



## **LARIX 2012: Larch in a warm climate**

The 8th international symposium of IUFRO Working Group S2.02.07 – Larch Breeding and Genetic Resources. Hallormsstaðaskógur National Forest, Iceland, 11 - 13 September 2012.

### **Excursions**



**Tuesday, 11 September**

A walk along forest roads and footpaths to the north from Hotel Hallormsstaður.

**Graubünden**

- Species: *Larix decidua*,
- Provenance: Graubünden, Switzerland, from an elevation of 1850 m
- Area of stand: 0.55 ha
- Planted: 1963
- Dominant height: 14 m
- Comments: This is the only reasonably well-growing European larch stand in Iceland. We have other examples with similar growth rates but form is usually very bad due to autumn frost damage. European larch from lower elevations than about 1800 m grows too long into the autumn and seed of higher elevation provenances is difficult to get. European larch is not used to any extent in Icelandic forestry.

**MoDo**

- Species: *Larix sukaczewii*
- Provenance: MoDo (Domsjöenget seed orchard, Sweden)
- Area of stand: Small
- Planted: 1981
- Dominant height: 10 m
- Comments: Larch of this origin was much planted in Iceland in the 1980s. It is among the best adapted larch for Icelandic conditions.

**Clear cut**

- Species: *Larix sibirica*
- Provenance: Sarala, Khakassia, Russia
- Area of stand: 1.68 ha
- Planted: 1969
- Dominant height: 9.5 m
- Felled: 2012
- Comments: This provenance, along with another Khakasian provenance, Bograd, was much planted in the 1950s and '60s. It often sustains both spring and autumn frost damage and is susceptible to conifer canker (*Phacidium coniferarum*). In recent years, its growth has been stunted by repeated spring frost damage after mild winter weather. The decision was taken to cut the rotation short in this stand due to poor form and slow growth.

**Raivola**

- Species: *Larix sukaczewii*
- Provenance: Mustila Arboretum, Finland (ex. Raivola)
- Area of stand: 2.8 ha
- Planted: 1966
- Dominant height: 13 m
- Comments: Larch of Raivola origin grows well in Iceland. For the past 20 years, Raivola larch from Finnish seed orchards has been a mainstay of forestry planting in Iceland.

**European larch provenance trial**

- Species: *Larix decidua*
- Provenances: The Czech Republic, Slovakia and Poland from elevations of 600 to 1400 m.
- Area of stand: 0.2 ha
- Planted: 1963
- Dominant height: 11-13 m
- Comment: This is a small provenance trial of Tatra and Sudeten larch. Survival was poor, ranging from 13 to 25% among provenances. Form is also very poor but the growth rate of some individual trees is good. Provenance differences in growth and form are not significant due to small initial numbers and high mortality.



Polish, Czech and Slovakian *Larix decidua* provenance trial planted 1963

**Wednesday, 12 September**

A walk along forest roads and footpaths to the south from Hotel Hallormsstaður

**Jón's forest**

- Species: *Larix sibirica*
- Provenance: Bograd, Khakassia, Russia
- Area of stand: 1.35 ha
- Planted: 1951
- Dominant height: 15.4 m
- Comments: With the exception of a few trees, this is the first stand of *Larix sibirica* planted in Iceland. Quality is generally poor.

**Irkutsk**

- Species: *Larix sibirica* (or *Larix x czekanowskii*?)
- Provenance: Irkutsk
- Area of stand: 0.91 ha
- Planted: 1953
- Dominant height: 16.2 m
- Comments: Poor initial survival but good growth rate of the surviving trees.

**Boxbaca**

- Species: *Larix sukaczewii*
- Provenance: Boxbaca, Finland
- Area of stand: 0.08 ha
- Planted: 1969
- Comment: A small stand of Raivola origin larch, very good form.

**The mother of Hyrmur**

- Species: *Larix decidua* and *Larix sukaczewii*
- Provenance: Blair Athol, Scotland, Tyrol, Austria (1600 m) and Velsk, Russia
- Area of stand: 0.38 ha
- Planted: 1960-1963
- Dominant height: 18 m
- Comment: The Blair Athol larch was thought to have all died so the area was replanted with Tyrol and Velsk larch the following years. The Blair Athol larch was originally said to be *Larix decidua* x *L. kaempferi*, but looking at the cones, there is no indication that the surviving trees are anything other than *Larix decidua*. Based on its growth elsewhere, the most crooked trees are Tyrol larch. The Velsk larch shows good growth and form. A plus tree of *L. decidua* selected here yields progeny with hybrid vigour when crossed with *L. sukaczewii*.

