Trans-national collaboration in southern Sweden

(e.g. trial series in neighboring countries)

Growth patterns for Norway spruce

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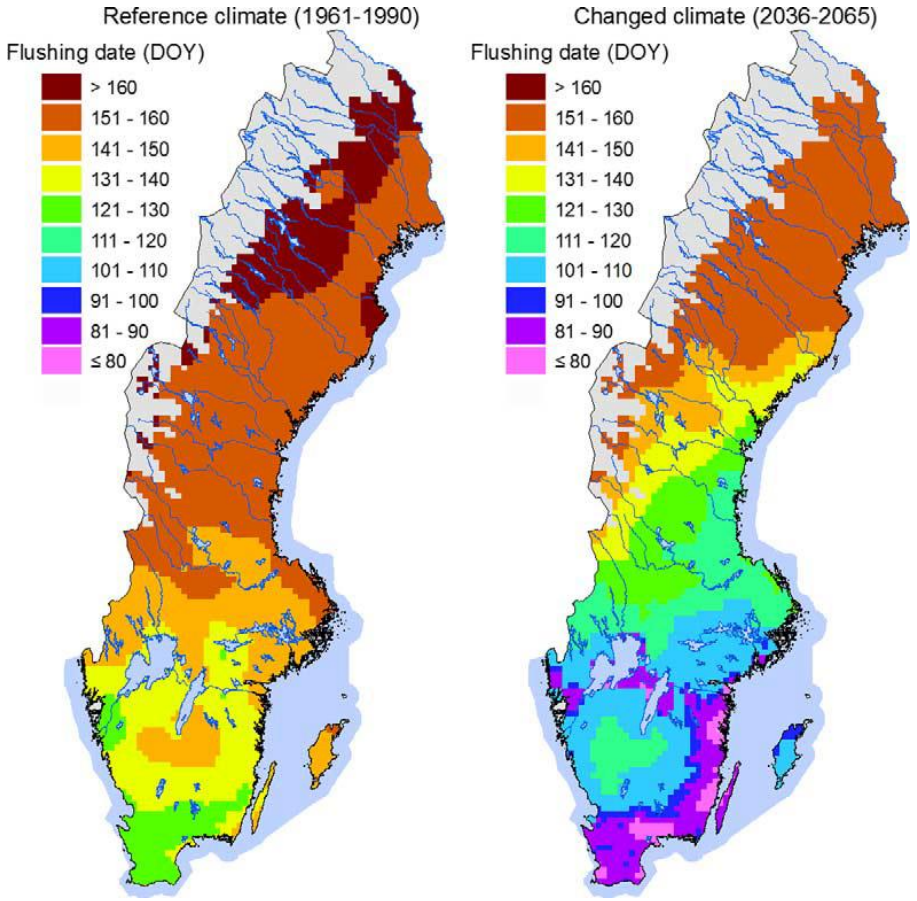
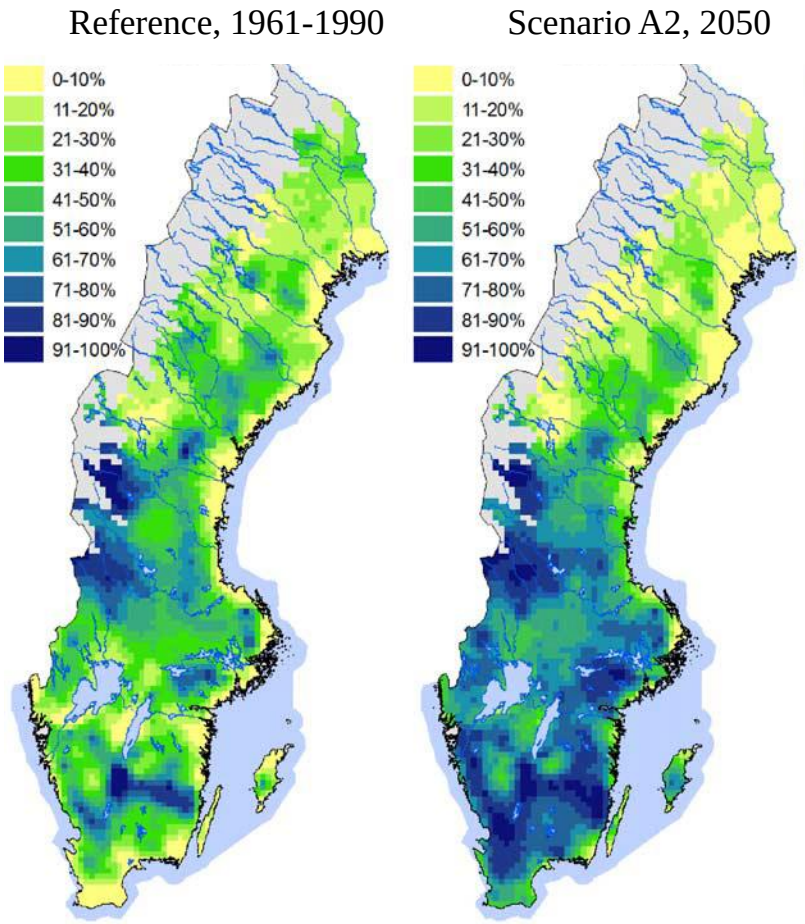
HealGencar meeting 19-20 april 2017, Riga

Growing conditions change



Bud burst occur earlier in spring…



…but, increased frost damage in south and decreased in north

Langvall 2011. Scand. J For Res.

