Enhancing forest growth using improved forest regeneration material

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Budget 600 000 €

Duration 2020 – 2022

Maa- ja metsätalousministeriö

Background

Climate change will probably affect growth, health and species composition of forests. **Health** and **tree species diversity** are key elements in assuring **growth and carbon sequestration** of forest in changing climate. However, during the past twenty years, tree species diversity in artificial forest regeneration has decreased.

Growth and carbon sequestration can even be increased by increasing the use of **improved forest regeneration material**. For example, growth of Scots pine can be increased by 15–25% using improved seed instead of stand seed. However, in direct seeding, high seed consumption due to low seedling establishment restricts increasing the share of improved seed on some areas.

Subproject 1: Diversifying the tree species palette

- Norway spruce dominates artificial forest regeneration

- This is a risky as spruce is susceptible to drought and for instance to bark beetles, both problems expected to increase with the predicted climate warming

- The situation is worsened by the trend to plant spruce on too dry sites

- Herbivory by cloven-hoofed animals drives the overuse of spruce

                                    12.6.2020

The proportion of different tree species in artificial forest regeneration in Finland by region in 2010 – 2014
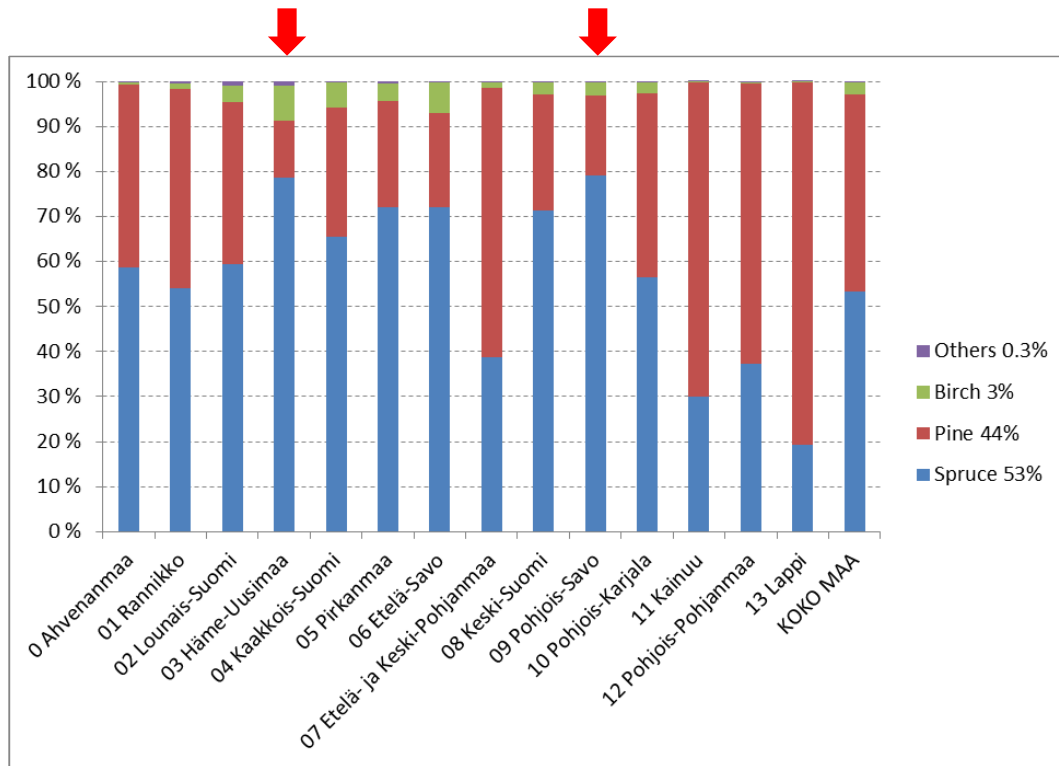
Aim & outcome

- The aim of this project is to evaluate alternative tree species (native & exotic) in order to decrease the risk due to limited set of species and to support biodiversity

- The outcome of the project is a literature review describing the potential of various tree species in artificial forest regeneration

  - Pros and cons of the species
  - Finding the bottlenecks for their use
  - Procurement of regeneration material for them

Subproject 2: Direct seeding of Scots pine

Aim is to increase seedling establishment (= reduce seed consumption) in direct seeding of Scots pine, and thus increase the share of improved seed used in direct seeding

Current figures:

