |
| 2004 | 144 | 104 | 81.8* | 40 428 |
| 2005 | 164 | 129 | 85.9* | 55 206 |
| 2006 | 157 | 140 | 97.4 | 51 814 |
| 2007 | 131 | 115 | 85.9 | 63 763 |
| 2008 | 103 | 82 | 68.7 | 64 595 |
| 2009 | 84 | 77 | 59.0 | 39 048 |
| 2010 | 81 | 69 | 67.9 | 48 733 |
| 2011 | 77 | 67 | 75.1 | 53 185 |
| 2012 | 80 | 68 | 76.6 | 61 434 |
| 2013 | 83 | 70 | 72.4 | 68 126 |
| 2014 | 86 | 75 | 74.7 | 77 311 |

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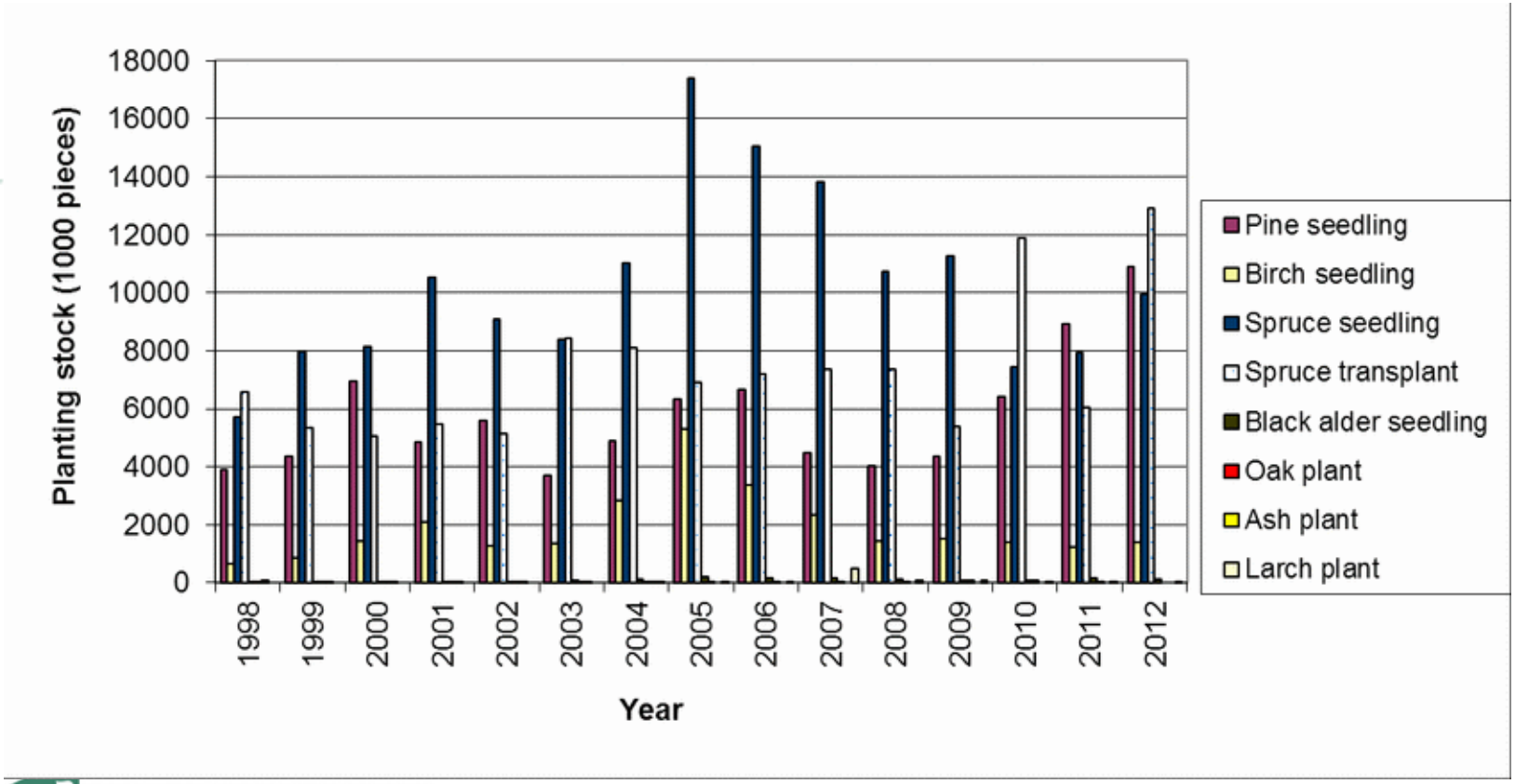
*Production area – without fallow

*Source: Estonian Environment Information Centre*
Yearbook FOREST 2007; Yearbook FOREST 2009

*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Planting stock produced in forest nurseries in 1998-2012




Eesti Maaülikool
Estonian University of Life Sciences

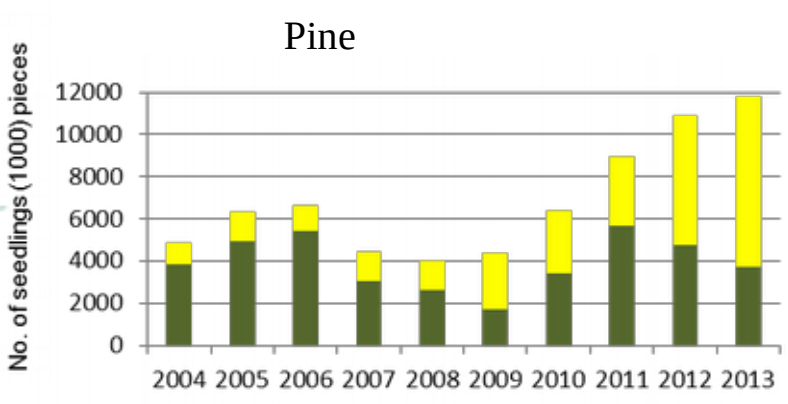
*Source: Estonian Environment Agency (KAUR)*
Yearbook FOREST 2013

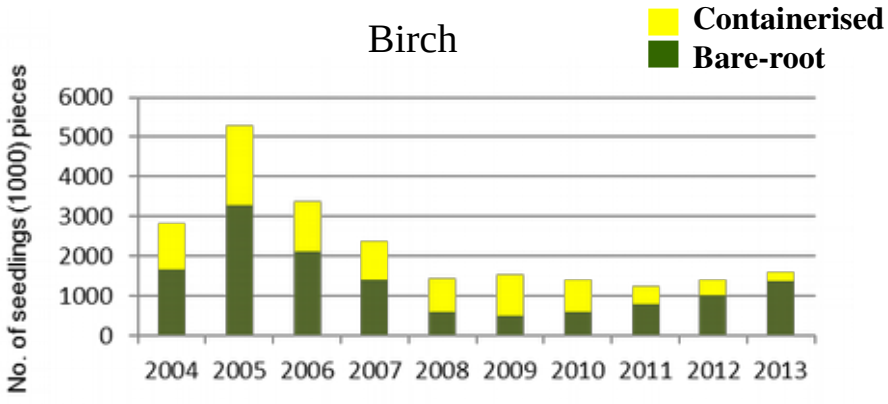
- Norway spruce transplants and containerised seedlings
- Scots pine seedlings and containerised seedlings
- silver birch seedlings, transplants and containerised seedlings
- black alder seedlings and containerised seedlings
- oak (*Quercus robur*) seedlings
- larch (*Larix sibirica*) and hybrid larch (*Larix* × *eurolepis* Henry) seedlings and containerised seedlings
- hybrid aspen (*Populus tremula* × *Populus tremuloides*) micropropacated containerised seedlings

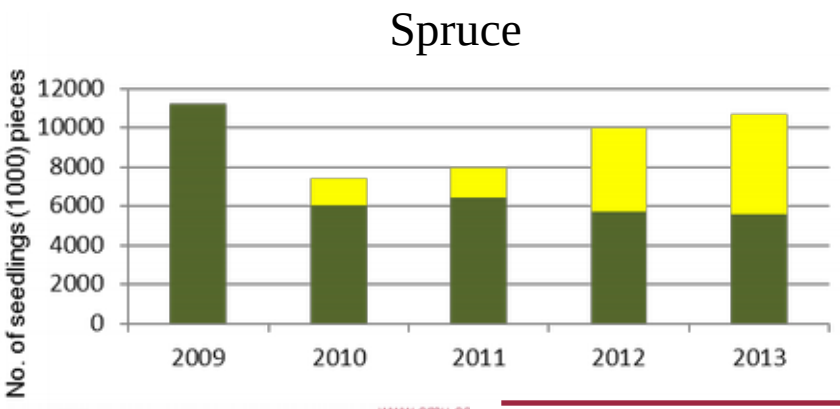


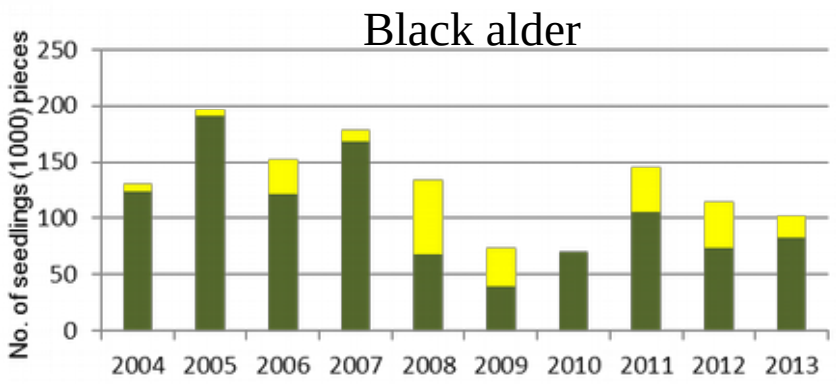
*Source: Estonian Environment Agency* (KAUR)

# Containerised seedlings vs. Bare-root seedlings




www.emu.ee
Eesti Maaülikool
Estonian University of Life Sciences

*Source: Estonian Environment Agency*
Yearbook FOREST 2014

# Recent trends in plant production

- In 2012-2014, in average 27 million seedlings was produced annually:

  - 78% produced by the state

  - 48% containerised seedlings

- In 2012-2014, in average 1.8 million seedlings were imported annually



*Source: Estonian Environment Agency* (KAUR)

# Plant production in private forests

- Origin of Norway spruce bare-root seedlings in private forests in 2015:

