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# Northern conditions influencing the selection of countermeasures after radioactive fallout in Finland

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## Abstract

The paper summarizes an evaluation of practicability of rural countermeasures after radioactive fallout in northern conditions carried out by a Finnish group of experts in the FARMING Network project. Snow and soil frost limit the selection of crops, and the short growing season allows mostly one harvest yearly. Cold climate restricts fruit production to apples and berries. Due to the long indoor feeding period, conserved and stored clean feed is available almost all year round. The use of fertilisers and lime on poor and acidic soils leads to high potassium and calcium intake of cows increasing the incidence of milk fever. The surface soil layer is thin and ploughing deeper than 20 cm is problematic due to stony and compacted soils. It also increases soil acidity and decreases fertility. Cultivation of peatlands limits the selection of plants and increases long-term radiocaesium contamination of crops. Frost and snow delay ploughing and spreading of waste milk on arable land, but removal of snow is a decontamination option. Long distances and high transport costs complicate carrying out

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the countermeasures. The Finnish stakeholder group considered it vital to be prepared for implementation of practicable measures for the safety of food.

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## 1. Introduction

During 2001–2002 the Finnish expert group in the Farming Network Project has been discussing the countermeasures to protect the food chain after radioactive fallout. A large number of rural countermeasures have been suggested to reduce the collective radiation dose of the human population (Nisbet et al., 2004). These countermeasures involve food and feed bans, animal management and feeding, soil, land and crop management, alternative land use as well as food processing. It has become clear that climatic and regional conditions affect the practicability of many, if not all, of these methods, and their implementation is different in the north compared to the south. Large seasonal variation in weather conditions in northern Europe affects the implementation of countermeasures depending on what time of year the radioactive fallout occurs.

Northern conditions are mostly associated with low temperatures, long and dark winters, snow and soil frost as well as short but light summers. Typical of the north are also large areas of forest compared to arable land, big river basins and the influence of ice ages in soil type. In addition, the northern regions often have a low density of population and long distances between population centres. However, all northern areas cannot be described identically. For example, despite its latitude, the climate in Fenno-Scandia, especially in the southern part, is favourable for farming due to the Gulf Stream. Therefore agricultural countermeasures are important in the north. Finland is the northernmost country that is practically self-supporting in its production of basic foodstuffs (FINFOOD, 2003).

Finland is located between the 60th and 70th parallels, and therefore the differences in climatic conditions are considerable between south and north. The average temperature in February during the years 1961–1990 was  $-5.7$  °C in southern Finland and  $-13.6$  °C in the northern part. The average temperatures in July were  $17.0$  °C and  $14.1$  °C, respectively. The annual precipitation varies from 600 mm to 700 mm in the south and from 450 mm to 550 mm in the north. The length of the growing season is 165–180 days and 110–145 days in the south and north, respectively.

The terrain of Finland is mostly low and varies from being flat to rolling plains interspersed with lakes and low hills. The highest point in Finland is Haltiatunturi, 1328 m above sea level. The surface area of Finland is 338 145 km<sup>2</sup> of which 7.7% is agricultural land, 68% forest areas and 10% water. About a third of the total area is peatland. The main (over 50%) soil type is moraine. In 2002 the area of agricultural

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