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Seedlings for future climate scenarios

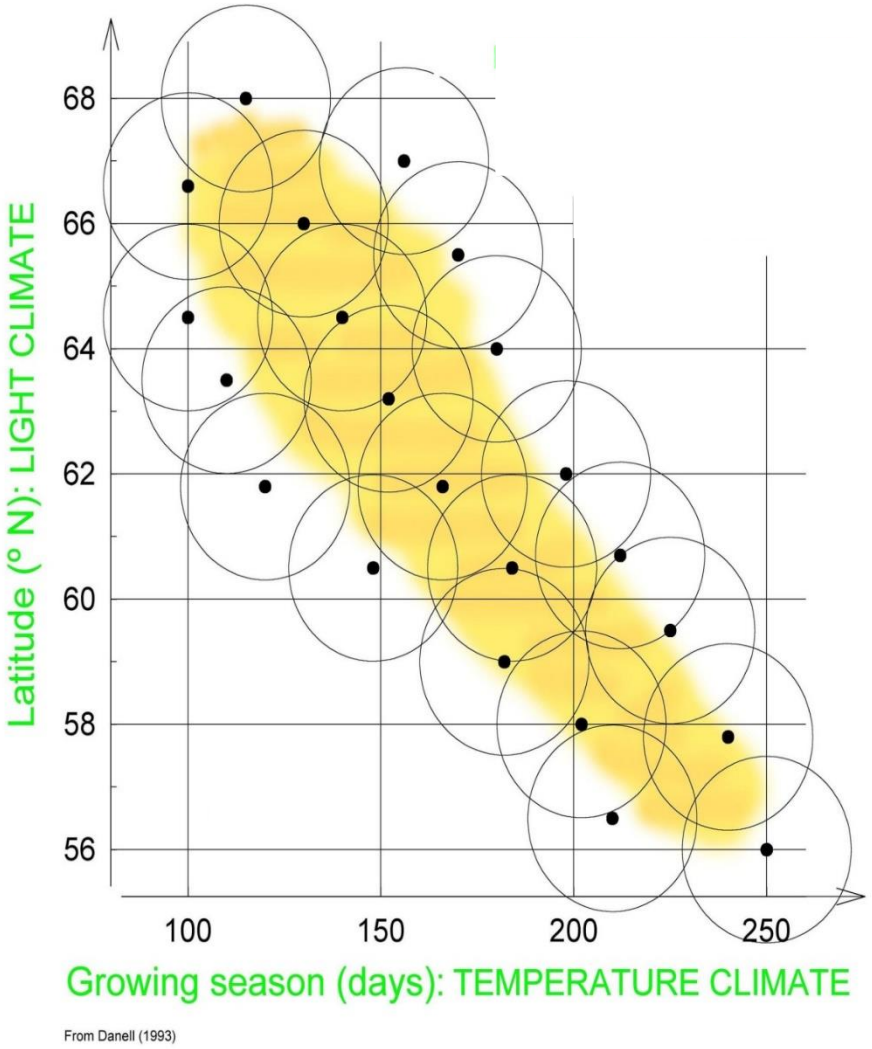
- Trees is adopted to different environments