  49% from Latvia

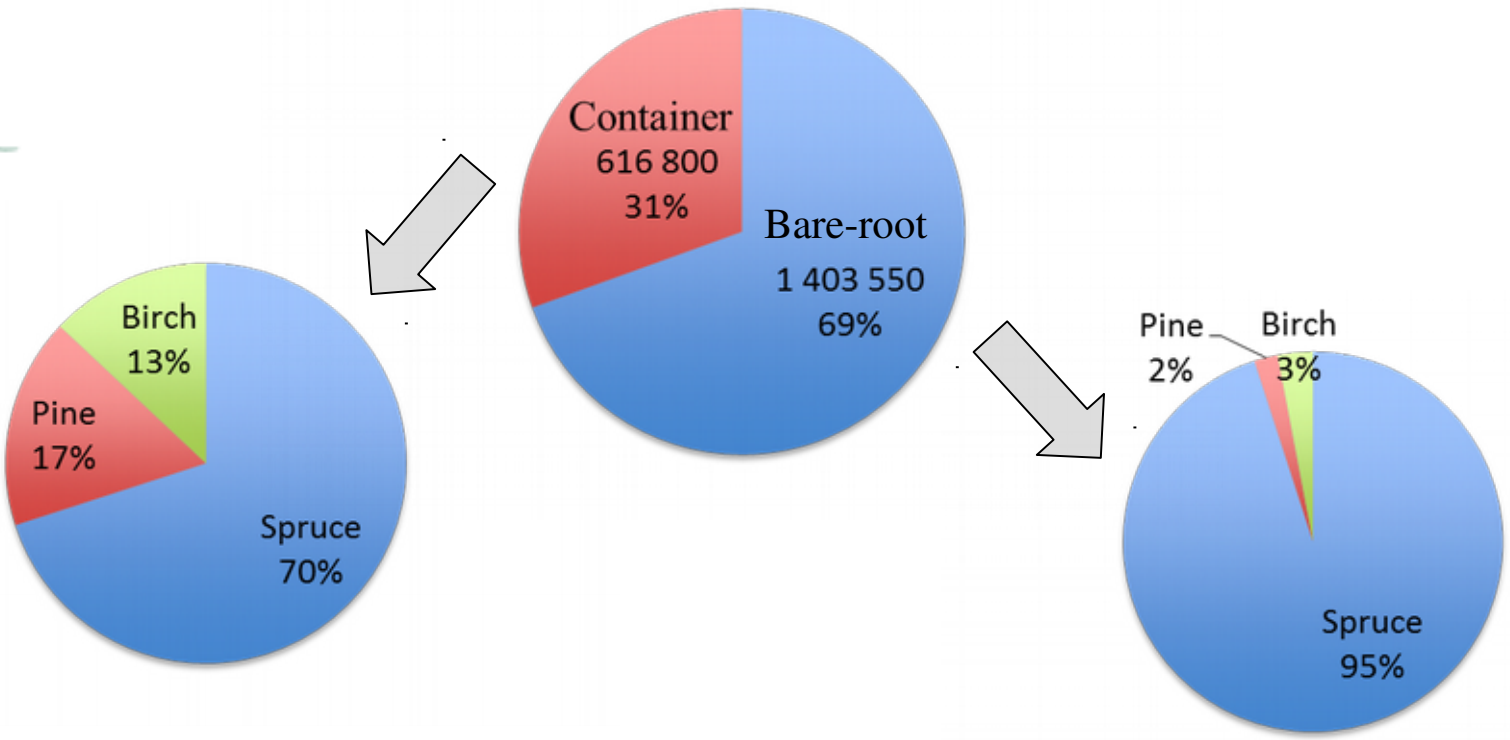
  27% from Estonia (80% from RMK nurseries)

  24% from Lithuania



*Source: The Foundation Private Forest Centre (PFC)*

# Plant production in private forests

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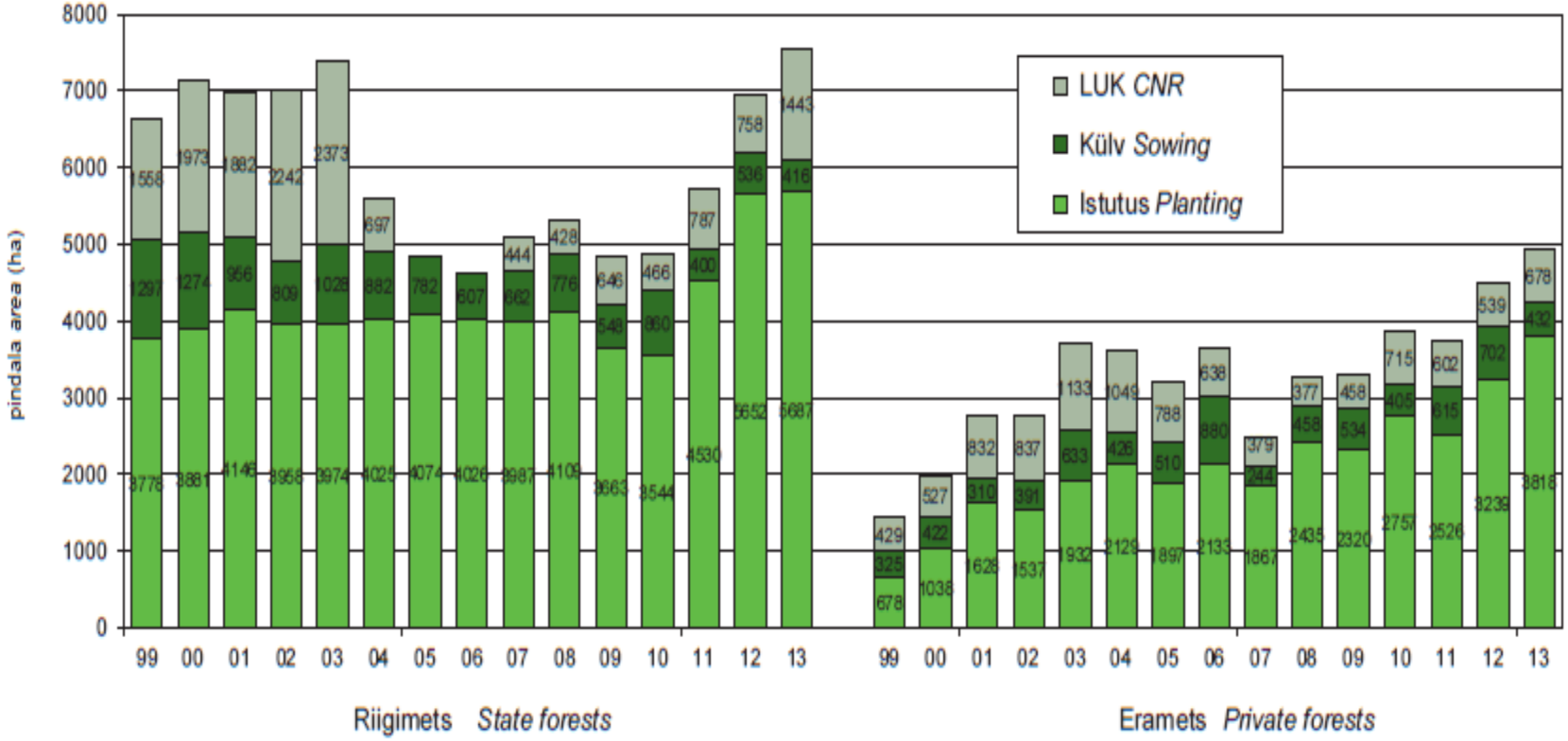
*Source: The Foundation Private Forest Centre (PFC)*

# Forest regeneration in state and private forests in 1999-2013

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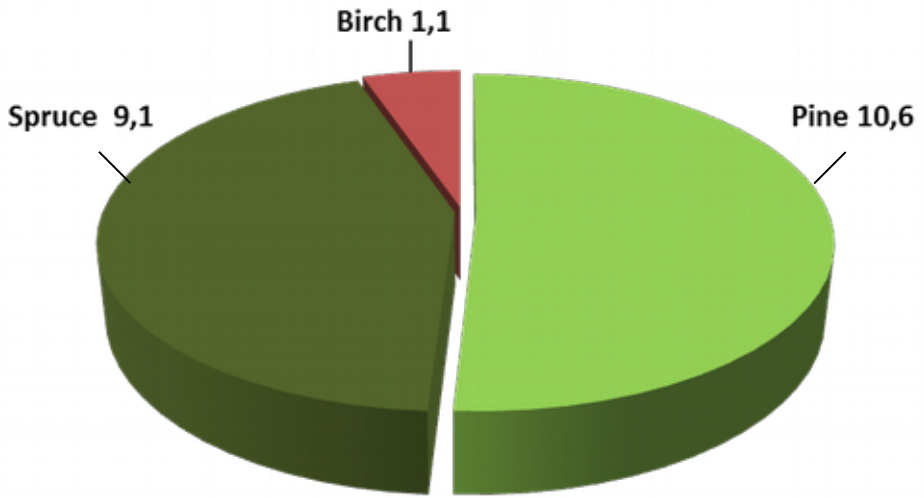
*Source: Estonian Environment Agency (KAUR)*
Yearbook FOREST 2013

# Planting of different tree species in state forest by number of plants in 2017

- Regeneration area: 11 000 ha;
- 21 million of trees are going to be planted:






*Source:* RMK

# Forest regeneration works in State Forest Management Centre (RMK) in 2015

- Planting mainly in spring and since 2012 planting also in autumn
- 19.3 million seedlings in 2015 (0.8 million in autumn)

  (*18.5 million seedlings in 2014*)
- Autumn planting – September/October – Norway spruce
- Regeneration area – >10 000 ha (1/5 left for natural succession)

  - expected natural regeneration of birch, aspen and black alder
- Plants needed by RMK are produced in 8 nurseries all over Estonia



*Source: State Forest Management Centre (RMK)*
*http://www.rmk.ee/organisation/press/news/news-2015/a-total-of-19-dot-3-million-trees-were-planted-in-the-state-forest-this-year*

# Mechanical site preparation

- In State forests different soil scarification methods are used:
  - disc trenching (75%)
  - patch scarification (20%)
  - mounding (5%)

- In private forests the most common methods are:
  - disc trenching;
  - followed by patch scarification;
  - recently (in drained peatland forests) excavators are used to reconstruct forest drainage systems and to make soil scarification simultaneously (quite expensive).

# Mechanized planting

- In **State forests** mechanized planting is not practiced, and only manual tree planting is used to regenerate the forests.
- Seedlings are planted with spades, planting tubes (e.g. *Pottiputki*) or other similar tools.
- Similarly, in **private forests** manual tree planting is still the most widespread planting method used today.
- In **State forests** mechanized seeding is carried out on 90% of sowing sites.
- In **private** forests mechanized seeding in conjunction with disc trenching is used.

# Pre-commercial thinning

- In Estonia, motor-manual pre-commercial thinning with a clearing saw is prevalent method in young stand management.

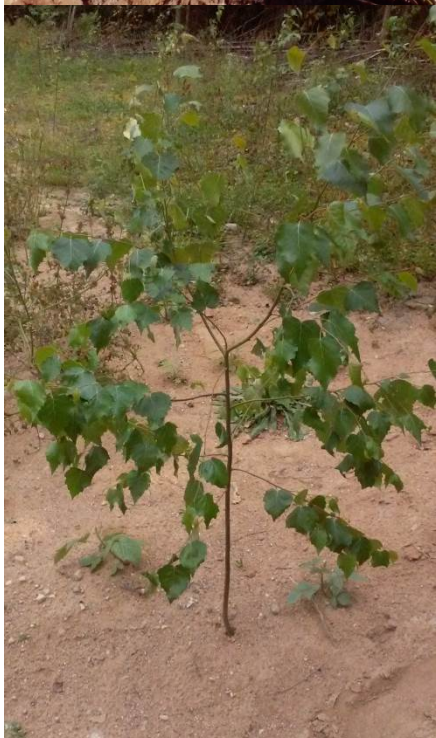
  - rather cheap method, with the main costs related to labour, and no need for expensive equipment, tools as well as materials.

- In some cases chainsaws are also used in pre-commercial thinning .