**Raivola**

- Species: *Larix sukaczewii*
- Provenance: Mustila, Finland (ex. Raivola)
- Area of stand: 0.33 ha
- Planted: 1957
- Dominant height: 16.5 m
- Comment: A very fine stand and one reason why we plant mostly larch from Finnish seed orchards in Icelandic forestry.

**Shebalino**

- Species: *Larix sibirica*
- Provenance: Shebalino, Altai Republic, Russia
- Area of stand: 0.82
- Planted: 1957
- Dominant height: 15.5
- Comment: One of the better stands of Siberian larch.

**Douglas-fir and lodgepole pine**

- Species: *Pseudotsuga menziesii* and *Pinus contorta*
- Provenance: Vernon and Smithers, B.C. Canada
- Area of stand: small
- Planted: 1940
- Dominant height: 20 m
- Comments: Small stands, the oldest of their species in Iceland

**Sverdlovsk**

- Species: *Larix sukaczewii*
- Provenance: Sverdlovsk, Russia
- Area of stand: 0.57
- Planted: 1962
- Comments: We have few examples of larch from the Ural Mountains in Iceland.

**Sakhalin**

- Species: *Larix gmelinii*
- Provenance: Mustila, Finland ex. Sakhalin
- Area of stand: 0.04 ha, a total of 400 trees planted initially
- Planted: 1954
- Dominant height: 10 m
- Comment: *Larix gmelinii* has survived and grown very poorly in Iceland.

**The arboretum**

- Over 80 established tree species and many more that have been planted recently



The mother of Hrymur (center), a *Larix decidua* from Blair-Athol, Scotland

**Thursday, 13 September**

Main symposium excursion

**Höfði**

1) Small, young stands of various larch species, provenances and hybrids including:

- *Larix decidua* x *L. sukaczewii* (Hrymur)
- *Larix sibirica* prov. Vendenga, Komi
- *Larix sibirica* prov. Ostskoe, Buryatia
- *Larix decidua* prov. Fuldera, Graubünden, Switzerland (1700 m)
- *Larix laricina* provenance hybrid (Alaska x Labrador)
- *Larix kaempferi* x *L. sukaczewii* prov. Långtora, Sweden
- *Larix kaempferi* prov. Långtora, Sweden
- *Larix occidentalis* prov. Tyner Lake, B.C. Canada
- *Larix lyallii* prov. Vaglir, Iceland ex. Lake Louise, Alberta, Canada

2) *Larix sukaczewii* and *L. sibirica* provenance trial planted 1999

Main results: Considering both growth and form, the best provenances are the Swedish seed orchard Östteg and the Icelandic seed orchard Vaglir. The southern *L. sukaczewii* provenance Kostroma grows as fast but has poor form. Finnish seed orchard provenances and the dubious provenance 'Leningrad' are also good. Three *L. sibirica* provenances (Vostochno, Altai and Ostkoe) grow the slowest although their form is often good. This trial is discussed in the symposium paper presented by Throstur Eysteinnsson.

3) Indoor seed orchard progeny trial planted 1999

Main results: Full-sib hybrid families of a single *Larix decidua* pollen parent crossed with 4 different *L. sukaczewii* mothers as well as half-sib progeny of that same *L. decidua* clone as a mother pollinated with a *L. sukaczewii* pollen mix were superior to *L. sukaczewii* families. Compared to pure *L. sukaczewii* families, the hybrid is:

- 10-50% superior in height
- 50-150% superior in volume
- Similar to much better in straightness
- Similar in autumn frost damage
- Less susceptible to spring frost damage

The decision was taken to produce only *L. decidua* x *L. sukaczewii* hybrid material in the indoor seed orchard. This hybrid has been given the cultivar name 'Hrymur'.



The progeny trial in 2004

**Hafursá**

Permanent sample plots with different thinning grade

Species: *Larix sukaczewii*

Provenance: Shenkursk, Arkhangelsk

Planted: 1967

In 1998, 4 permanent measurement plots were established, 20 \* 20 meters or 400 m<sup>2</sup>. Before the thinning the number of trees/ha was 2894/ha. The thinning grade was 1000, 1500 and 2000 trees/ha after thinning and one plot was left unthinned. Plot 1000/ha was heavy thinning were 52 % of the basal area was removed and the plot has not been tinned after that. Plot 1500 moderate thinning were 33 % of the basal area was removed 1998 and 40 % of the basal area was removed 2008. Plot 2000 light thinning, were 28 % of the basal area was removed 1998, 8 % removed 2003 and 34 % 2010.

