Abstract

[Project Information]

Project Title :	Mapping to Reduce Abandoned Cultivated Land Using Suitable Growth Area in Pear for Global Warming
Project Number :	JPMEERF20222R01
Project Period (FY) :	2022-2024
Principal Investigator :	Yoshihiro Takemura
(PI ORCID) :	
Principal Institution :	Faculty of Agriculture, Tottori University Tottori-City, 680-8553, JAPAN Tel: +81-857-31-6749 E-mail: y-takemura@tottori-u.ac.jp
Cooperated by :	
Keywords :	Abandoned cultivated land, Dormancy, Estimation of suitable area, Global warming, Pear

[Abstract]

Most abandoned farmlands in Japan are in mountainous areas, which may be due to the unfavorable agricultural production conditions there. However, the production areas of several deciduous fruit trees, particularly pears, are expected to shift to mountainous areas at higher altitudes in the future. One reason for this is the frequent failure of pears to flower during spring. Pear buds end their dormancy (endodormancy) when exposed to low temperatures during the winter, leading to flowering. However, in recent years, owing to the effects of warm winters associated with global warming, sporadic cases of pears failing to flower, with incomplete dormancy, have been reported in the plains of the warm southwest. As poor flowering is a major problem that directly leads to a decrease in fruit production, it is recommended that production areas be relocated to mountainous areas. However, fruit trees cultivated in the same place for decades after planting, it is important to develop production areas that can withstand predicted future warming.

In this study, we evaluated suitable locations for growing pears assuming a temperature rise in 2100, and created "maps of suitable locations for global warming" for each prefecture. Five locations in each prefecture with different latitude and longitude and altitude were selected as reference locations. Daily data (1,629,464) and hourly data (39,107,136) were used for all reference locations to complete the conversion formula for each prefecture. Using the completed conversion formula, maps were created for each variety (CU1000, 1200, 1400, 1600, and 1800) in 46 prefectures. For each prefecture and variety, five maps were created assuming a temperature rise (normal +1.0°C (RCP2.6), +1.8°C (RCP4.5), +2.2°C (RCP6.0), +3.7°C (RCP8.5) (including normal values)). As a result, we were able to create a total of 1,150 maps as originally planned. Furthermore, we created a "Map of

Abandoned Farmland Reduction" by mapping areas with a high rate of abandoned farmland on the map, and proposing future utilization of abandoned farmland. In addition, we evaluated the economic effect of utilizing 0.1% of abandoned farmland as pear orchards in two ways: orchards that produce fruit and pollen orchards that only collect pollen. We calculated the gross profit per 0.1 ha for each orchard as 594,000 yen.