# THANK YOU!

Marek Metslaid: marek.metslaid@emu.ee

Sigitas Girdziušas: sigitas.girdziusas@stud.emu.ee




www.m-planter.fi

# Benefits of the mechanical planting

- Efficiency: Mounding and planting at the same time.
- Enables additional soil construction during planting.
- Similar planting quality: One man + one machine.
- Fresh mounds: Planting immediately after mounding.
- Other applications: Spreading of fertilizer, water, herbicide…

# Background of M-Planter

- Mechanical soil preparation and manual planting since 1970's.
- Contracting and manufacturing of excavator applications for soil preparation (mounding).
- Development of excavator based planter.

# M-Planter

- Combining of mounding and planting.
- 2005: The first prototype of the two-headed mounding planter M-240.
- 2007: The second prototype of M-240.
- 2008: Serial manufacturing of standard models for the domestic market.



# Product development continues

- 2013: M-160 – Single-headed mounding planter for harvester.
- 2015: Development of customized models for export market.
- 2016: M-320 – Two-headed planter for eucalyptus and acacia in Indonesia.

# What M-Planter requires?

- Pot seedlings
- Base machine: min 12-17 ton excavator with:
  - Electrically piloted hydraulics
  - 160-170 bar hydraulic pressure
  - 100 l/min hydraulic flow
  - 1-7 buttons from joysticks

# Seedling carrier

# Standard models


M-120

| | |
|---|---|
| Weight: | 900 kg |
| Width: | 1 000 mm |
| Height: | 1 100 mm |
| Depth: | 2 000 mm |
| Plantingtube Ø: | 60 mm |
| Seedling capacity: | 122 pcs |

M-240

| | |
|---|---|
| Weight: | 1 500 kg |
| Width: | 2 890 mm |
| Height: | 1 400 mm |
| Depth: | 1 450 mm |
| Plantingtube Ø: | 60 mm |
| Seedling capacity: | 244 pcs |

# M-120 vs M-240


M-120

- Requires smaller excavator.
- Can be made to work only with hydraulics (no electricity).
- Easier to use at difficult sites.

M-240

- Can mound and plant two locations at the same time, but can also mound and plant single location.
- At least 25 % more efficient.
- More efficient to push the harvesting residue.

# Productivity

| Planting site quality | M-120 (one-headed) | M-240 (two-headed) |
|---|---|---|
| Difficult site (steep, lot's of rocks and harvesting residue) | 120 seedlings / hour | 160 seedlings / hour |
| Average site (some rocks and harvesting residue) | 150 seedlings / hour | 240 seedlings / hour |
| Easy site (flat areas, clean site, few rocks) | 180+ seedlings / hour | 300+ seedlings / hour |

# What M-Planter has planted?

- Spruce
- Pine
- Birch
- Aspen
- Alder
- Eucalyptus
- Aacacia

# Why M-Planter?

- Long experience of mechanical silviculture.
- Only notable manufacturer of the excavator based two-headed mounding planters.
- The most efficient excavator based mounding planter (METLA/LUKE research).


# M-Planter Oy


**CEO/Domestic sales:**
Antti Meriläinen
+358 400 120 349
antti@m-planter.fi
www.m-planter.fi

Post address:
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88300 PALTAMO, FINLAND

**Export sales:**
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Visiting address:
Konttitie 3
88300 PALTAMO, FINLAND

# Forest regeneration mechanization in Latvia

(history, innovations and projects of technology transfer)

Dr.silv.Dagnija Lazdiņa

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# First experiments of mechanized forest planting in Latvia - 20th century

Planting machine "Quickwood" (Austria) adapted to replant container seedlings "Brika" in simultaneously with soil preparation, 80-ties.

# First research of mechanized forest planting in Latvia - 20th century

Discrete planting machine "SBS-50" (Latvia) with trailer for transportation of seedlings. Experiments in Scientific forest station at Kalsnava, 1980.

# First experiments of mechanized forest planting in Latvia - 20th century

Container seedling planting machine “KLM-1” (Russia) mounted on excavator “TB-1” able to make mound and simultaneously plant seedling on it 1983.

# First experiments of mechanized forest planting in Latvia - tranfer of technologies from Finland

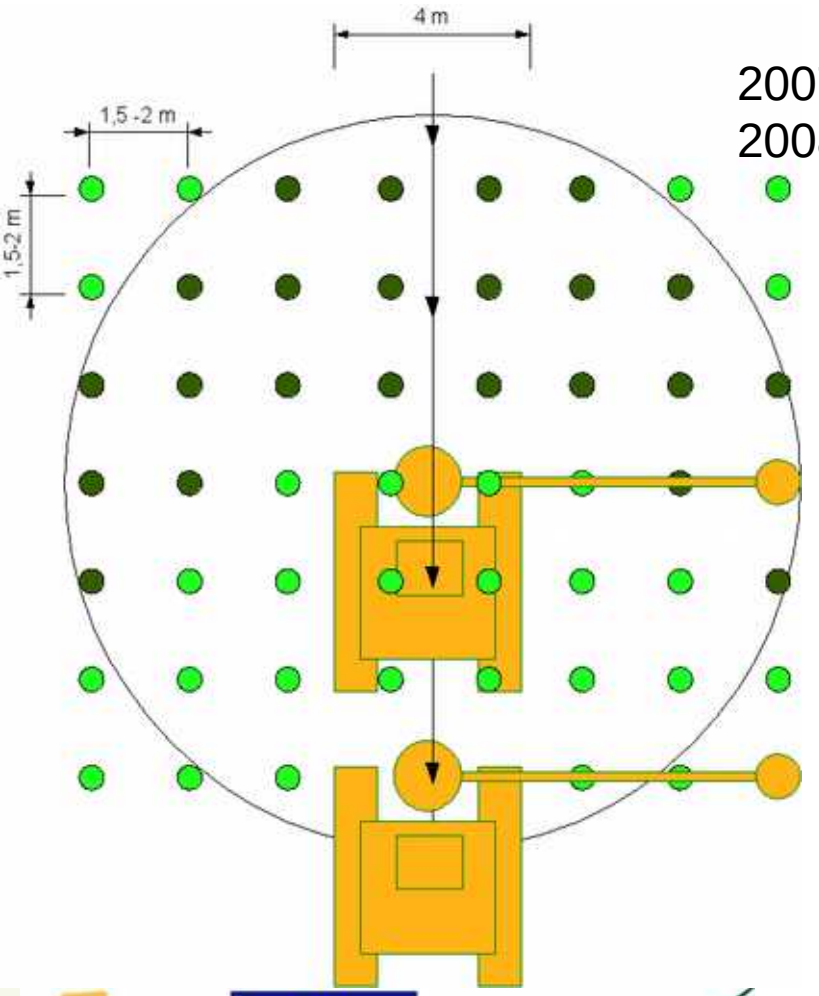
Mechanized forest planting device "SERLACHIUS" planting and simultaneously soil preparation "VALMET 886 K" (Finland), experiment at Ogres MRS 1983.

# Research projects and transfer of technologies

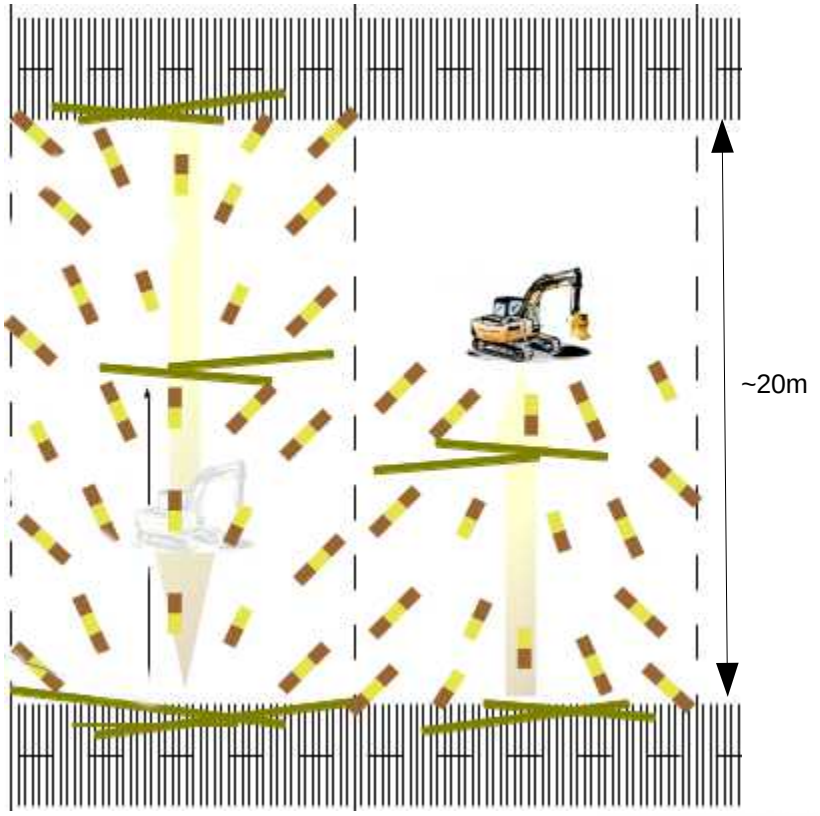
- 2007- Bracke P11a research of time studies - funded by forest development fund (spruce and pine planted in forests of Rīgas meži,Latvijas finieris, Latvijas valsts meži) ;
- 2008 – M-planter-funded by forest development fund and SIA Rigas meži (spruce and pine planted in SIA Rīgas meži) ;
- 2009 – target oriented projects – remeasurements of sites and sowing ;
- 2011-2013 - ERDF project Stump lifting and soil preparation - (planted spruce in Rīgas meži).
- 2012 "mounding "pilot project at As "Latvijas valsts meži" planted spruce and pine.
- ESF project Ecological and technical aspects of cultivating vital spruce stands (No. 2013/0022/1DP/1.1.1.2.0/13/APIA/VIAA/052) -remeasurements of stands established at previous projects.
- Forest regeneration,establishment and tending/cleaning programm.