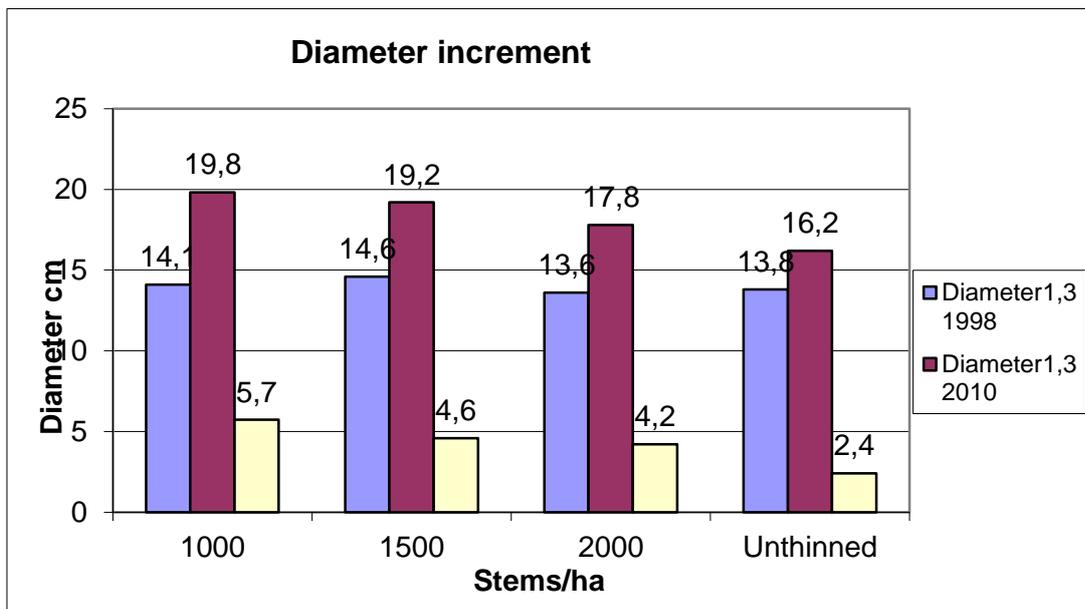


Figure 1. Diameter increment over the measurement period.

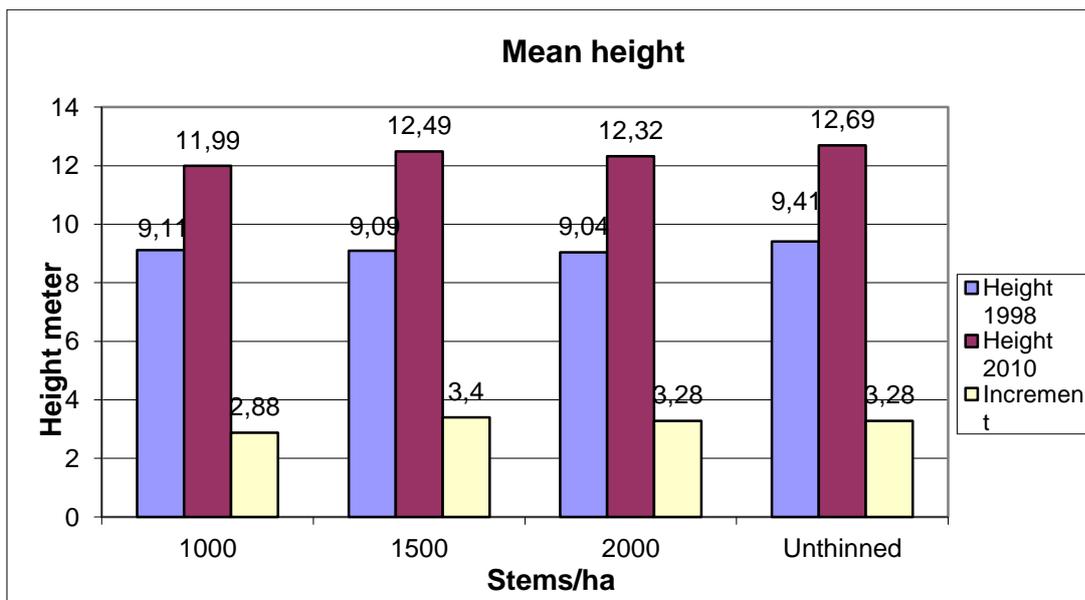


Figure 2. Mean height growth over the measurement period.