- Natural selection, works afterwards

- Breeding, works in advance

- New climate profiles

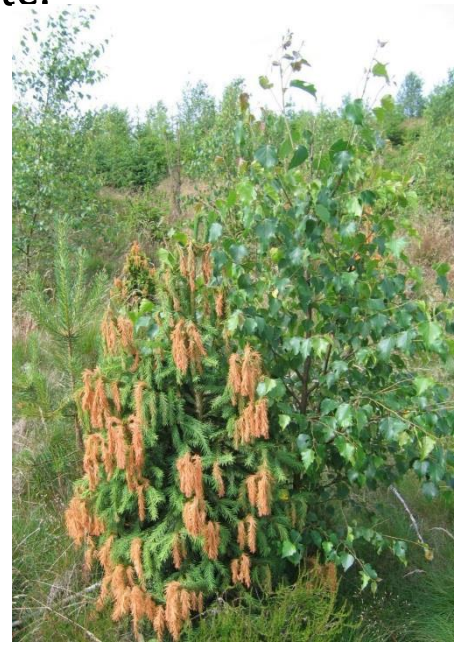
- More robust trees

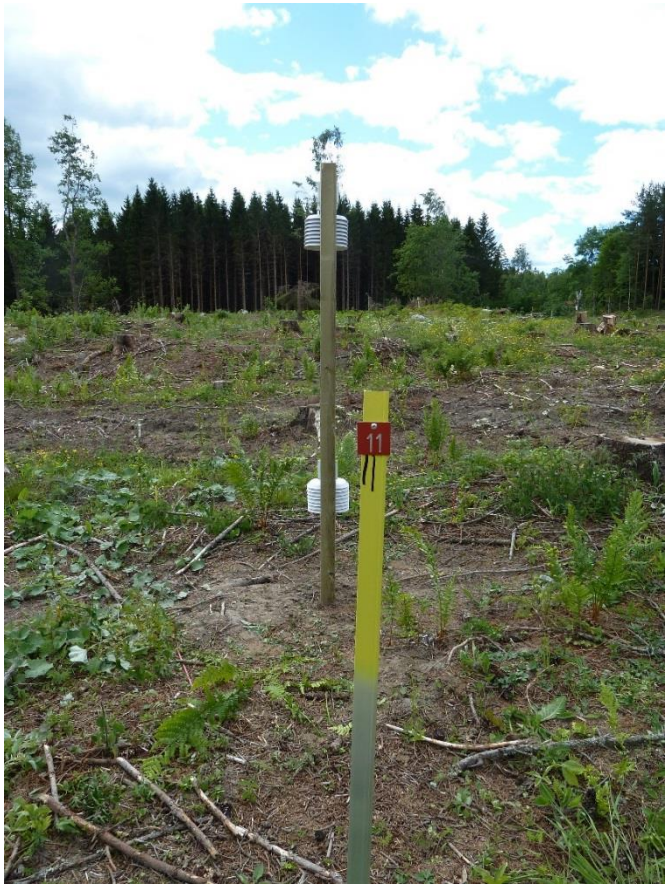


Field and nursery measurements

- Phenology traits is registered in nursery and field tests

  Bud burst, autumn shoot, hardening, damages (forking) etc.

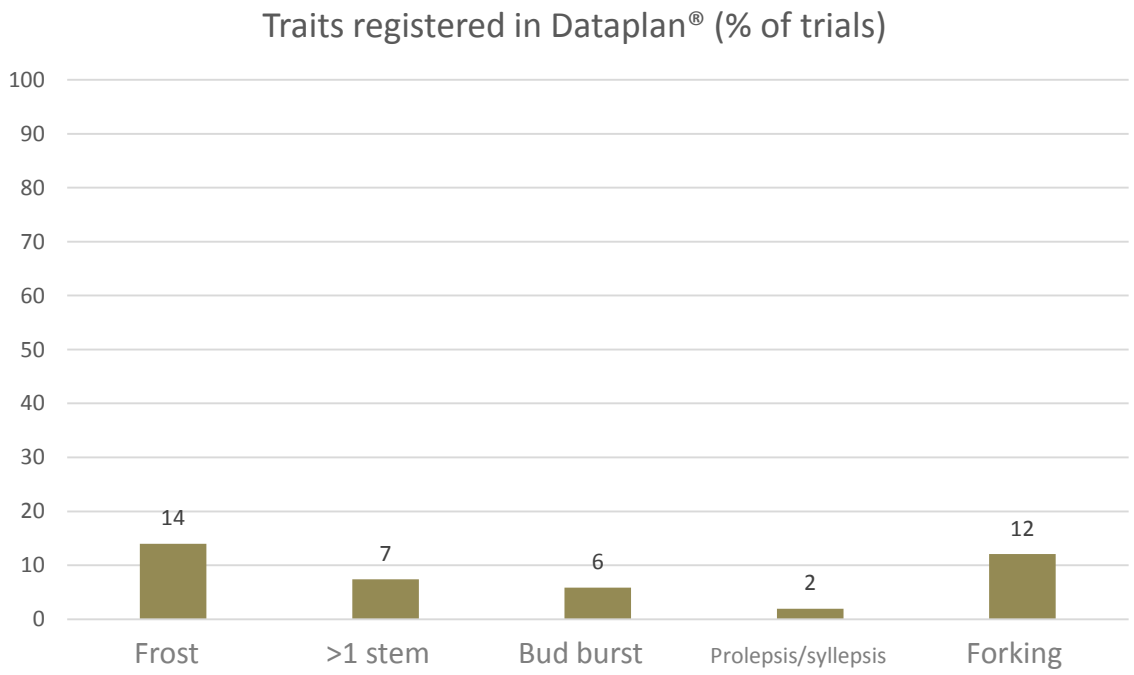




- Temperature is logged in new trials

Dataplan® *Picea abies* 2016

- Focus on phenology traits



approx. 50% of trials added

Expand test sites - Growth patterns for Norway spruce

Expand the test area and focus on phenological traits

- Long transfer experiment Uppsala to Bordeaux

Breeding pop field trial planted 2017 (last week) in Denmark

Next planting season 2018?

Rules how and when to measure phenological traits?

- Coordination Nordic countries?
- Bud burst index, is this used and how to implement in breeding?

A long transfer experiment

- Material from Central Swedish breeding populations tested for use at LAT=60 (here)
- 14 families and 295 clones (both Swedish and East-European origin)
- Tested at 4 localities:
  - LAT=60 (near Uppsala)
  - LAT=55 (southern Sweden)
  - LAT=50 (northern Germany)
  - LAT=45 (near Bordeaux)

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A long transfer experiment

- Main purpose – to analyze flowering capability under very different climatic conditions.