# **Recomended designs of planting** and methods asked how to do...

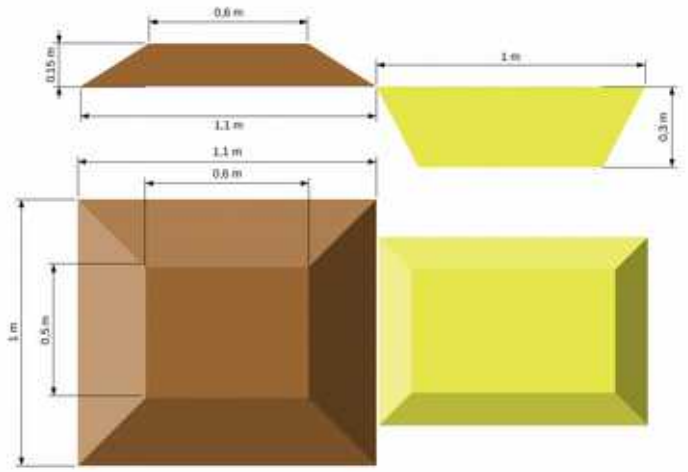
2007-2008



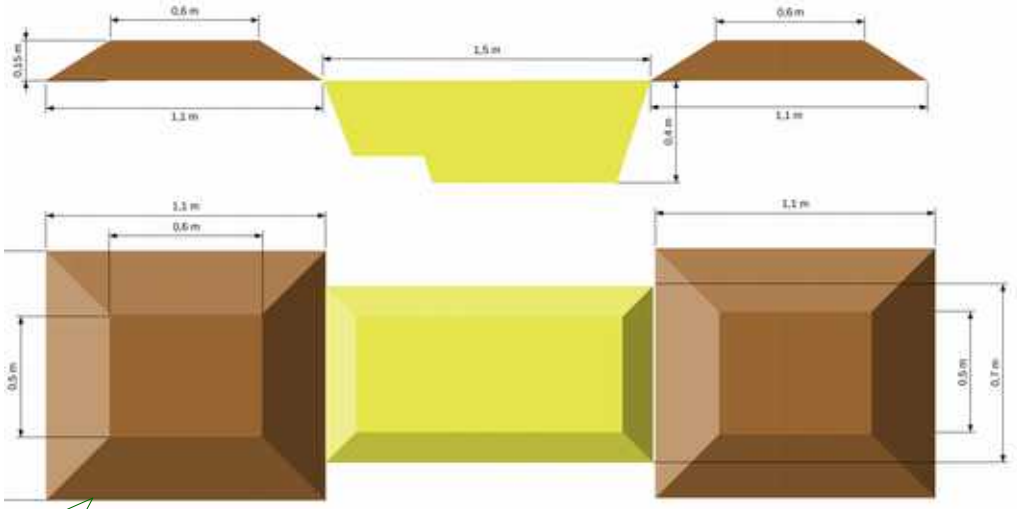

2012-...



# Size and princip of mound



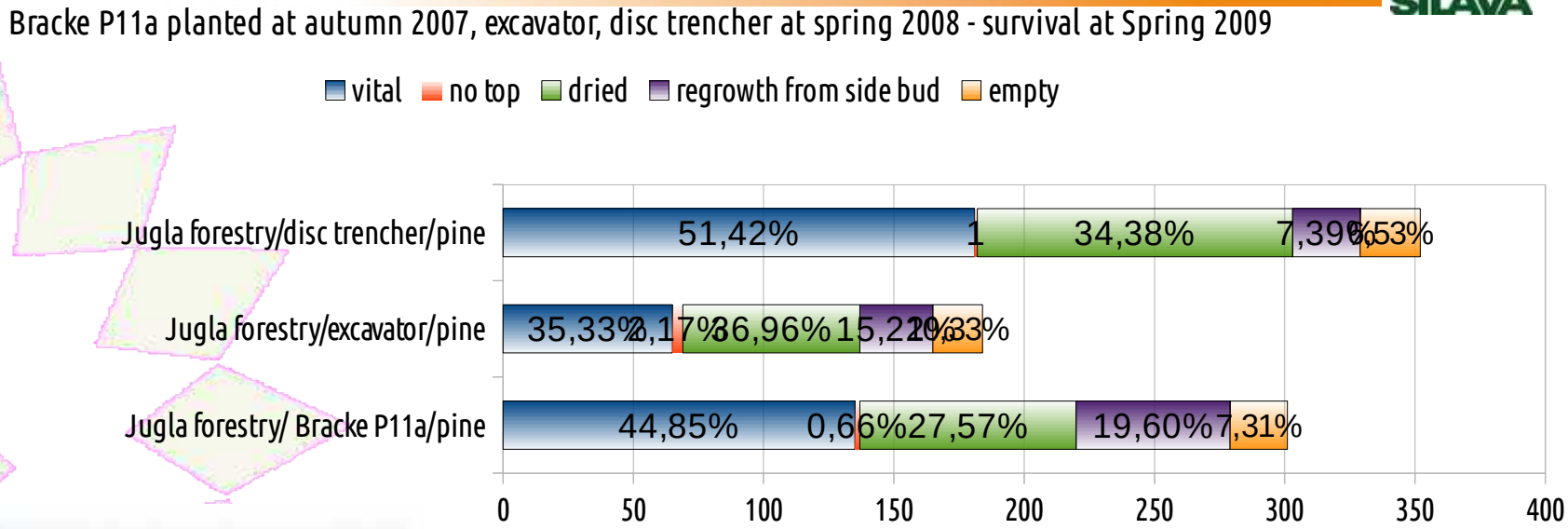

2007-2008




2012-...

More mounds per ha, less scarification of soil!

# Bracke P11.a 2007 October-Ln (*Myrtillosa*), Pine ~3000 plants ha survival and vitality after two years

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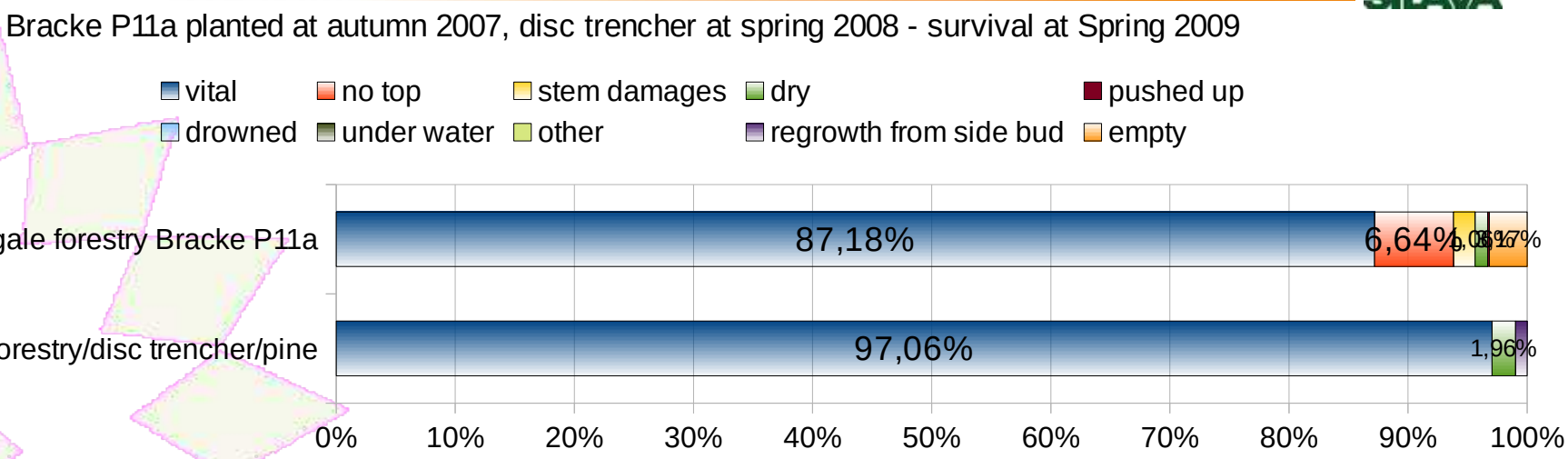
# Bracke P11.a 2007 October, Dm (*Hylocomiosa*), Spruce 2500 plants ha and survival after two years




# Expierence from Finland to Latvia or tecnology transfer.

SILAVA

## 2008-06-18 Sounenjoki

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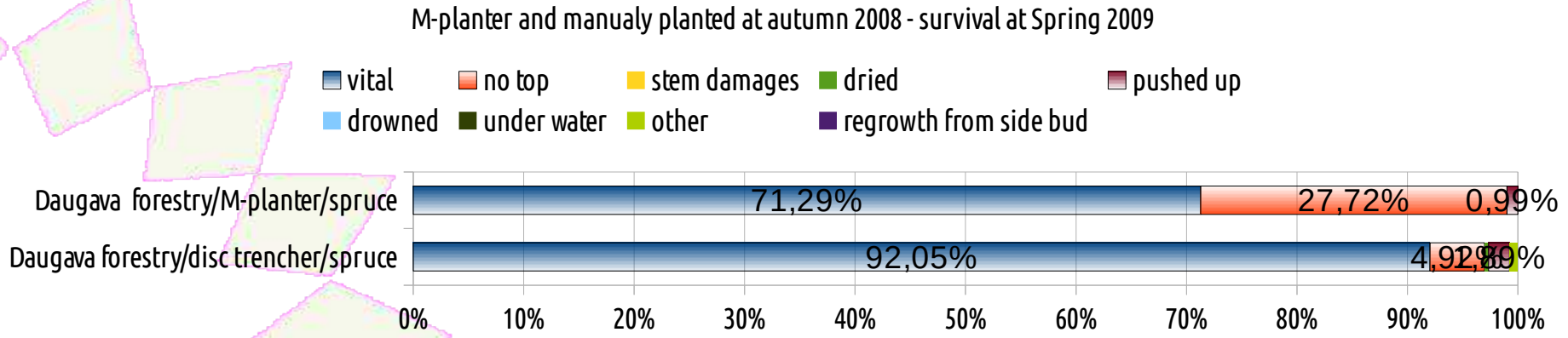
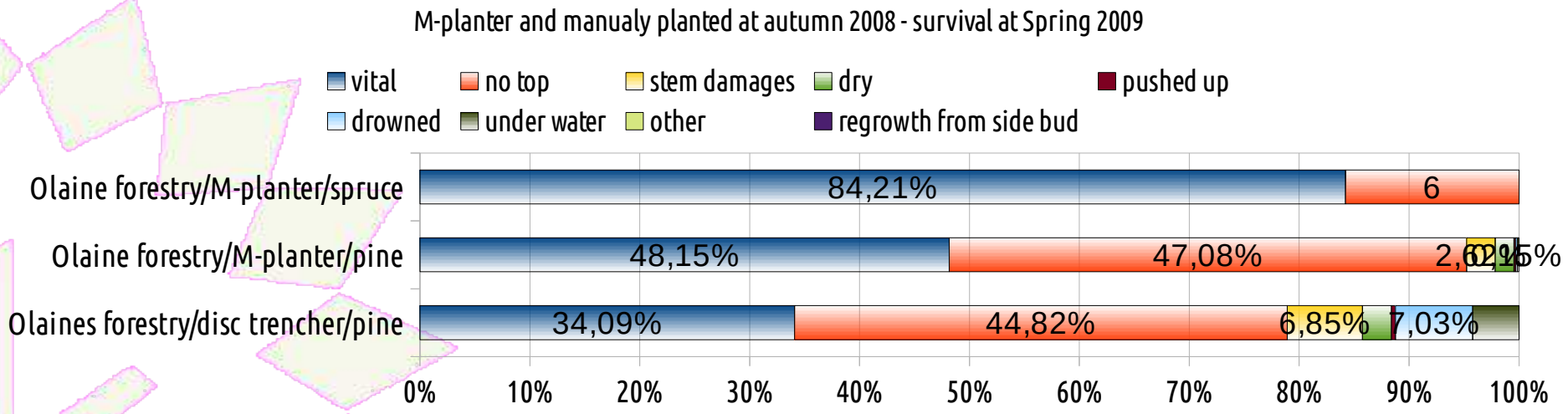
# M-planter 2008 September Dm (*Hylocomiosa*), spruce 2500 plants ha - survival after one year




# M-planter 2008 September, As (*Myrtillosa mel.*) Spruce just for demo, pine ~ 3000 plants ha - survival after one year

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# Main benefit - root system  should to have optimal conditions for development, plant get + 10-15 cm of height

*Ln, priede ¶*

*Dm, egle ¶*

# Costs at that time (2007/2008)

- Bracke P11a – 368 (for spruce) – 710 (pine) EUR
- M-planter – 388 EUR
- Manualy –212 (soil preparation disc trenching) +136 (planting)  EUR


