

The Significance of Windbreaks in the Tokachi Region, Hokkaido

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1 Introduction

This research, conducted in The Tokachi region in Hokkaido, the northernmost prefecture in Japan, is intended to prove the significance of windbreaks for prevention of storm damage in that area(Photo 1). During seeding time in early spring every year, the Tokachi region suffers from wind erosion caused by strong winds that follow low pressure fronts. Windbreaks, which help prevent this wind erosion, however, have been decreasing due to the recent agricultural policy of field expansion and the enlargement of modern machinery(Fig.1). The windbreak is not only significant in terms of farmland maintenance but also of landscape preservation as it is an essential part of Tokachi scenery. This research was therefore done to slow the decrease in the use of windbreaks by showing their significance in preventing wind damage. The main method was using the windbreak data with in the GIS(geographic information system).



Photo 1 Wind erosion in Tokachi region (Memuro town:Apr.30.1999)

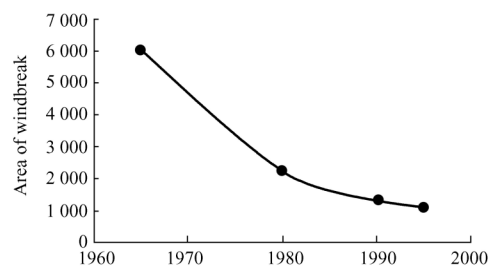


Fig.1 Decrease of windbreaks in Tokachi region

2 Materials and methods

The area of study was Memuro town, an agricultural farming area at the center of The Tokachi region(Fig.2). In the summer of 2000,a field survey was conducted on the windbreaks in 9 agricultural areas in Memuro town(Fig.3). Two windbreak surveys were used in this study. First, was a windbreaks investigation conducted by The Tokachi branch office of Hokkaido government in 1995. A second survey was done in 2000. Both sets of data were input into the GIS. Storm damage data collected during investigations in 1997 and 1998 was input into it as well. Based on these data, the relationship between damage seduction, the sheltered area of windbreak and the actual incident area of storm damage, as well as the quantitative analysis of the decrease in windbreak area between 1995 and 2000 were examined with the following results.

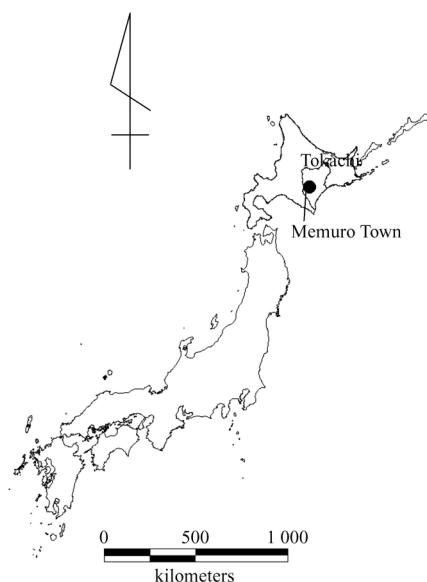


Fig.2 Location of Tokachi region and Memuro Town in Japan

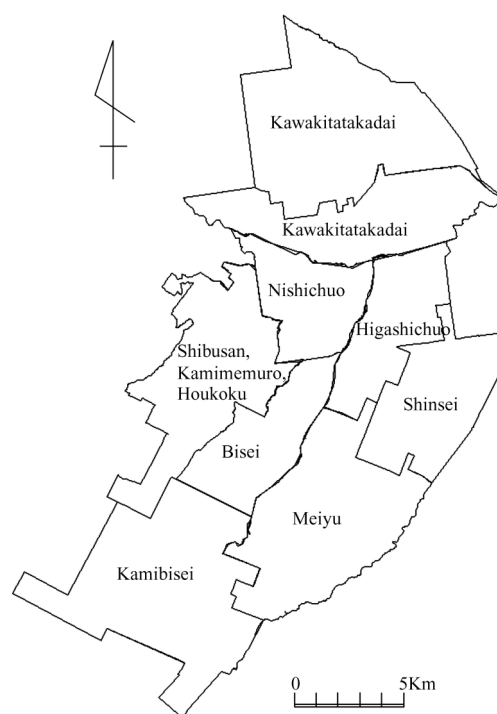


Fig.3 Map of 9 agricultural area in Memuro town

3 Result and conclusion

It was shown that the length of windbreaks in Memuro town decreased from 349km in 1995 to 338km in 2000, which was an 11km (3%) decrease in 5 years(Fig.4). This change included 30km of windbreak removal while 19km was planted as a new extension. According to the district comparison within Memuro town, Kamibisei district turned out to be the area with the largest extension decrease, which was 12%. The area with the largest extension increase, on the other hand, was Shinsei district with an increase of 7%. This comparison suggests that the decrease of windbreaks is not occurring at the same rate in different areas; the farmers' different awareness of the significance of windbreaks is probably the one that has affected the different decrease rates of its extension in each district. In short, this quantitative analysis of windbreak's decrease has shown the possibility of easing the decrease rates, if the importance of windbreaks among farmers is sufficiently explained.