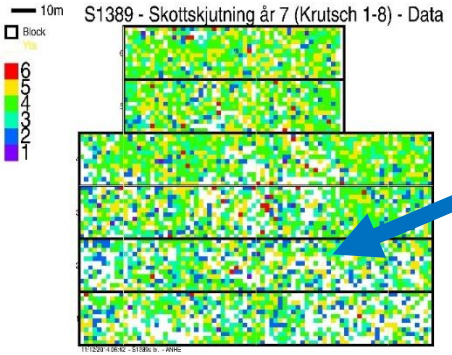
”By-effects”

- GxE and/or reaction norms when transferred very far.
- Phenological events (one ”standard” and one more advanced climatic station per site)

When to measure bud burst?

Correlation of bud burst between donor plants, cuttings and field trials

Donor plants - nursery

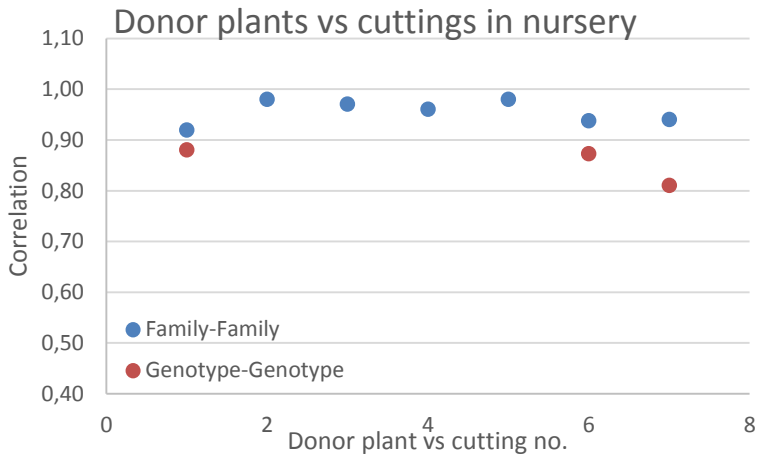


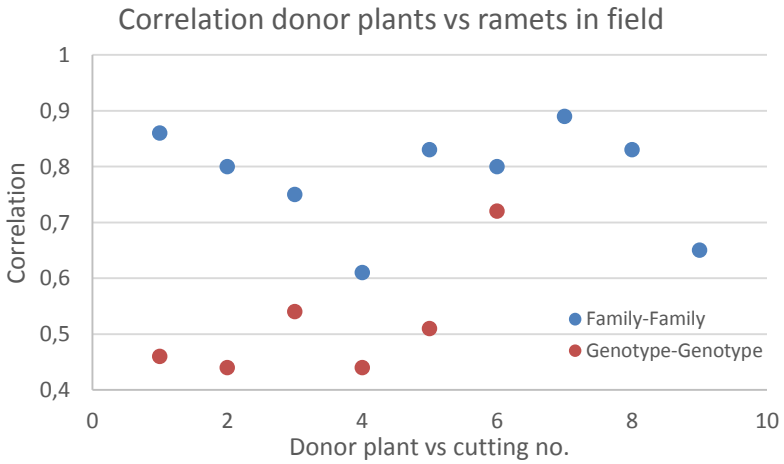
Field trial

Cuttings (ramets) – nursery

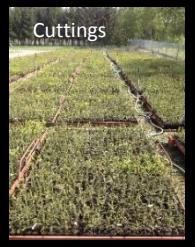
(Ref: Helmersson A and Westin J, 2015. Rapport 237 – Föreningen skogsträdsförädling)

Correlation bud burst between young/old trees



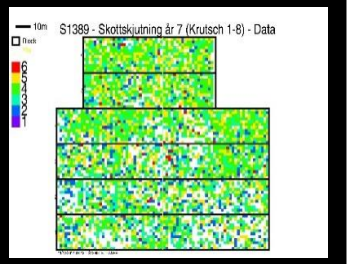


Nursery vs Nursery



Family-family: **0.94** +-0.02
Genotype-genotype: **0.85** +-0.04

Nursery vs Field trial



Family-family: **0.78** +-0.11
Genotype-genotype: **0.53**+-0.05

(Ref: Helmersson A and Westin J, 2015. Rapport 237 – Föreningen skogsträdsförädling)

Development of a useful index

- A need to develop model variables relating geographic origin with growth rhythm.
- Example: Critical temperature-sum requirement for bud-burst $TSUM_{ack}$

