

Spatial Allocation of Greenhouses (Poly-Tunnels) and Total Agricultural Land Usage: A Case Study around the Peripherals of University of Tsukuba

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1. Motivation

Farmers, due to cold weather, usually grow crops using poly-tunnels (greenhouses) in winter season. Thus, the total area covered by the crops to the total farmland is less in winter season. The purpose of this study is to detect the spatial allocation of poly-tunnels and its area coverage to the total farmland in winter season.

2. Introduction

The greenhouses or poly-tunnels are used for diverse agricultural purposes such as growing seedlings and crops, and also involve storing seeds, manure or equipment's. The poly-tunnels, which are generally small in height but varying in lengths, are mostly used for growing crops during the winter to protect crops from the cold weather. The off-season crops grown in poly-tunnels are very expensive and hard to find during winter season. The interior of poly-tunnels heats up due to solar radiation from the sun warming plants inside the structure with slow heat escape. Depending upon the poly-tunnels, the temperature, humidity and ventilation can be controlled by the equipment's used inside poly-tunnels.

3. Study Area

The field work was conducted in the peripherals of the University of Tsukuba, particularly around Hanabatake, Kaname, Tamatori, Kashimadai and Takimachi areas (of Tsukuba city, Ibaraki prefecture, Japan) where large farmlands are available.

4. Methodology

The spatial allocations of poly-tunnels were done using GPS (Garmin etrex 20) and the pictures of each location were taken using i-phone. The poly-tunnels were characterized according to the size, number, length and the area covered using Arc GIS. The areas of the poly-tunnels and the total farm land were calculated using the Google Earth. The ratio of the area covered by the poly-tunnels to the total agricultural land was calculated using the data obtained from the Google Earth.

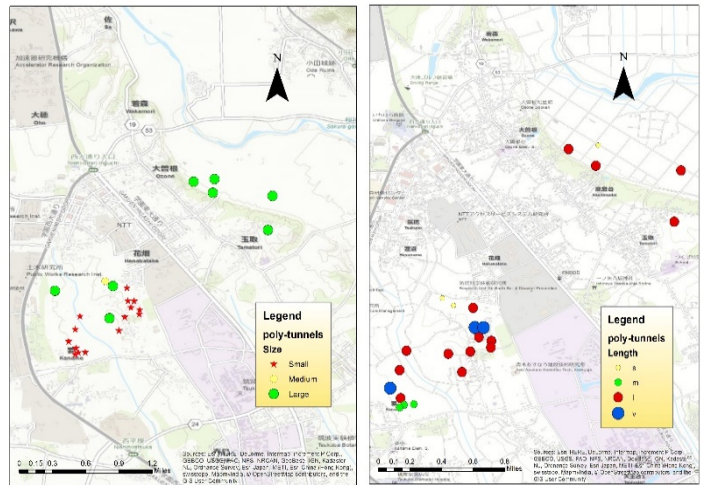


Figure 1. Spatial allocation of poly-tunnels according to size and length.

5. Results and Discussion

The totals of 23 poly-tunnels points were mapped. Each point has different number and size of poly-tunnels. The Kashimadai and Tamatori areas have very less number of poly-tunnels and all of them are large in size. The Hanabatake and Kaname areas have more small poly-tunnels clustered together in high numbers covering a large area. Characterization of poly-tunnels was done according to their size, length, number and area, as shown in Figure 1. The poly-tunnels area coverage was found to be around 91588.8 square meters and the total agricultural land was found to be around 2695183 square meters. So that the ratio of areas covered by the poly-tunnels over the total agricultural land is 0.034%, which indicates only 0.03% of land is used for agriculture during winter season.

This helps the researchers who are interested in finding efficient ways of farming during the winter season in order to increase agricultural productivity 'viz-a-viz' decreasing the cost of vegetables as well as to make fresh vegetables available during off seasons