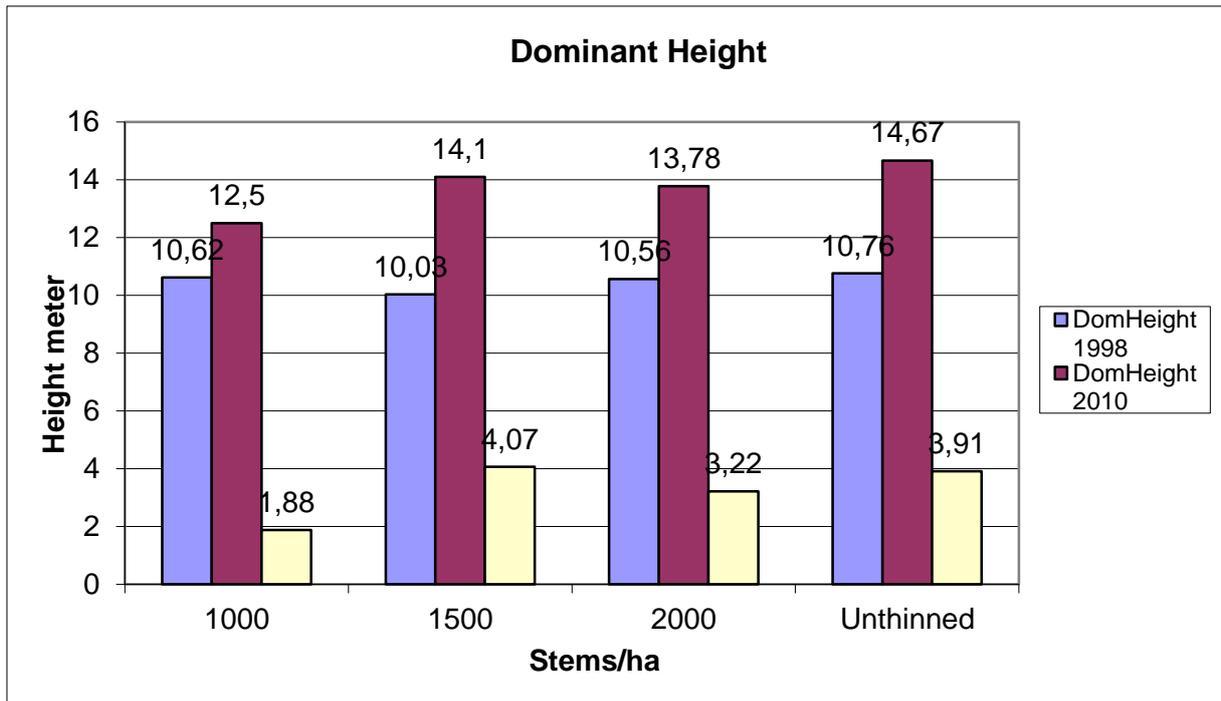


Figure 3. Dominant height growth over the measurement period.