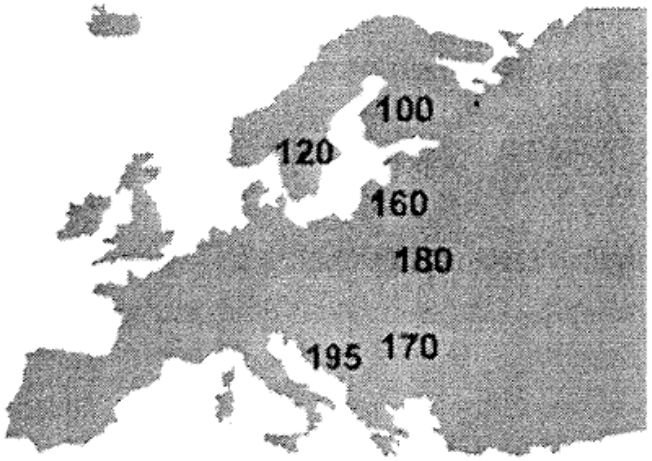
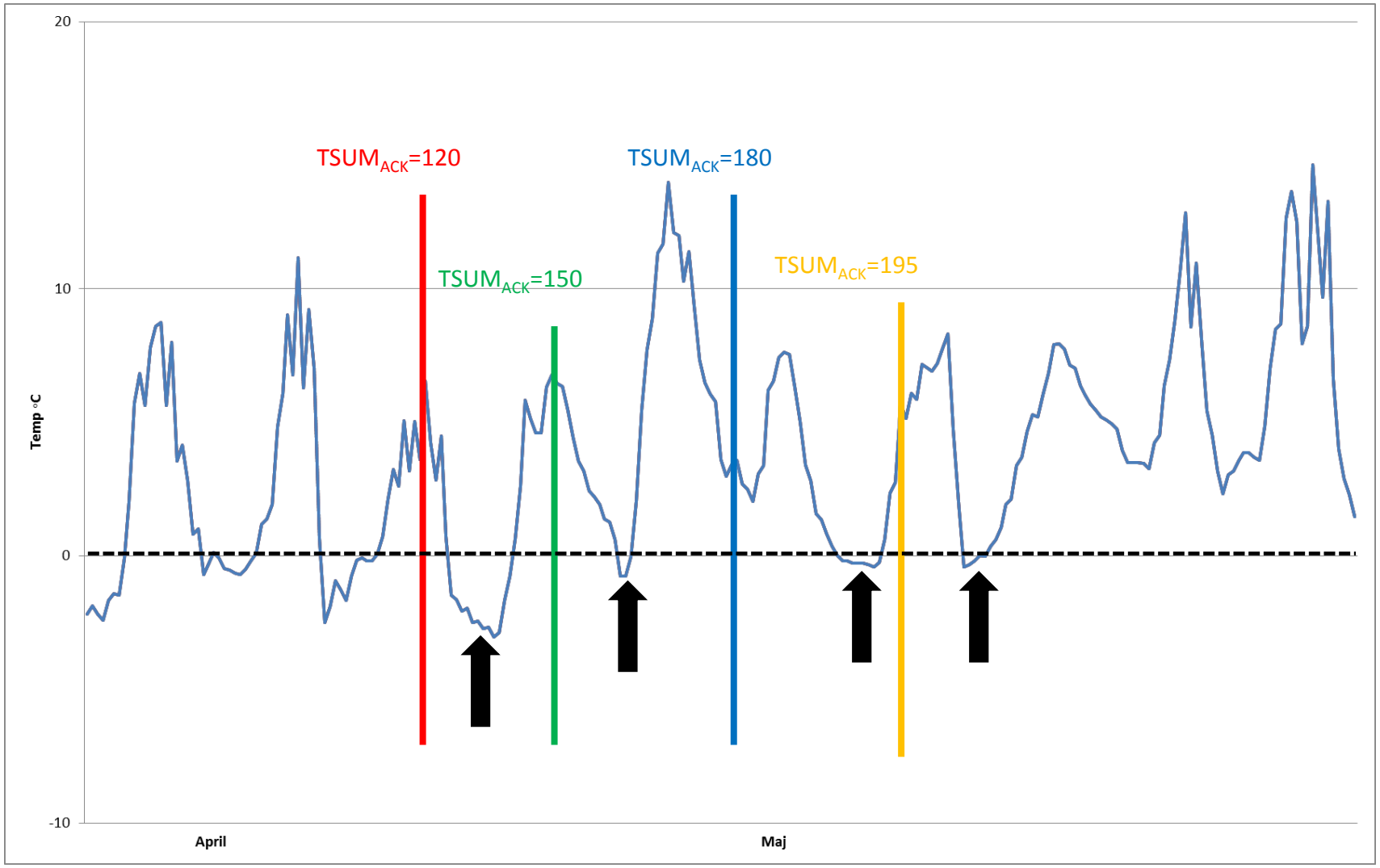


Figure 3. Approximate temperature-sum requirements for budburst in 3-5-year-old seedlings of various Norway spruce provenances, assuming that the chilling requirement is fulfilled. Accumulated day-degrees > +5°C.

(Ref: Hannerz, 1999)

Approach for ”frost index”



“Autumn” shoots both positive and negative!

+ Better growth

- Increased risk for damages

Selection of families with low proportion autumn shoots and good growth is possible

Autumn shoot conclusions

- Prolonged growing season in autumn no big problem
- Start of growth more problematic, relates to spike knot etc.
- No problem with forking/spike knot using breed material

  Less or equal amount of forking if recommendations for seed orchard deployment is used.
- Tree breeding increase the level of autumn shoot growth but how this affects the quality of sawn timber is unknown, will the increased volume growth motivate inclusion?
- Is there anything that is seriously negative with autumn growth?
- How should a breeder reason when selecting material for next generation?

