

# Influence of bamboo forest landscape transition on urban spatial form and city function in the town of Otaki, Japan

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## 1. Introduction

Japan has a long history of planting bamboo, continuing from 800 years ago. *P. pubescens*, the main species of bamboo growing in Japan at present, was introduced from China during the eighteenth century (Ogura 1988) and thus has only grown in Japan for a few hundred years. The town of Otaki, Japan, has been famous for its bamboo shoot, called white bamboo shoot because of the region's typically acid soil, since the Edo Period. Today, the bamboo forest in Otaki covers an area of more than 375 ha. As the bamboo is an important agricultural product in Otaki, the growing of bamboo influences not only people's lives but also the landscape and town development. However, since 1980, the large amount of edible bamboo shoot being imported from China has decreased the local bamboo production. Therefore the agricultural and urban structures in the town have been changing. In this study, we aimed to determine a relationship between the bamboo landscape transition and the changes of city space and also provide a strategy for area renovation by analyzing tendency data of bamboo production.

## 2. Methods

We used two different methods in this study: 1) We acquired the topographic maps of the Otaki area made in 1970, 1984, 1991, 2000, and 2017 as basic data and compared the tendency of bamboo forest change in these periods. We also used aerial photographs acquired in 1971, 1982, 1990, 2005, and 2017 as support material and analyzed the reasons why the changes occurred in these years. 2) We examined several typical bamboo landscape spaces in the Otaki urban area, and using photos and 3D models, classified the different types of spaces to analyze the connection between urban spatial form transition and extent of bamboo.

## 3. Results and Considerations

The map analysis results from the 1980s showed that the bamboo forest in the Otaki area decreased slowly because of city development. However, due to the strong ability of bamboo to reproduce, the bamboo growing area expanded quickly during the past 30 years. The analysis of the aerial photographs revealed the urbanization changes of the city area. The roads and streets built in recent years invaded landscape space. Additionally, the distribution of bamboo landscapes changed from planar to dotted. Another finding of the spatial analysis was that the people living in Otaki plant bamboo forest not only because bamboo is an essential product but also because it is a part of their daily social lifestyle. Also, for historical preservation, some areas were left untouched in bamboo forest as symbolic landmark areas.

From this study, we found a strong relation between bamboo forest landscape transition and urban spatial form, with an expansion of the bamboo growing area. For Otaki's development, more sustainable measures that make full use of the bamboo forest landscape should be considered.

キーワード：竹林、竹景観、空間分析、地形図研究

Keywords: bamboo forest , bamboo landscape, spatial analysis, topography map study