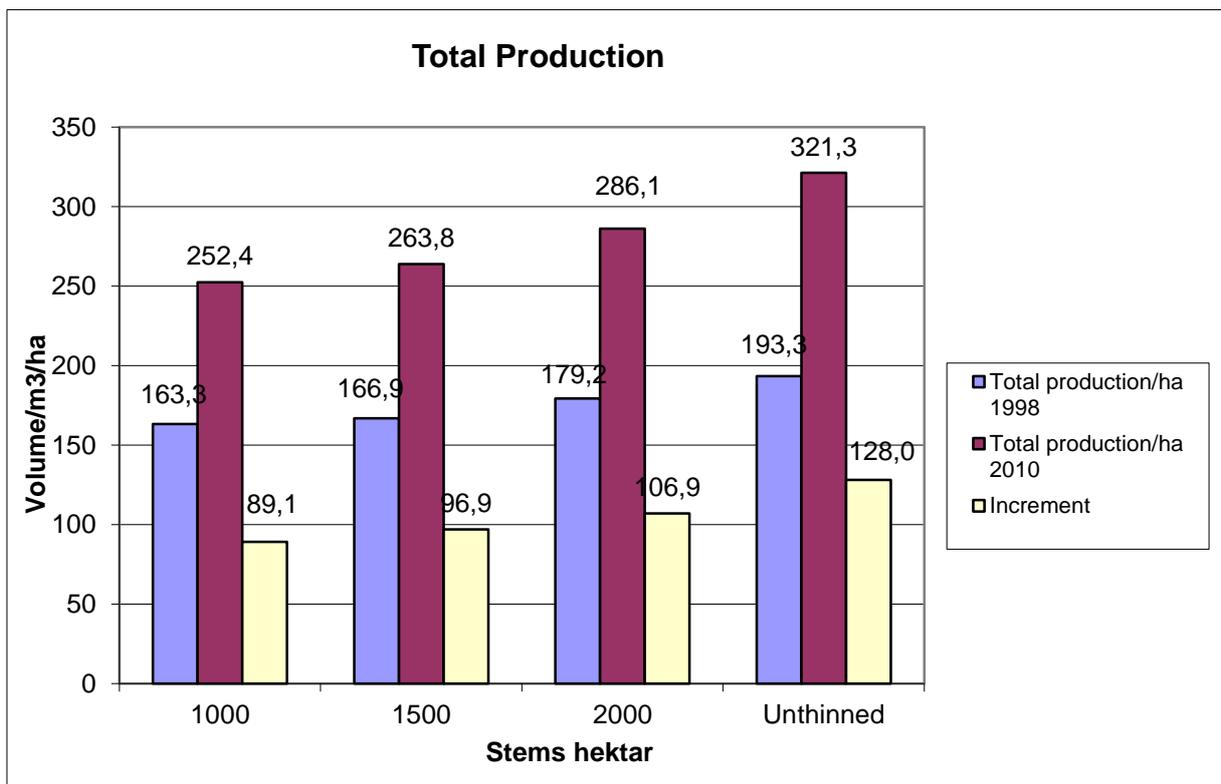


Figure 4. Total production and increment over the measurement period.

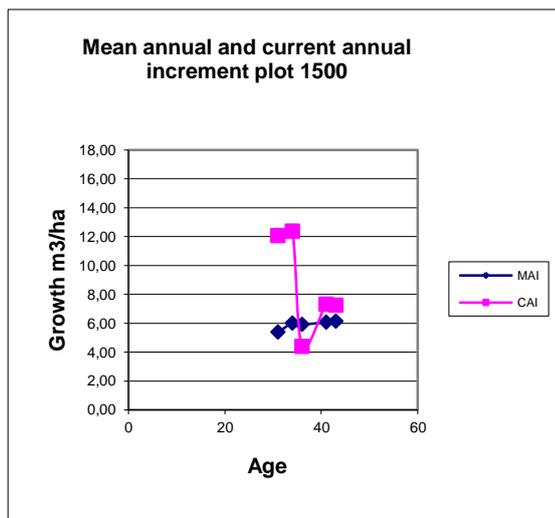
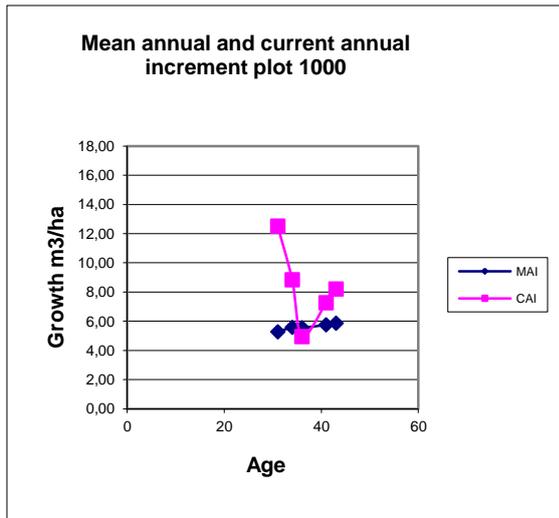


Figure 5 and 6. Mean annual and current annual increment at age 31, 34, 36, 41 and 43.