SILAVA

Jaunāko meža mehanizētās atjaunošanas tehnoloģiju izmēģinājumi Latvijā

Kaspars Liepiņš, Dagnija Lazdiņa, Andis Lazdiņš

LVMI „Silava" Meža atjaunošanas un ieaudzēšanas darba grupa

NEW HOLLAND

Mehanizētās stādīšanas agregāti un to darbības principi
Priedes mehanizētā sēšana
Mehanizētās meža atjaunošanas izmaksas

Informatīvais materiāls sagatavots pamatojoties
SIA Rīgas Meži un Latvijas Republikas izglītības un zinātnes ministrijas (TOP-07-23) finansējumam

RĪGAS MEŽI

Salaspils, 2010

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LATVIJAS FINIERIS

RĪGAS MEŽI

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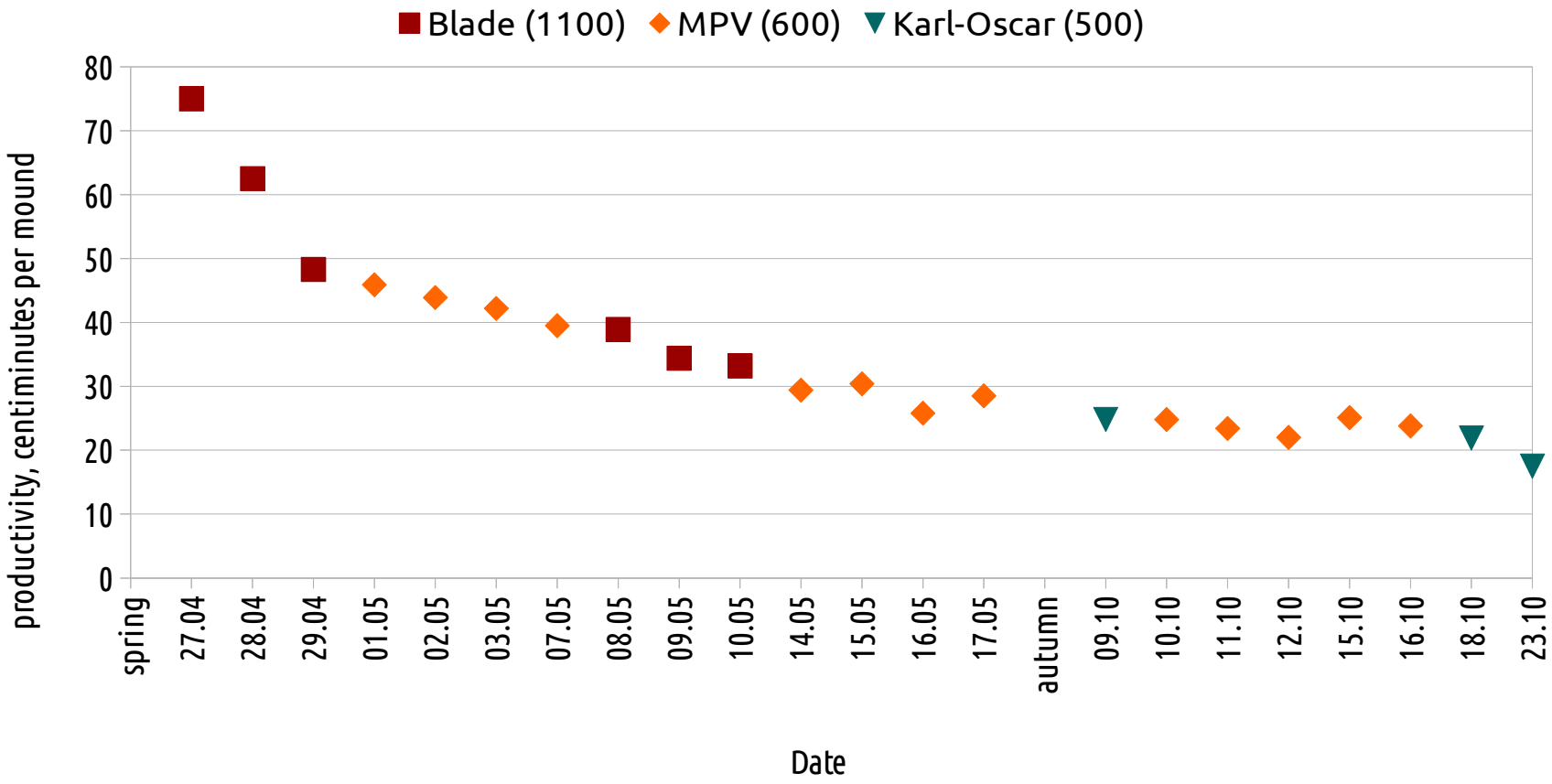
2012 April

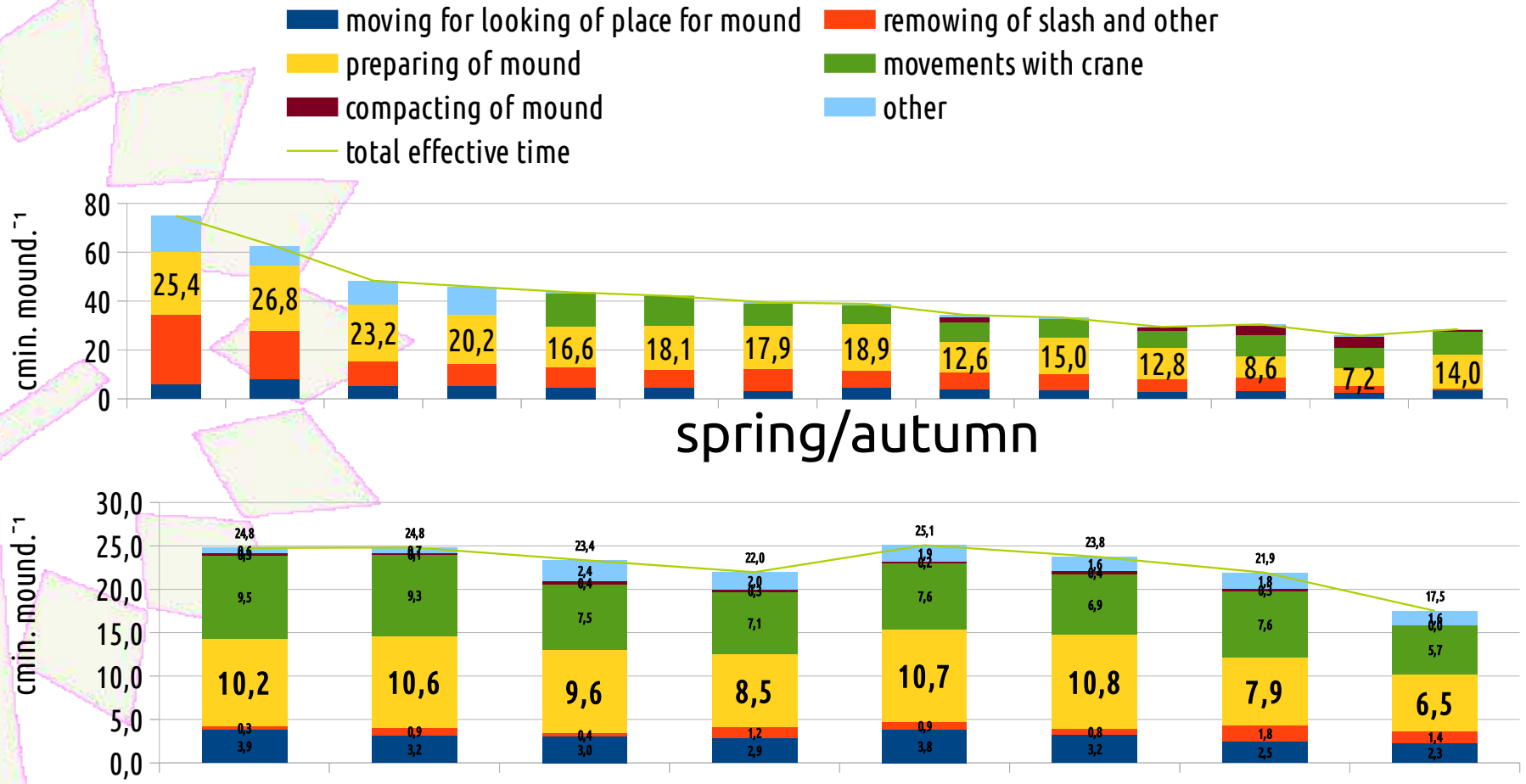
# 2012 - Evaluation of our own devices and pilot time studies for mounding with excavator and different blades