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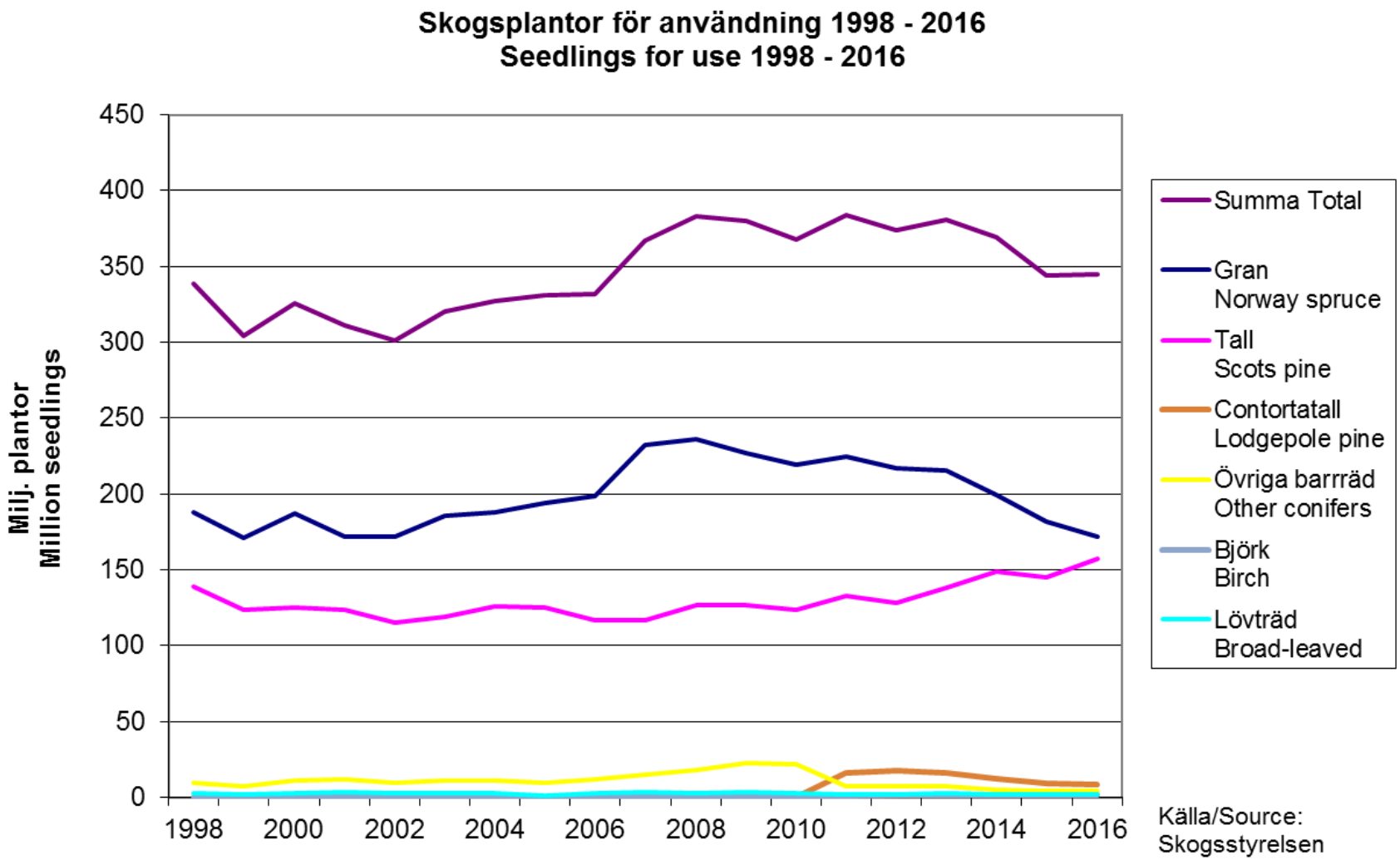
Seedlings for use 1998-2016