Amount of seed used annually in DS: 8000 kg

Average seedling establishment: 10%
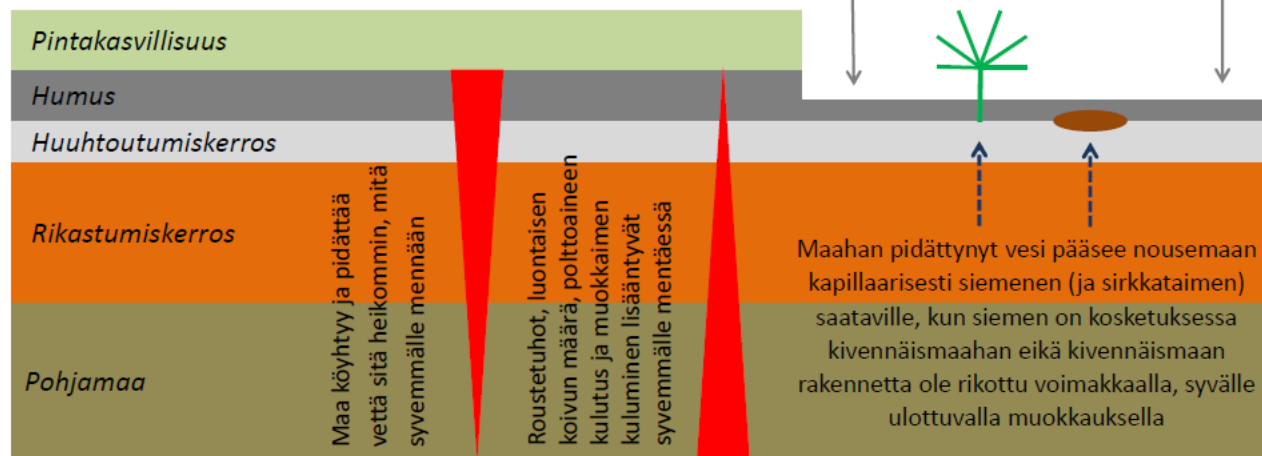
Amount of lost seed: > 7000 kg

Optimal seedbed – from blueprint to reality?

Humus-kivennäismaapeitto (noin 1 cm) siementen päällä:

- Vähentää siementen riskiä joutua pikkulintujen ja -nisäkkäiden syömiksi
- Nopeuttaa siementen itämistä hidastamalla kivennäismaan pinnan kuivumista
- Vaimentaa haitallisen sade-eroosion vaikutusta itäviin siemeniin ja sirkkataimiin
- Vähentää roustetuhoriskiä tasaamalla lämpötilan vaihteluja kivennäismaassa
- Nopeuttaa sirkkataimien kasvua luovuttamalla niille maatuessaan ravinteita

Laikun koko:

- Mitä pienempi laikku, sitä vähemmän se routii ja sitä vähemmän uudistusalalle syntyy luontaista koivua
- Noin 50 cm × 50 cm riittää

Pintakasvillisuus

Humus

Huuhtoutumiskerros

Rikastumiskerros

Pohjamaa

Maa köyhtyy ja pidättää vettä sitä heikommin, mitä syvemmälle mennään

Roustetuhot, luontaisen koivun määrä, polttoaineen kulutus ja muokkaimen kuluminen lisääntyvät syvemmälle mentäessä

Maahan pidättynyt vesi pääsee nousemaan kapillaarisesti siemenen (ja sirkkataimen) saataville, kun siemen on kosketuksessa kivennäismaahan eikä kivennäismaan rakennetta ole rikottu voimakkaalla, syvälle ulottuvalla muokkauksella

Kylvölaite

Seula

Kylvökauhan prototyyppi (ViperMetal / Ajutech Oy)
Kesäkuu 2016

Subproject 3: Developing long-term conservation methods for forest genetic resources

Objectives

1. To develop **a cryo-conservation method** for *Ulmus laevis* and *Ulmus glabra* – species that are under a concrete pathogenic threat in a changing climate

2. To strengthen the existing genetic conservation program by establishing **a cryo conservation collection** of *Ulmus laevis* and *Ulmus glabra*

   as a back-up of the present ex situ collection and also by inserting new material, as needed

3. Strengthen the **link between conservation and use** by producing information on the usability of the seed collected from the existing conservation collections

Methods

Objective 1: Development and testing of cryopreservation protocol for *U. laevis* and *U. glabra* buds, and micropropagation method for the regeneration of frozen buds into plants capable of growing *ex-vitro*.

Objective 2: Evaluation of the coverage of the material in the collections and mapping the possible new sources (natural populations) and their availability. Sampling, cryopreservation and data management (SOTKA-database for cryosamples)

Objective 3: Literature based study on the legal aspects of marketing material from the conservation collections and on the methods for the germination analysis that will be needed

Expected outputs

A cryo conservation collection of the two native elm species in Finland

A plan for making the material from genetic conservation collection usable and used