

Background

The non-native Sitka spruce (SS) from NW America has been planted preferably close to the coast line in West and North Norway after world war two and has shown favorable growth and good vitality in these ca 50 000 hectares. Norway spruce (NS) is an indigenous tree in most of Norway and both tree species have been applied in the coastal afforestation program over the last 70 years, where Norway spruce cover ca 250 000 hectares. Presently, there is an increasing pressure to replace non-native tree species with indigenous species. Several long-term trials have been established to investigate growth and yield at different sites.

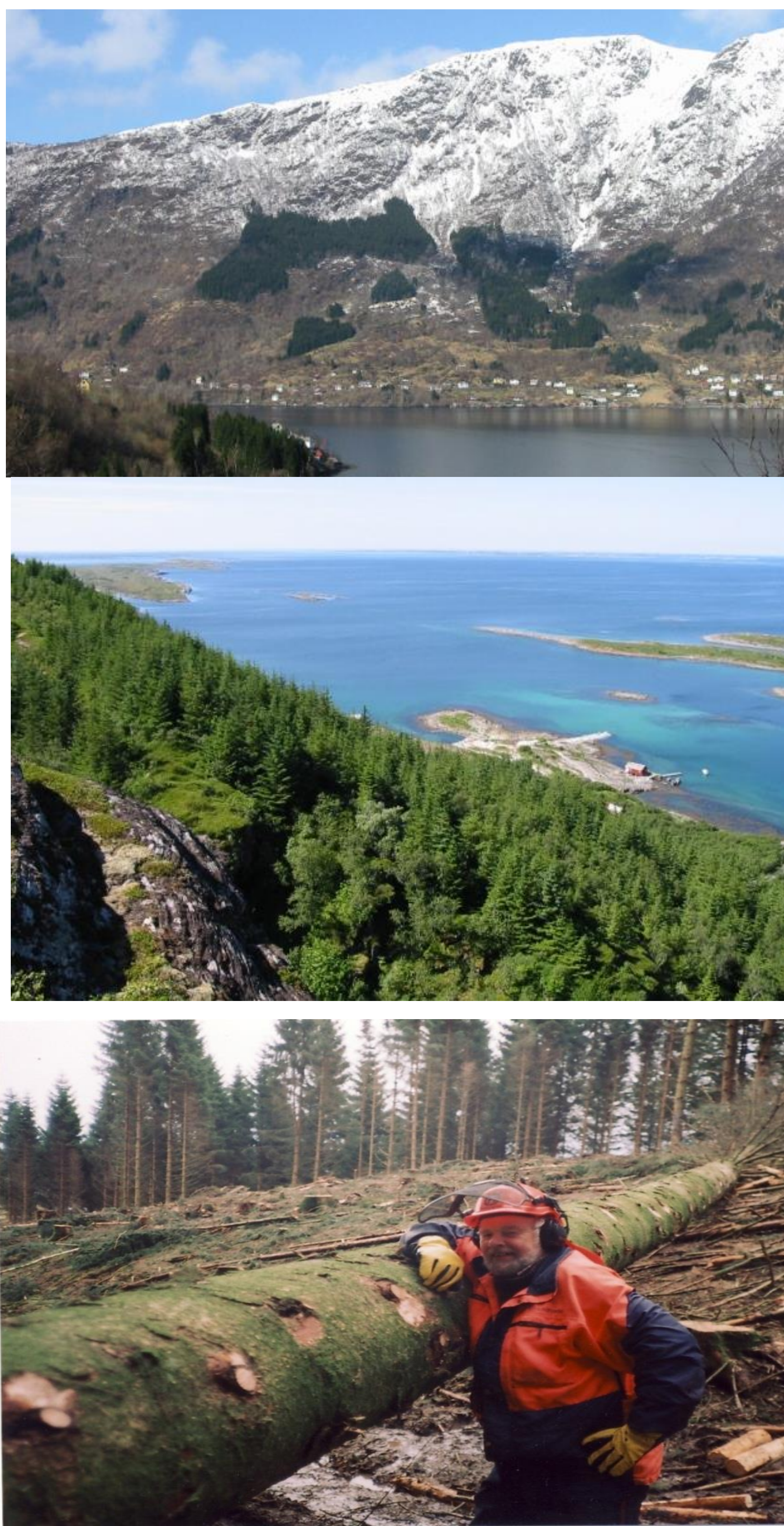


Fig 1. Sitka spruce plantations close to the coast in Norway and produce large diameters