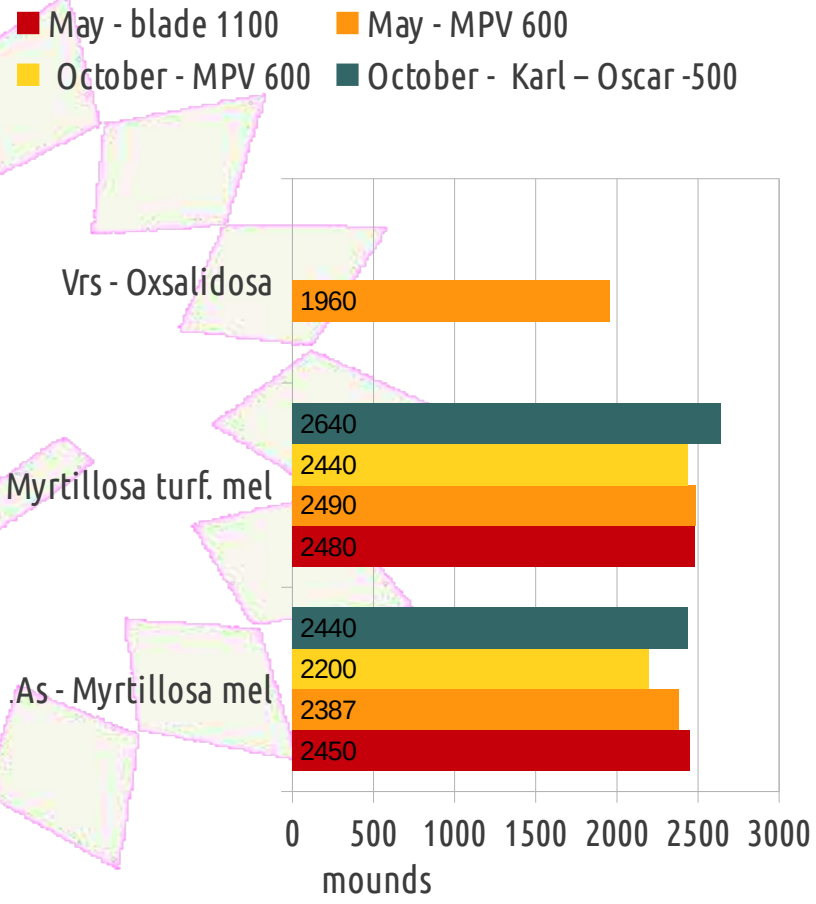

# Productivity

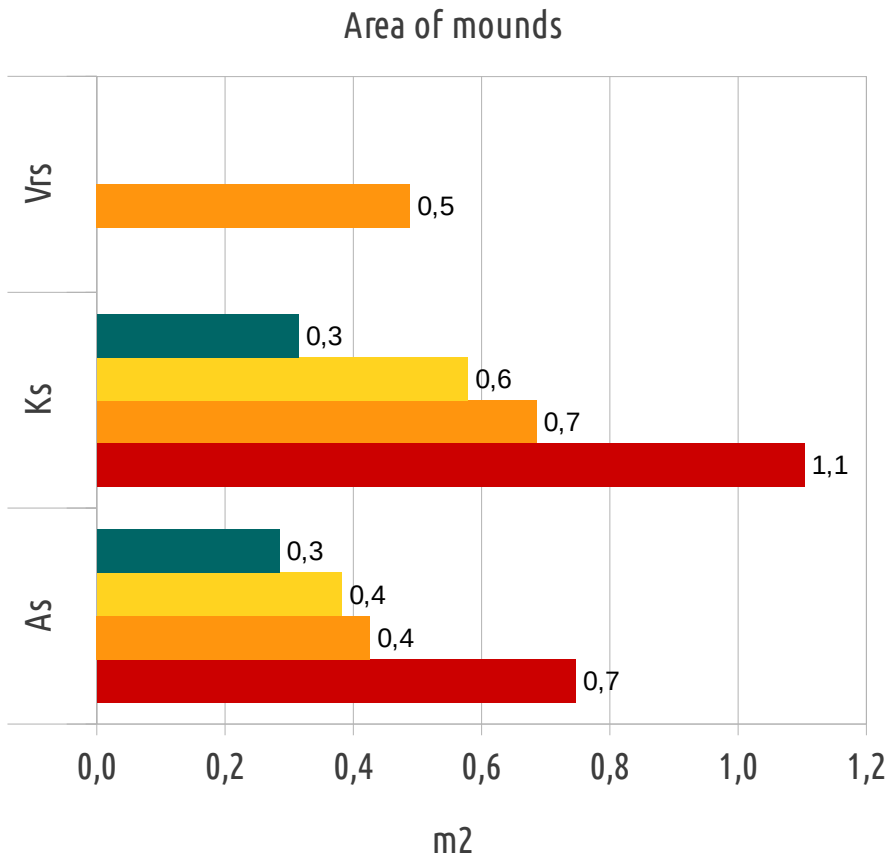


# Time studies – efective cmin per one mound



# Number of mounds and size diferences at different forest sites



# Calculated costs at spring and autumn per operating hours at site

## MPV-600 – after harvesting

- 9 operating hours $ha^{-1}$
- 169 ha season
- 388 EUR $ha^{-1}$

## MPV-600 – one year after harvesting

- 6,17 operating hours $ha^{-1}$
- 248 ha per season
- 266 EUR $ha^{-1}$

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# MPV-600-2012

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# 2012-Carl-Oscar

# Mounding is expensive treatment suited to problem sites, do not over-prescribe! (1999)

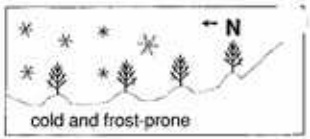
FOREST RESOURCE DEVELOPMENT AGREEMENT

Canada BC

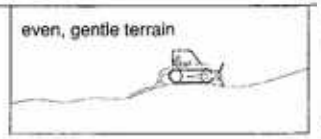
SILAVA

## Suitable Mounding Conditions

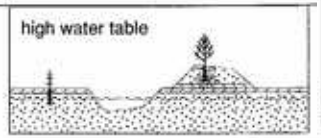
**Climatic conditions**
- short growing seasons and cool temperatures (most subzones of BWBS, SBS, SBPS, and ESSF; also ICHmk, mc, wk, vk, vc, and wetter MS)
- cool, shady north-facing slopes, especially at higher elevations
- frost pockets and areas of cold air drainage



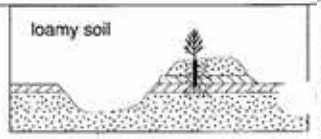

**Terrain**
- even or rolling terrain
- slopes less than 30% (or up to 50% if excavator or flex-track prime mover available)
- deep soils



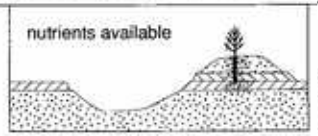

**Soil moisture**
- mesic and especially subhygric, hygric, and subhydric moisture regimes
- no significant risk of drought
- poorly aerated soils with seasonal or year-round high water tables (but prime mover access may be difficult)



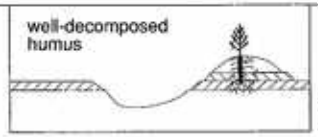

**Soil texture**
- sandy loam to clay loam soils best
- clayey or silty soils acceptable (if no other treatment option available)
- gravels or stones less than 30%
- compacted subsurface layers (hardpan) - (only if equipment with sufficient down pressure is available)



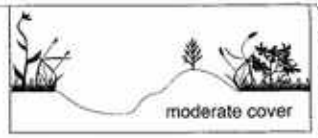

**Soil nutrients**
- inverted humus mounds will benefit seedlings on nitrogen-deficient, nutritionally poor sites




**Soil organic layers**
- duff layers less than 15-20 cm thick (unless excavator available)
- well decomposed organic matter (H layer) can be an acceptable planting medium on wet sites

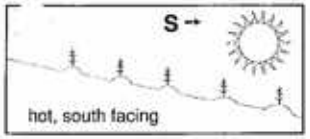



**Competing vegetation**
- light to moderate herbaceous or shrub cover
- dense, but short grass cover

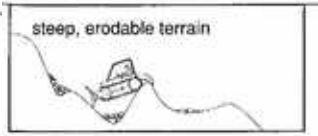



## Unsuitable Mounding Conditions

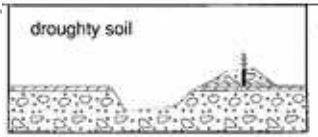
**Climatic conditions**
- warm, dry growing seasons with significant risk of summer drought (IDF; PP; drier MS, ICHdk, dm, dw, mw, xw; SBSdh, dk, dw, mh, mw,mm)
- sunny, exposed south-facing slopes and ridges.



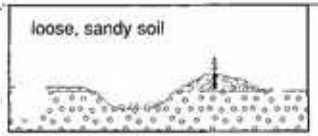

**Terrain**
- significant erosion hazard present
- slopes greater than 30% (or 50% if excavator available)
- irregular terrain with shallow soils and frequent rock outcrops



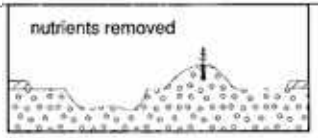

**Soil moisture**
- submesic, subxeric, or xeric moisture regimes
- significant risk of drought
- coarse-textured or shallow soils with low moisture-holding capacity;
- rapidly drained ridge crests or upper slopes



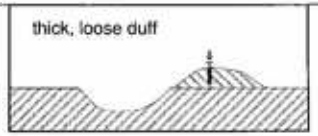

**Soil texture**
- loamy sand to sandy soils lacking cohesion
- use with caution on fine-textured or silty soils prone to frost-heaving
- gravels or stones greater than 30%




**Soil nutrients**
- scalping with mineral mounds not recommended for nitrogen-deficient, nutritionally poor soils



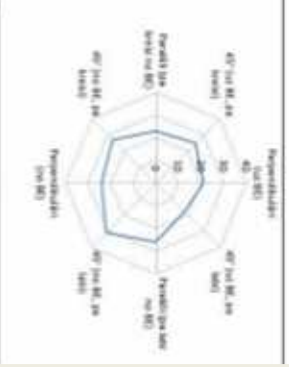
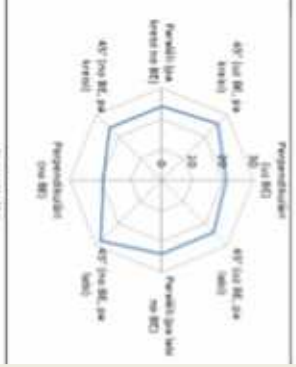
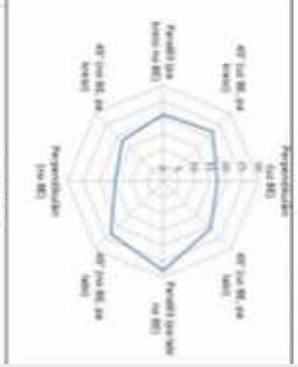
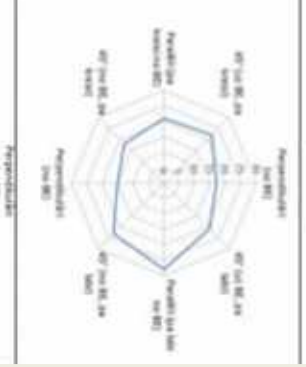
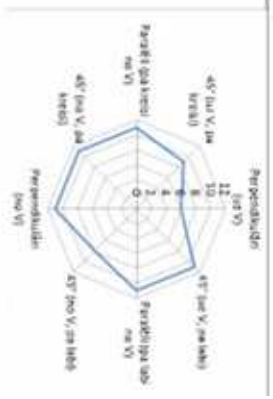
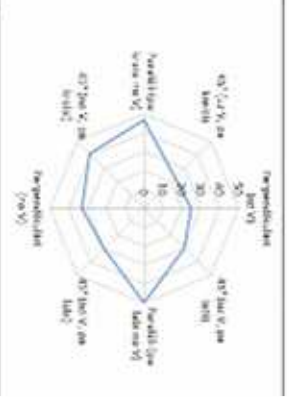
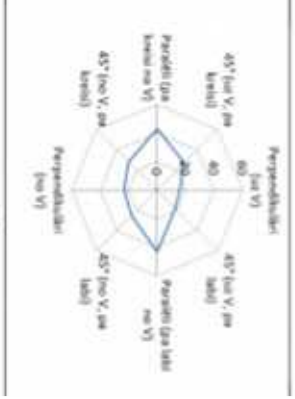
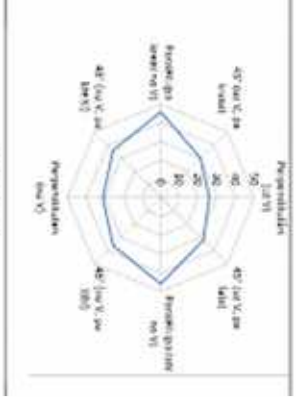
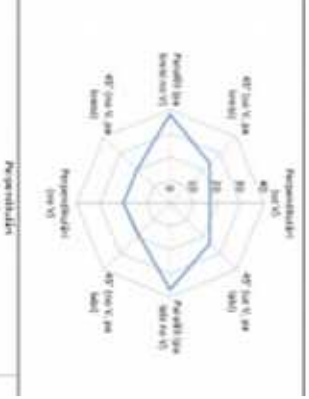
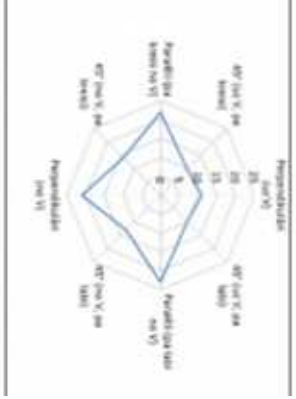