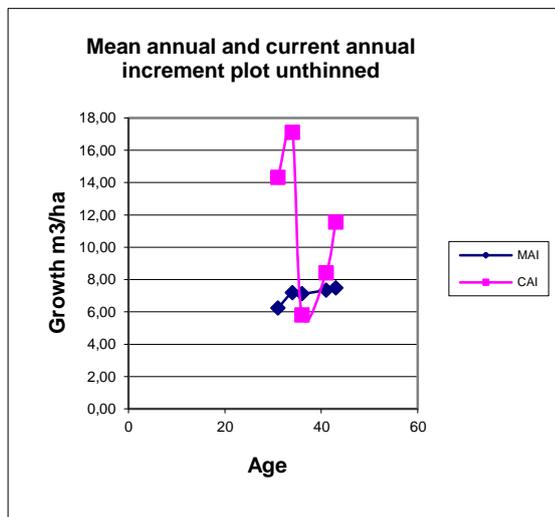
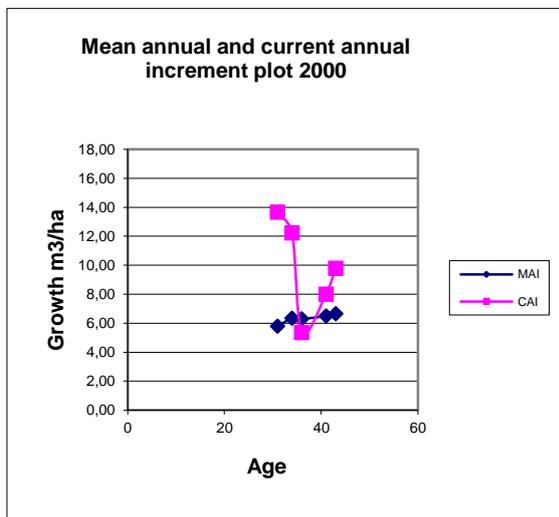


Figure 7 and 8. Mean annual and current annual increment at age 31, 34, 36, 41 and 43.

### Regional Afforestation Projects in Iceland

- The first seedlings in the pilot project were planted in 1970 on four local farms
- The Regional Afforestation Projects were formalized with the enactment of legislation in 1991
- The Project began as one limited to eastern Iceland and has since grown to five projects. Farms in all areas of the country are eligible for participation
- At present there are a total of 132 farms participating in eastern Iceland. The average area contracted for afforestation is 115 ha. making the total 15,207 ha.
- To date, approximately 26 million seedlings have been planted with support from the Regional Afforestation Project in East Iceland, of which 51% is larch, 18% spruce, 13% pine and 10% birch.

### Viðivellir

- The total contracted afforestation area on this farm is 93 ha.
- Viðivellir was a participant in the pilot program and it was here that the first seedlings were planted in July of 1970.
- The first plantings were *Larix sibirica* provenance Altai



**Valþjófsstaðir**

- Original contract 19.2 ha.
- First plantings are from 1992
- Three provinces of Russian larch were used here:
  - Pinega (wild seed)
  - Imatra (Finnish seed orchard)
  - Lassinmaa (Finnish seed orchard)
- The area planted is an old river course and therefore very porous making the area susceptible to drought.
- Spacing protocol and time trails 2009-10
- Initial density was 5,200 pl/ha, present density 1,700 pl/ha.



**Setberg**

- The farm was contracted in 1994 and the afforestation area is 162 ha.
- The area we are visiting is a blend of seed orchard seed from Lassinmaa and Ihala.
- The Lassinmaa seedlings used here are plants that were over wintered in a freezing facility at one of the local nurseries.
- The planting was done in 2010 at a density of approx. 3.500 pl/ha



**Mýnes**

- First contracted in 1994 with an afforestation area of 101 ha
- There are two larch provinces used here Stórholl and Vendenga.
- The Stórholl larch is the 3rd generation Icelandic seed. The original source of the seed is most likely Russian larch from the Ural Mountains and the Icelandic parent trees are located in Guttormslundur in Hallormsstadur Forest. According to Aleksey Fedorkov, the Vendenga material was probably collected in plantations of Siberian larch originally from Khakasia or Altai, which fits with the adaptation seen here.



**Friday, 14 September**

Optional post-symposium trip leaves Hotel Hallormsstaður at 8:00

Ponts of Interest:

**Northeast interior highlands,**

An uninhabited area of tundra, mountains, deserts and more

**Námafjall:**

Hot springs, steam, boiling mud, sulfur mines

**Höfði by Mývatn:**

A forest of birch, larch and other species on lava by Lake Mývatn started in 1937. One of the first areas in Iceland afforested by a private individual.

**Goðafoss:**

The waterfall of the gods

**Belgsá:**

Siblarch provenance trials  
Seed orchard progeny trial

**Vaglaskógur National Forest:**

Indoor seed orchard of larch and birch

Akureyri airport at 17:00