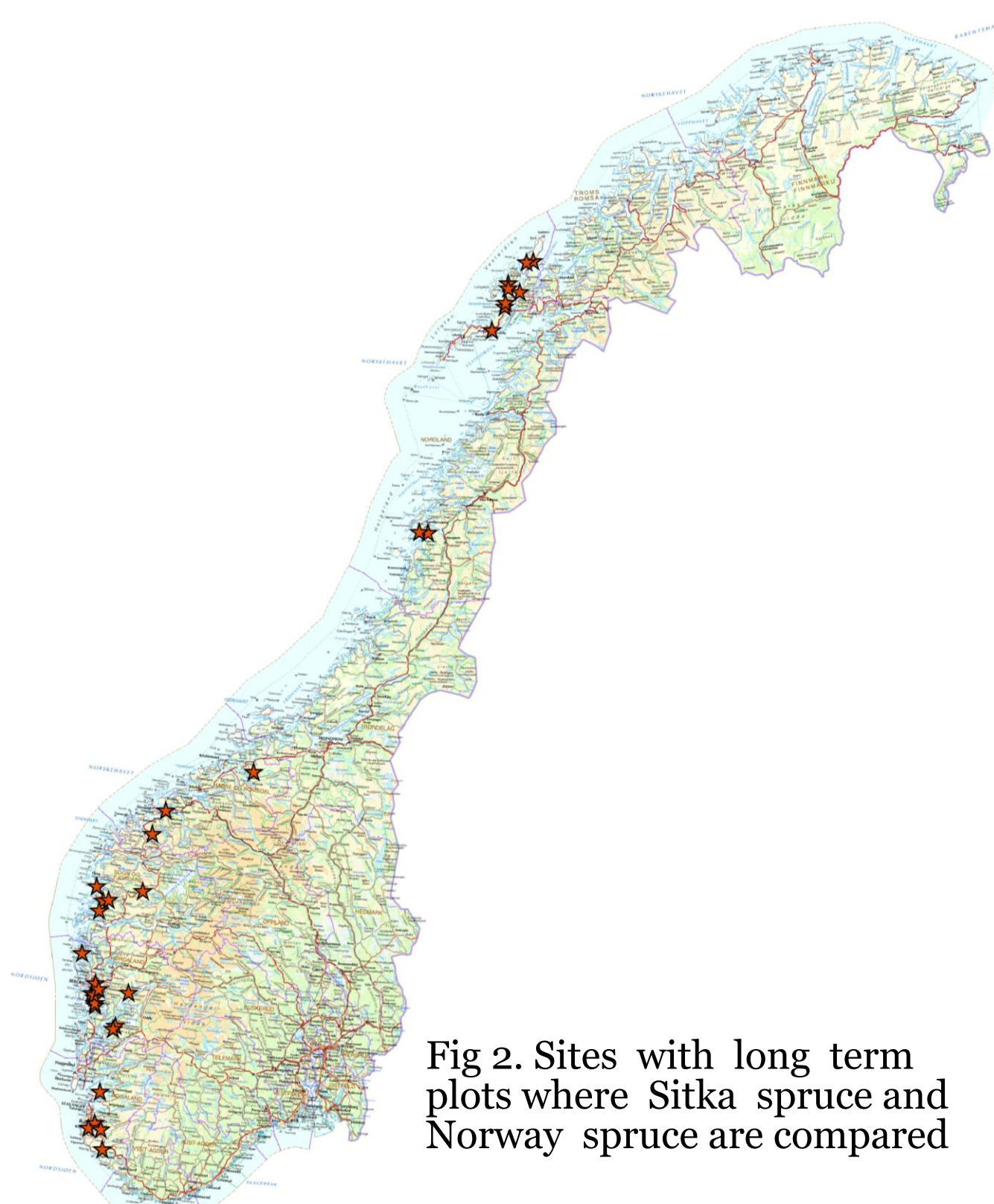


Fig 2. Sites with long term plots where Sitka spruce and Norway spruce are compared

Material and Methods

We analyzed 36 coastal sites (Fig. 2) with neighboring plots of Sitka spruce and Norway spruce at about same age. The stands were both young, middle aged and old on mineral soils from 58° to 69°N. The long term plots have a mean size of 900 m², are measured over a time span of 15 up to 53 years, and a mean revision period of 6 years between the measurements. Through the observation period the standing volume at Sitka plots varied from 85 to 1500 m³/ha (mean 450), and at Norway spruce plots from 65 to 900 m³/ha (mean 420). The mean height varied from 8 to 34 meter at Sitka sites, and from 6 to 26 meters at Norway spruce sites.

Each tree with DBA > 2.5 cm were calipered, and heights of about one of four trees were measured. The annual growth was calculated as the increase of standing volume including mortality and cuttings between two measurements (m³/ha/yr).