**Soil organic layers**
- poorly decomposed duff greater than 20 cm thick (must be removed before mounding)



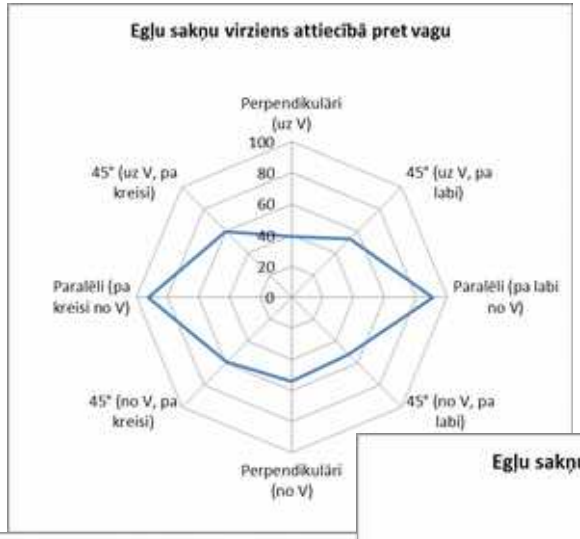

**Competing vegetation**
- dense, tall grass, herbs, or shrubs (must be removed before mounding)

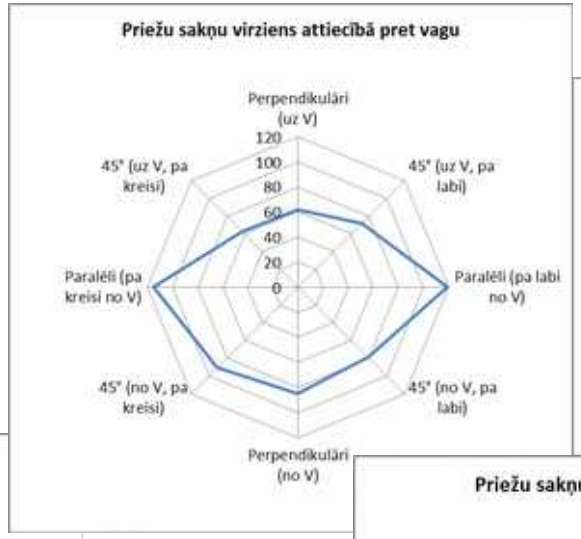

**CAUTION: Mounding is an expensive treatme[nt] s[uited] to problem sites. Don't over-prescribe!**

# Main roots and soil preparation method used

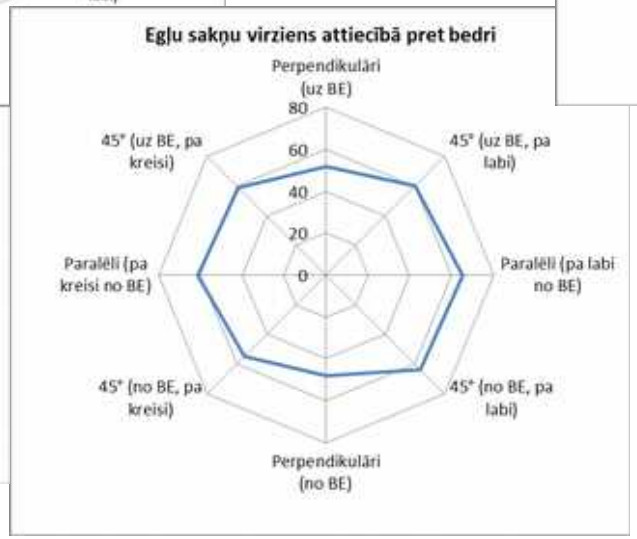
| Kūdreņi | | Āreņi | | Slapjaiņi | | Tips/ suga |
|---|---|---|---|---|---|---|
| Egle | Priede | Egle | Priede | Egle | Priede | |
|  |  |  |  |  |  | Pacila |
| In furrows roots developing parallel to furrow! | | | | | | |
|  |  |  |  |  |  | Vaga |

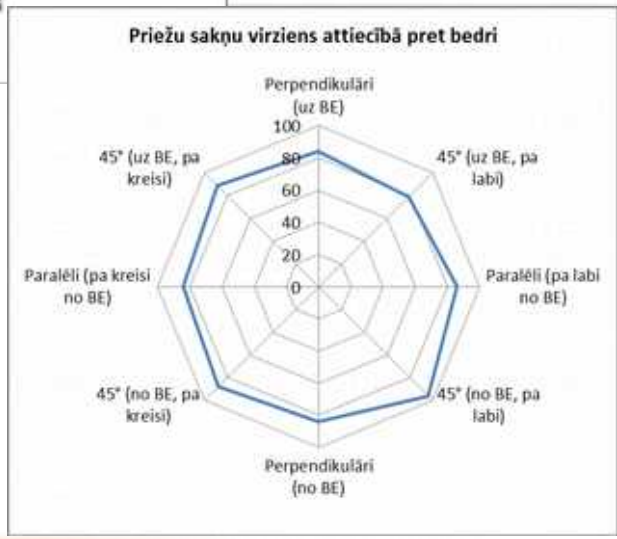
# Root direction not correlated with cardinal points



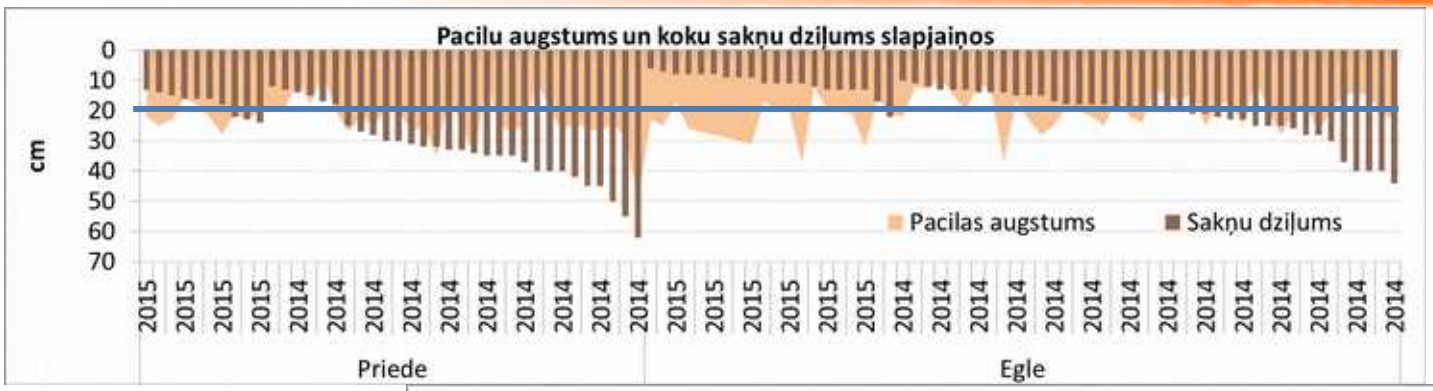


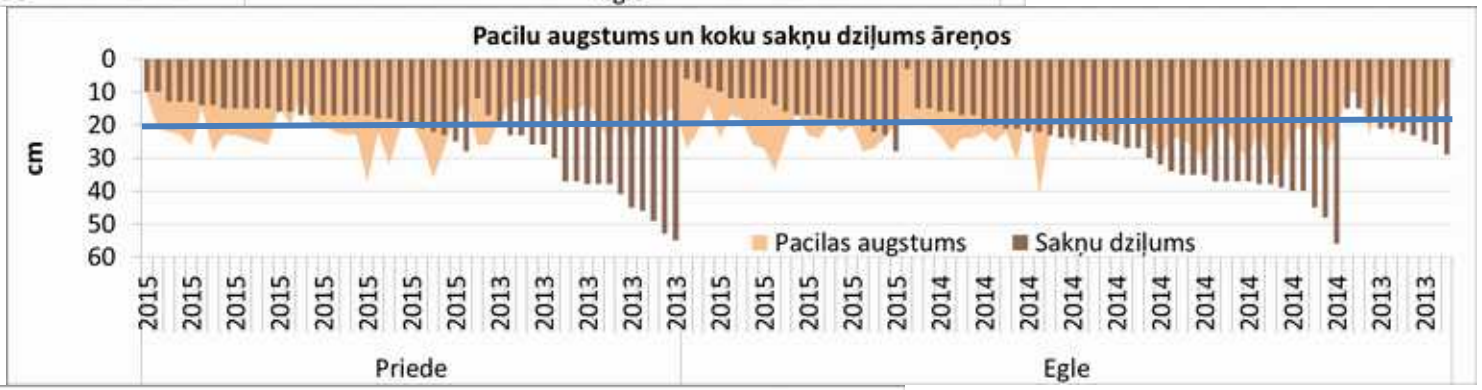



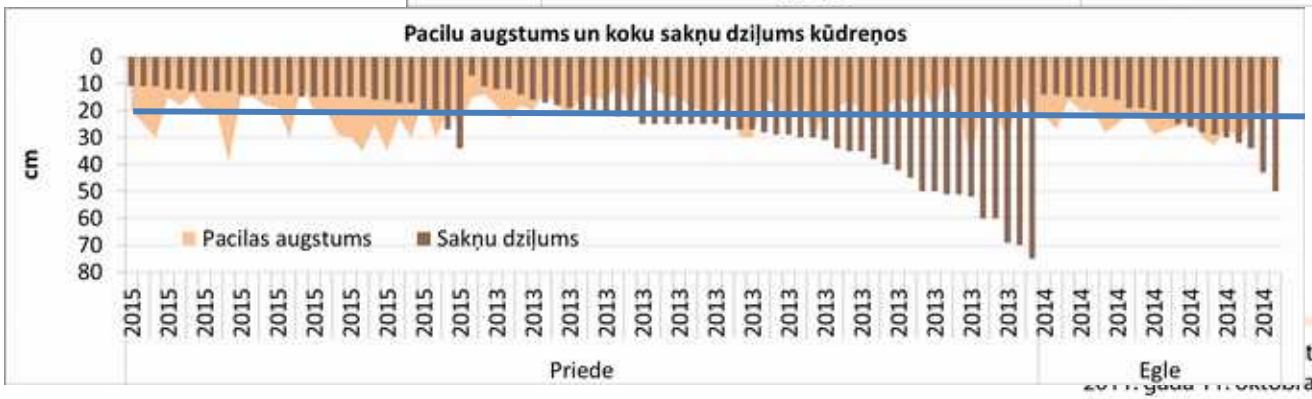




Pētījums veikts a/s "Latvijas valsts meži" un LVMI Silava
2011. gada 11. oktobra memoranda
"Par sadarbību zinātniskajā izpētē" ietvaros

# Roots growth through mound in second – third year




tvijas valsts meži" un LVMI Silava
a memoranda
"Par sadarbību zinātniskajā izpētē" ietvaros

Thanks for attention!