No. plants regenerated from Swedish seed orchards

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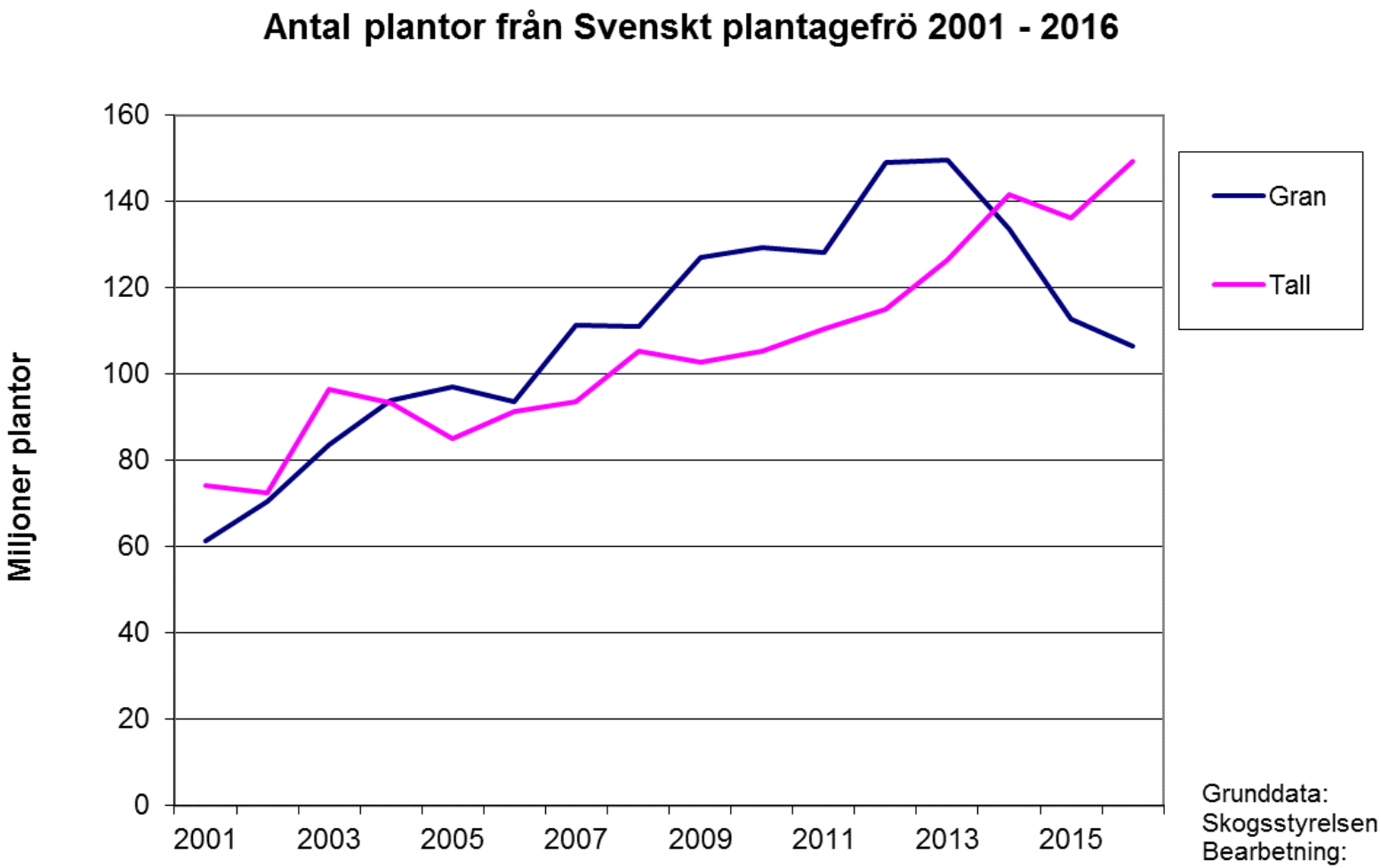
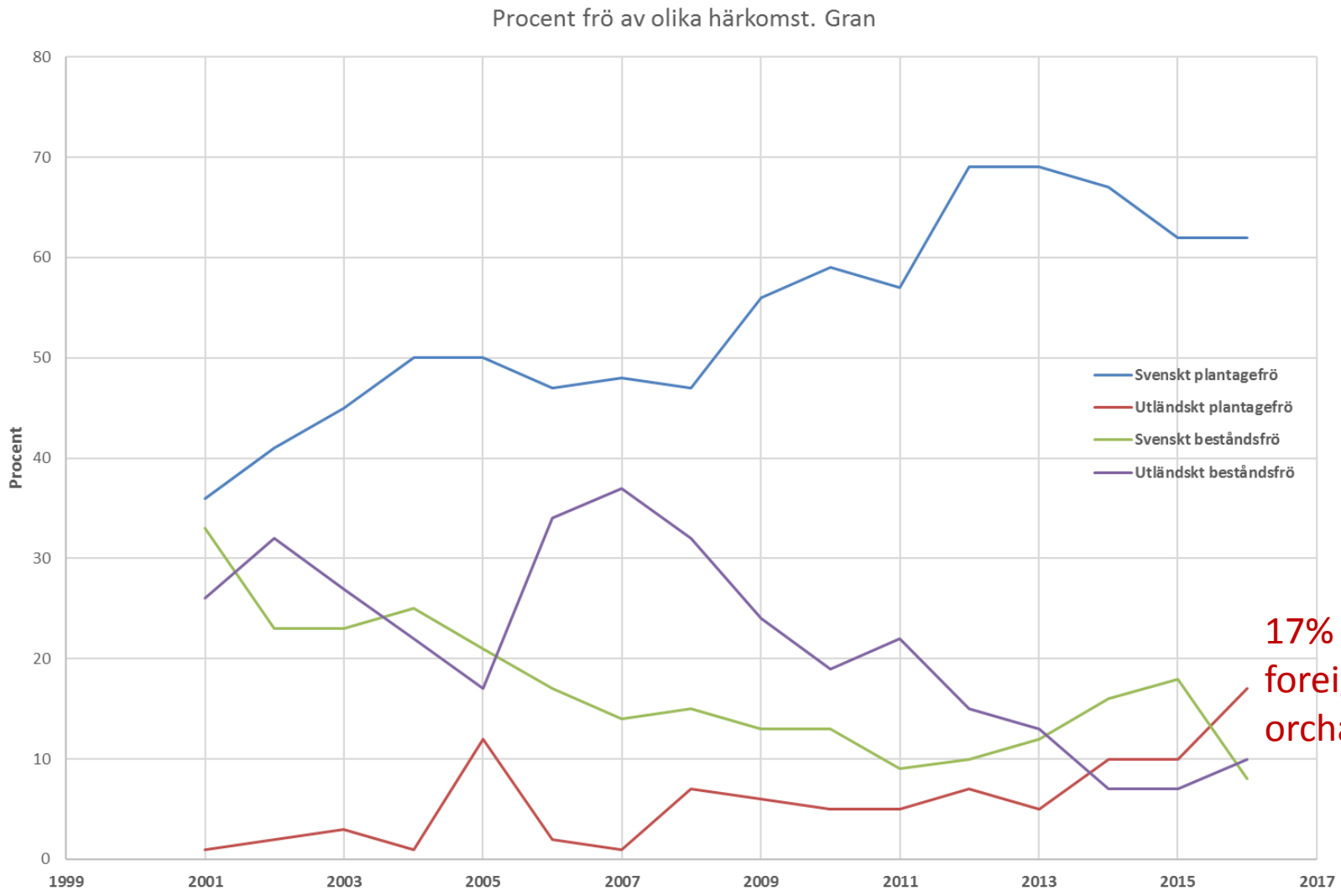
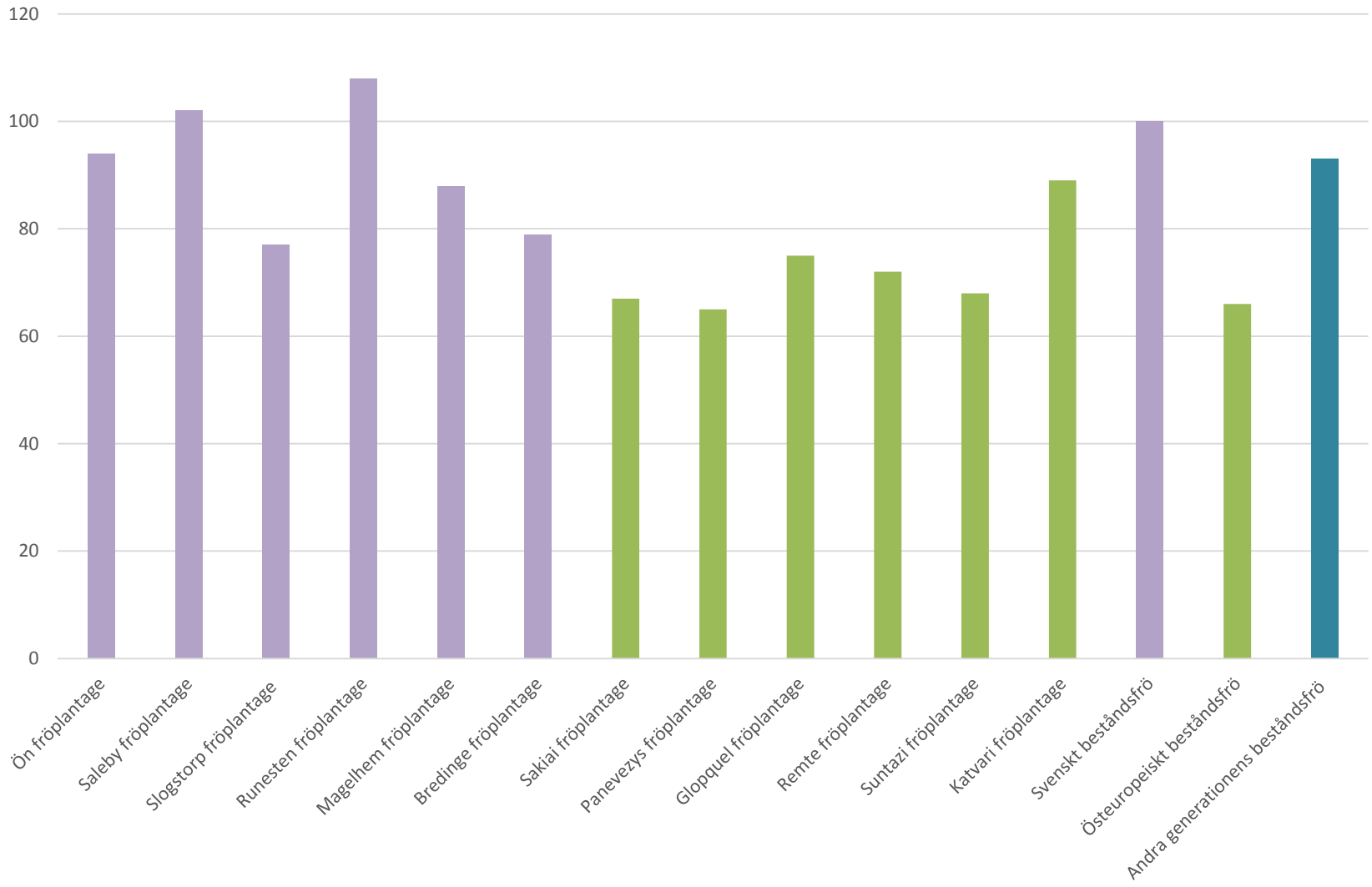


An increase of imported spruce seeds



17% from foreign seed orchards

Bud burst seed orchard material (Norway spruce, Krutzsch)



Diversify decrease risks?

Stable long term

- Norway spruce
- Scots pine
- Contorta
- Birch

Short intermittent breeding

- Larch – 3 new trials 2019
- Sitka
- Douglas
- Hybrid aspen
- Populus
- Alnus
- Oak
- Beech
- Ash
- Cherry
- Linden

END

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