Secondly, the following is about the examination of the relationship between the sheltered area of windbreaks and the incidence of storm damage(Fig.5). The calculation of the sheltered area is necessary to verify the effect of the windbreak. The sheltered area for the farmland was therefore

made using the function of buffer zone with in the GIS. Here decreasing wind effect was made to be 15 times the height of the tree. The northwest wind direction was used as it was the wind direction of maximum wind speed during wind erosion vulnerable period from late in April to early in May in Memuro town.

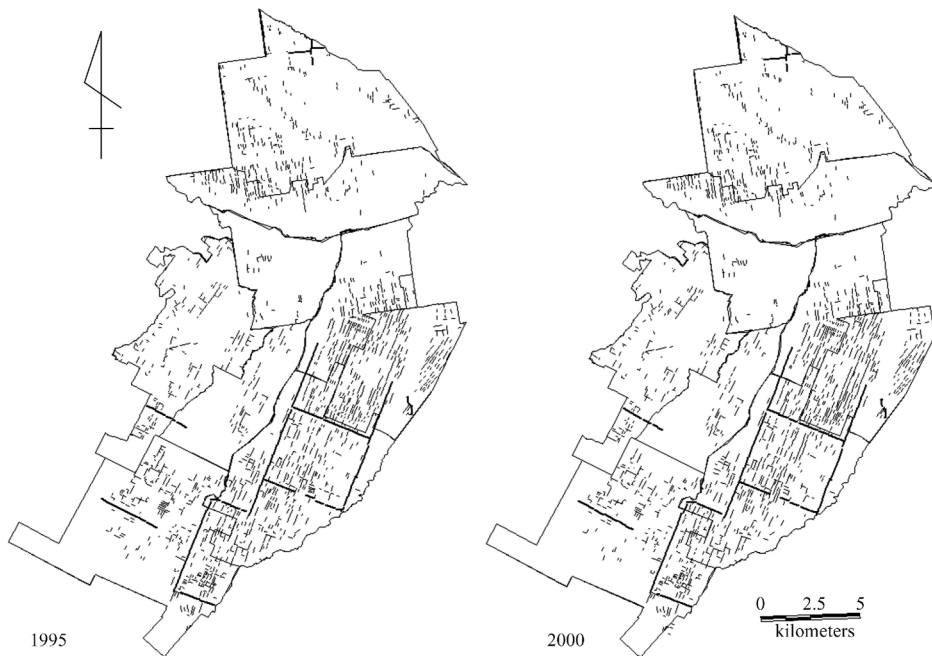


Fig.4 Map of windbreak of distribution in agricultural area, Memuro town

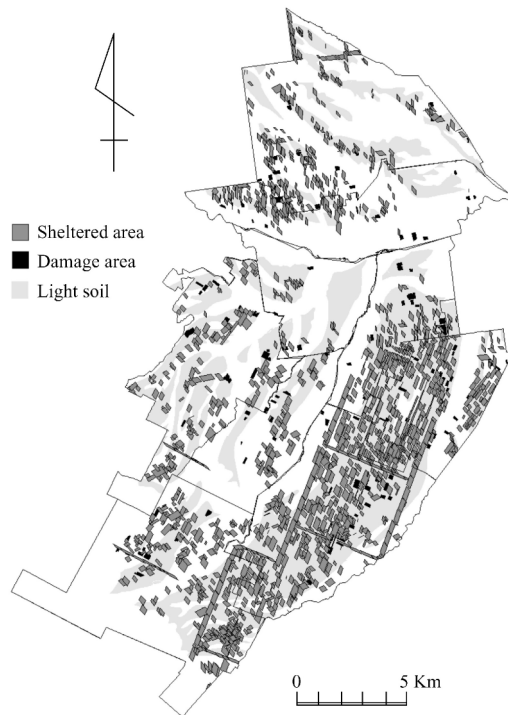


Fig.5 Map of sheltered area and wind erosion damage area in Memuro town

As a result of the comparison between 1995 and 2000, in contrast to the case of windbreak's extension, all the districts in Memuro town had a decrease in sheltered area. In addition to that, the ratio of sheltered area as a whole was less than 40 %; there were districts with extremely low effect as well such as 7% in Nishi-chuou district and 11 % in Kahokushimodai district. As these two areas have large areas of old windbreaks, it is important that new windbreak plantings be made in order to cope with the expected vulnerability of the area to storm damage.

Finally, by superimposing the sheltered area on the incident points of storm damage in 1997 and 1998 on the GIS, storm damage was found to be arising mostly in places outside the sheltered area of windbreak, where light soil was widely distributed. As a whole, integrating the above findings, the significance of windbreak restoration in mitigating storm damage was proven to be especially urgent in the zone with widespread light soil.

References

- Osamu T. 1999. Windbreak and agricultural landscape in Tokachi region. *Soil Science and Plant Nutrition in Hokkaido Agriculture*,1999:p.42-45.