Pētījums veikts a/s "Latvijas valsts meži" un LVMI Silava
2011. gada 11. oktobra memoranda
"Par sadarbību zinātniskajā izpētē" ietvaros

# Kāpēc mežkopis šodien domā par darbu mašinizāciju?

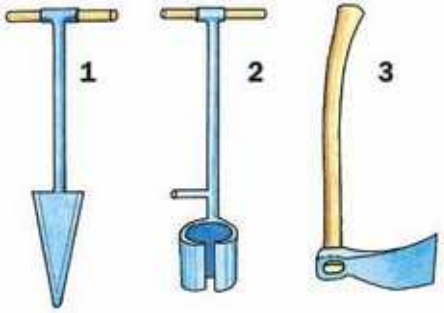
**Mārtiņš Gūtmanis**
**mežkopība, direktors**
**Rīga, 12.05.207**

LATVIJAS VALSTS MEŽI

# Meža apsaimniekošanas cikls Latvijā (50-100 gadai)

# Kāpēc mežkopis šodien domā par darbu mašinizāciju?

## Meža stādīšana

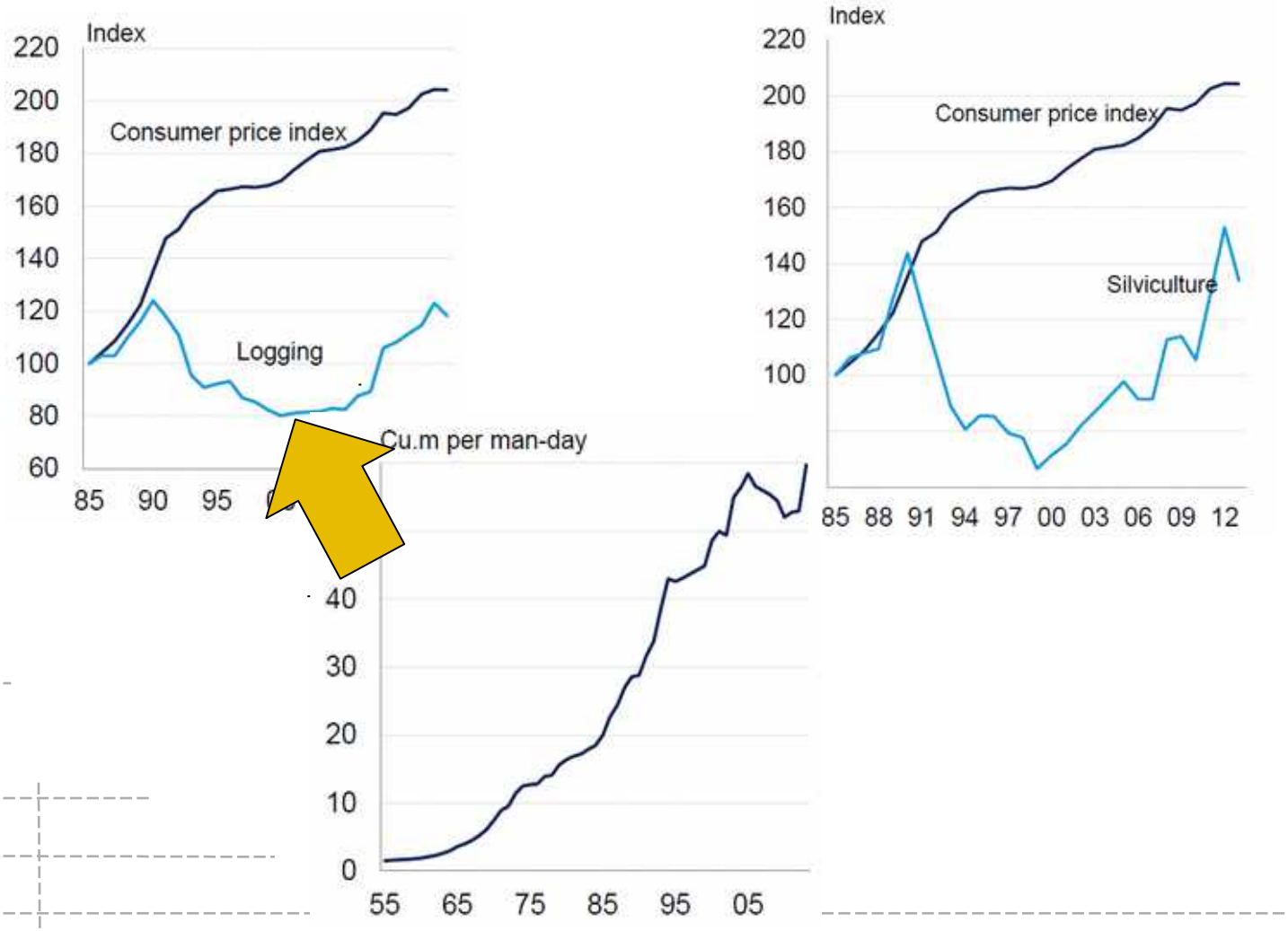



LAIKA ASS

# I Jāpaaugstina darba produktivitāte

Izmaksu indeksa izmaiņas Zviedrijā

1985-2013




Dati: SCA Skog March 2014

# I Jāpaaugstina darba produktivitāte

LVM ieviesis ražošanā 2014.-2017.gadā

GPS tehnoloģiju izmantošana augsnes gatavošanā

Darba uzdevuma nosūtīšana uz viedtālruni

Dokumentu elektroniska aprite

eParaksts

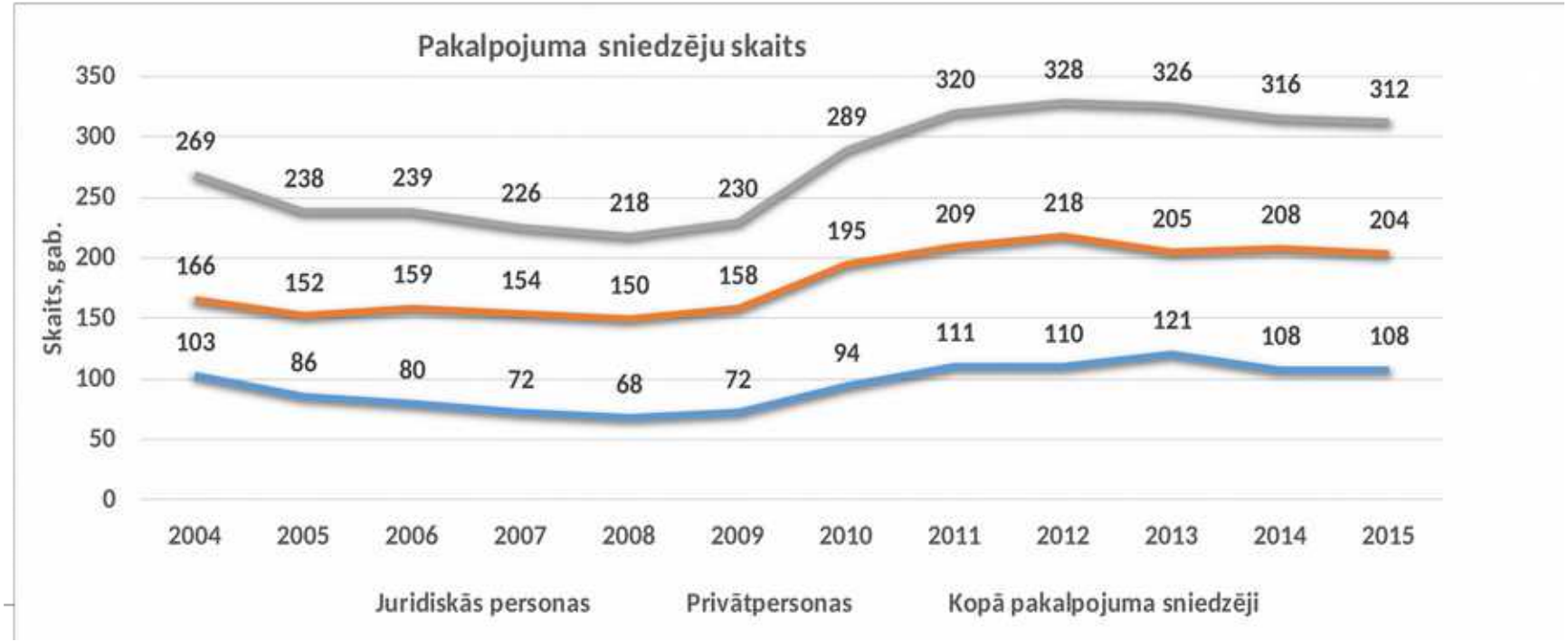
Piemaksa par augstas kvalitātes pakalpojumu

Mežkopības darbu veicēju profesionāla apmācība

Lauka datora ieviešana – datu ievākšana mežā

# II Trūkst kvalitatīvs darba spēks

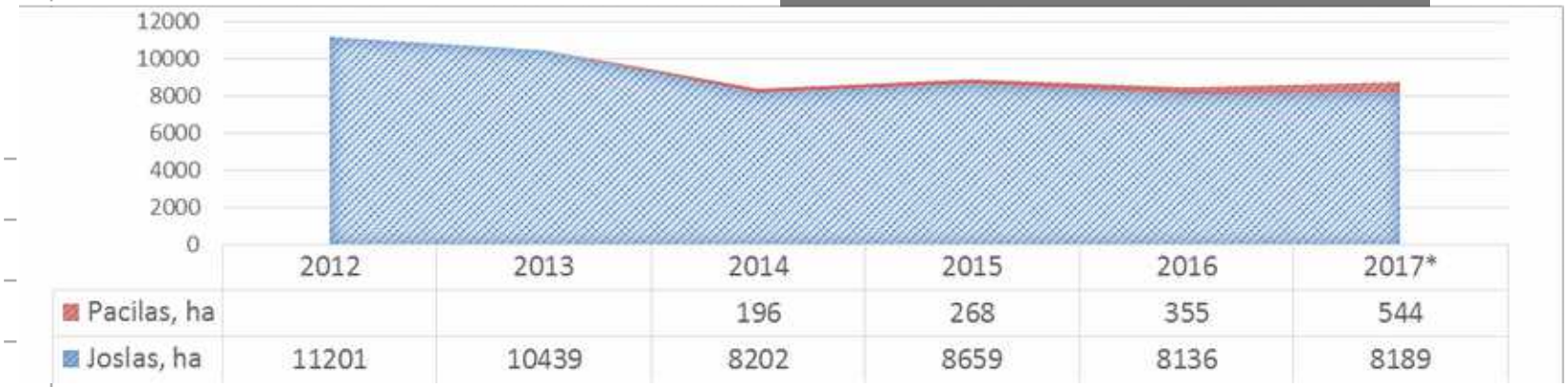
LVM pakalpojuma sniedzēju skaits stādīšanas, kopšanas un aizsardzības darbos



# III Uzsākta augsnes gatavošana ar ekskavatoru, veidojot pacilas

Svarīgākais meža atjaunošanās priekšnosacījums ir **pareiza augsnes gatavošana**

Atjaunošanās rezultāts, turpmākās kopšanas izmaksas ir rādītāji, kuri jāzina, lai izvēlētos pareizo augsnes gatavošanas veidu




| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017* |
|---|---|---|---|---|---|---|
| Pacilas, ha | | | 196 | 268 | 355 | 544 |
| Joslas, ha | 11201 | 10439 | 8202 | 8659 | 8136 | 8189 |

* plāns

# Zināšanas



Sadarbībā ar LVMI «Silava» iegūt jaunas zināšanas:

- Izvērtēt  mašinizētas augsnes gatavošanas - stādīšanas un tehnoloģiju pārneses iespējas Latvijas apstākļos
- Novērtēt augsnes gatavošanas-stādīšanas darba izpildes kvalitāti un izmaksas

**Novēlu šodien iegūt jaunas zināšanas,**
**lai rīt tās pārvērstu naudā!**