

SECTION 2

The Effects on Barley Yields

2.1. Introduction

In Section 1 several scenarios based on instrumentally observed historical climatic data, and on results from a general circulation model (GISS), were selected. In this section we use models to estimate the impacts associated with these scenarios on barley yields in Finland. Two methods were used, one based on the longest available temperature and precipitation records expressed as monthly averages and the other one on more detailed daily meteorological records for the years 1959–83. Two study areas were selected: Uusimaa province, covering the area around Helsinki at latitudes 60–61°N, to represent southern Finland; and the Talousseura region, centered on Oulu in the agricultural subdistrict of northern Bothnia, at latitudes 63°50′–66°N, to represent the northern limit of the present barley growing area (*Figure 1.9*).

Barley is the oldest cereal crop cultivated in Finland. Cultivation spread from south to north with the settlement of the country. At the beginning of the eighteenth century, the Finnish settlers brought barley cultivation up to the coast of the Arctic Ocean in Alta Fjord at latitude 70°N in Finnmark, part of Norwegian Lapland (Sundbärg, 1895). In Finnish and Swedish Lapland the northern limit of occasional barley cultivation reached latitude 69°50′N on some individual farms in the middle of the eighteenth century (Rein, 1867; Hellstenius, 1871; Grotenfelt, 1897; Hellström, 1917).

At present, barley is commonly grown in Finland between latitudes 60° and 66°N, less commonly up to 67°N and occasionally up to 68°N [*Figure 2.1(a)*]. It is usually cultivated in rotation with other field crops, in the Helsinki region mostly in clay soils, in the Oulu region mostly in sandy or peat soils (cf. *Figure 1.2*).

Until the 1950s, the area annually under barley was 0.1–0.2 mha. In the 1970s this area increased to 0.4–0.5 mha and in the 1980s to 0.55 mha,

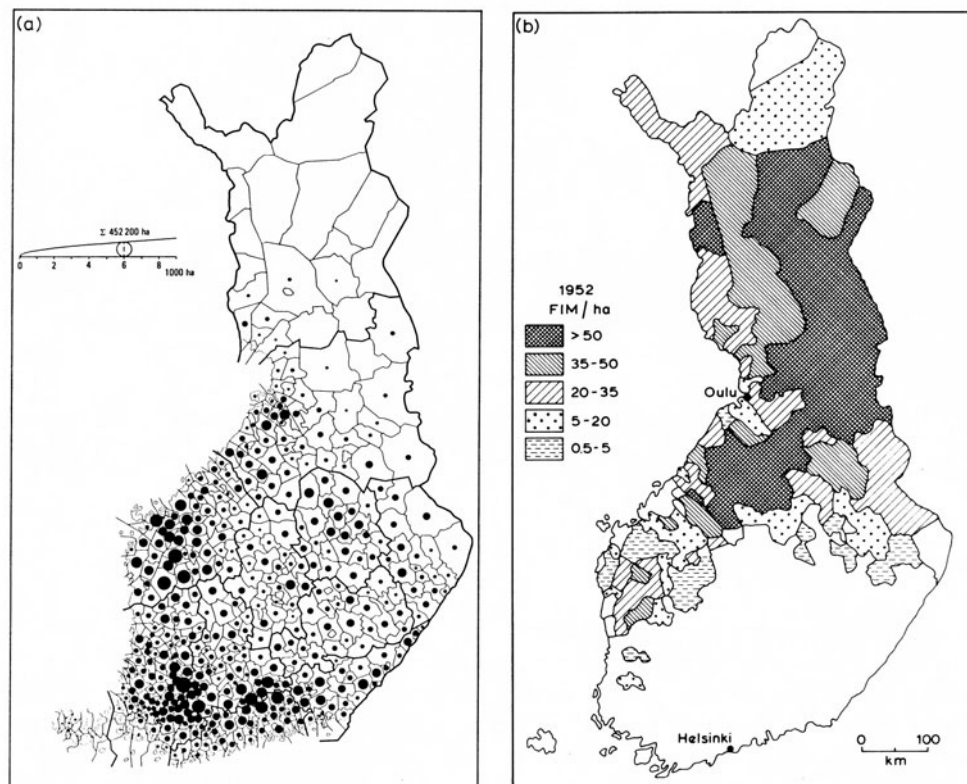


Figure 2.1. (a) Distribution of barley cultivation by municipalities (*Atlas of Finland*, 1982). (b) Regional distribution of compensation paid to farmers for crop losses caused by night frosts in 1952 (Valmari, 1966).

corresponding to 20–25% of the country's arable field area. In early times barley was used mostly for human consumption. Nowadays, the major part of the crop is used for animal feed on farms, 10% for malting and 7–8% for seed; only 1.5% is hulled for food. Present production meets domestic demand.

The average barley yield was less than 1000 kg/ha until the 1920s, exceeded 1500 kg/ha in the 1930s and reached an all-time record of 3206 kg/ha in 1983. This remarkable improvement has been a result of intensive plant breeding, improved cultivation techniques, increased use of fertilizers, etc. This trend shows no signs of abating. The yearly deviations from the average barley yields have been as much as 15–25%, except in the Helsinki area during the period 1870–1930, where they were less than 10% (cf. *Figure 2.3*).

Owing to restrictions imposed by the climate, only spring barley can be grown in Finland. Winter barley is not hardy enough to survive the long Finnish winter. The great majority of the barley cultivars currently grown in Finland are domestic varieties, adapted to long days and a short, cool growing season. The first Finnish cultivars were selected from a local six-row strain in the