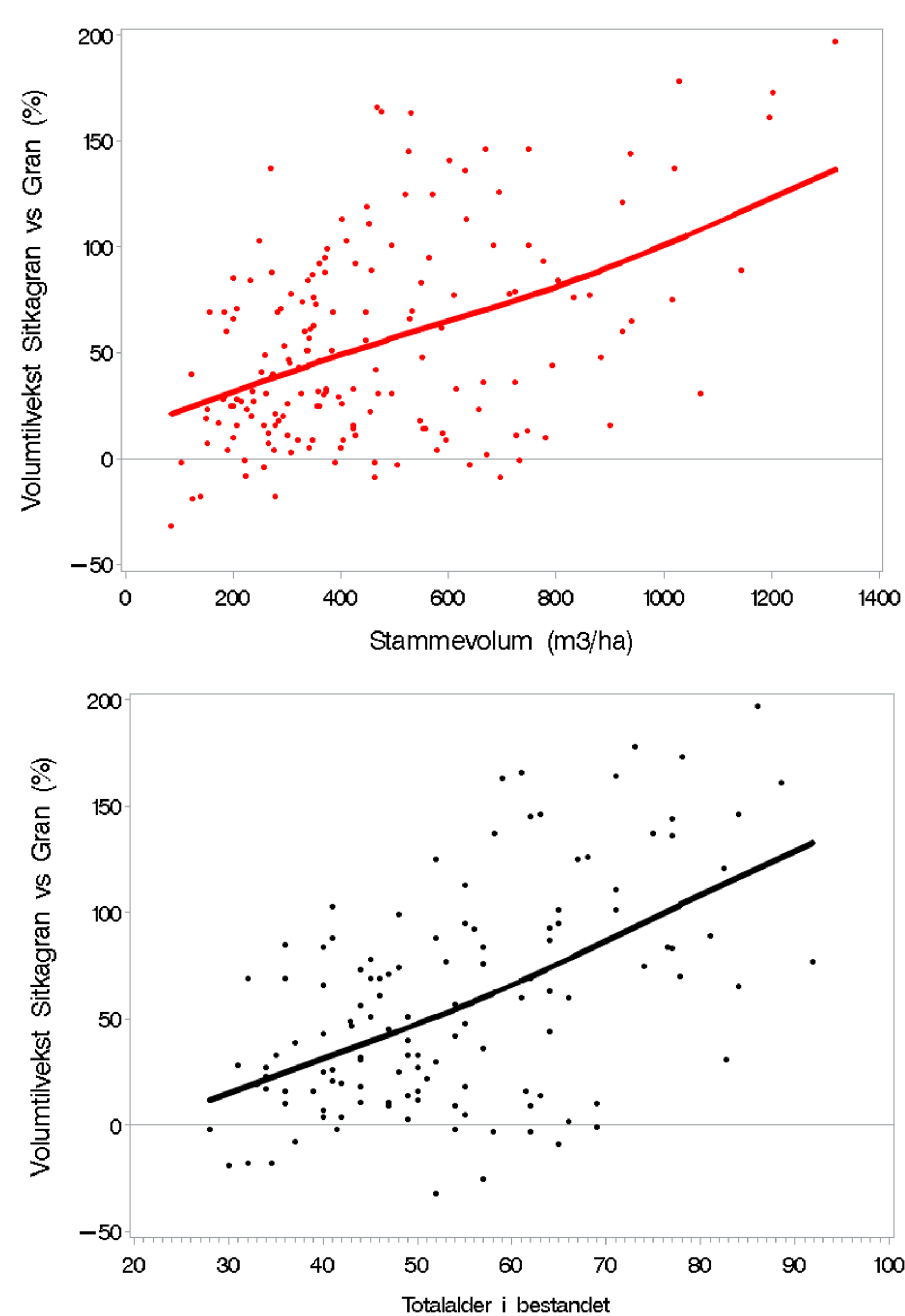


Fig 3. Sitka spruce growth in % of Norway spruce growth. Growth periods.

Results

The stem volume production for Sitka spruce was in average 53 % higher than for Norway spruce. (Fig. 3 and Table 1) The main variation was from 30 % lower to 170 % higher production for the Sitka spruce. The growth in SS is more sustainable for old stands than the growth in NS at these sites near the coast (Fig 3.) The growth differences are higher in medium and old stands (Fig. 4). The differences are most pronounced near the sea shore, and in the North (Fig. 4). An average Sitka spruce stand over a rotation period of 75 year, had a yield of 14 m³/ha/yr, corresponding to a aboveground biomass production of about 550 tons dry matter/ha.

Table 1. Mean volume growth	(m ³ /ha/yr)
Sitka spruce	24
Norway spruce	17

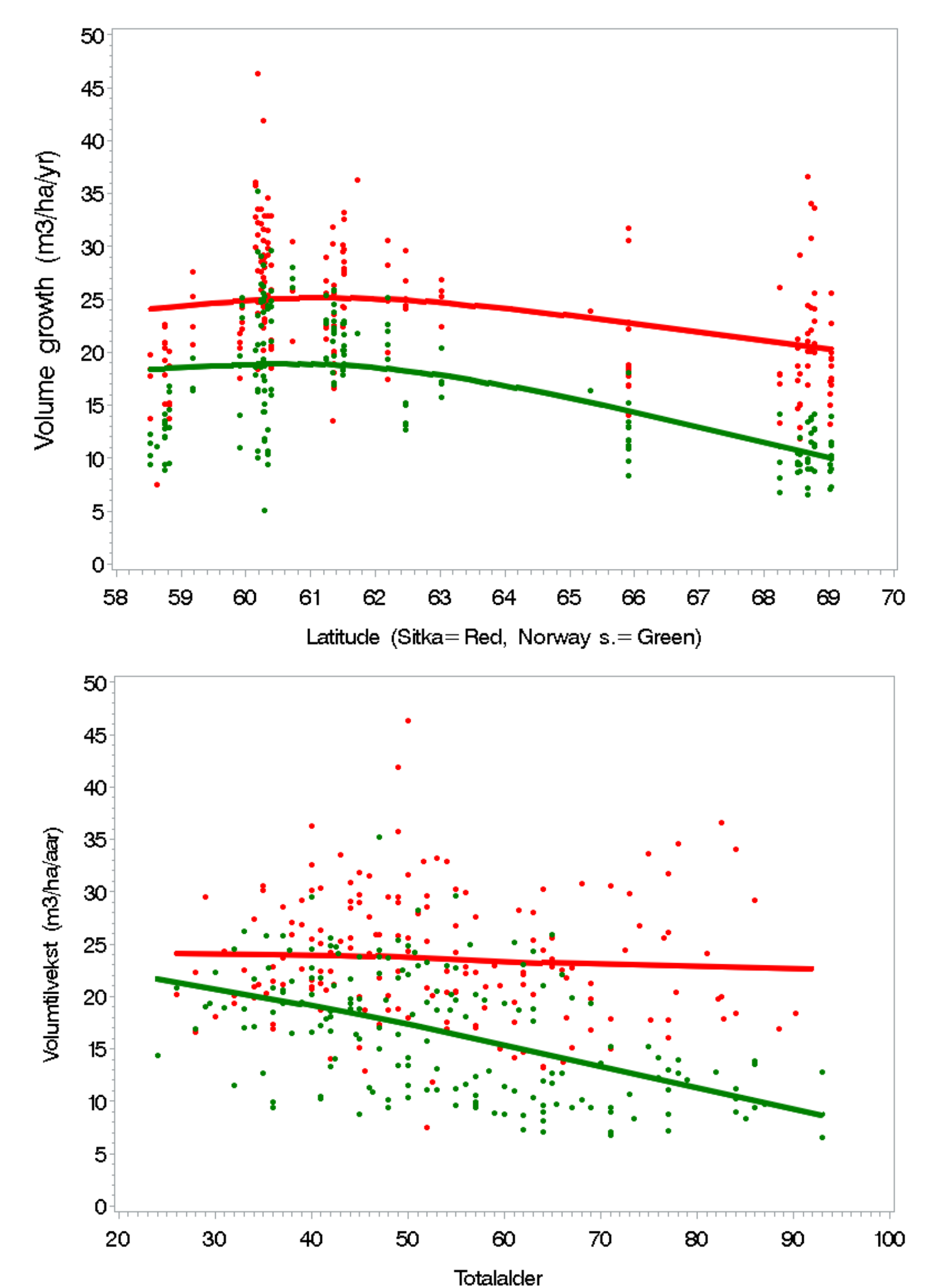


Fig 4. Volume growth (m³/ha/yr) for Sitka spruce and Norway spruce growth

Facts

- 50 000 ha Sitka spruce planted on Coast areas in West and North Norway
- Most intensive afforestation period: 1960 -1990
- Compared with Norway spruce the Sitka spruce show 53 % higher volume production at the same coastal site with largest difference in North Norway
- Today: Increasing pressure to replace non-native tree species with indigenous species in Norway
- Key words: Sitka spruce, Norway spruce, growth and yield, biomass, comparison, West- and North Norway