

## **Assessment of Geothermal Resources for Agricultural Applications: Enhancing Regional Development Through Geothermal Heated Greenhouses**

Öyküm Berfin GÜLERGÜL\*, Alper BABA

İzmir Institute of Technology, International Water Resources Department, Urla, İzmir, Türkiye

\*oykumgulergul@iyte.edu.tr

The growing world population and the escalating effects of climate change have increased the need for sustainable food security and reliable energy solutions. Geothermal energy, a renewable and versatile resource, offers continuous availability and stability throughout the year, regardless of weather conditions. It is both environmentally friendly and economically feasible, making it a significant resource for power generation, direct applications and agricultural purposes. In agriculture, geothermal energy is particularly effective in heating greenhouses, as it creates a stable internal environment for optimal plant growth. Geothermally heated greenhouses reduce operating costs and ensure year-round agricultural production, increasing productivity and competitiveness. These systems are gaining momentum in Türkiye, where geothermal resources are being utilized to support agricultural development. This study evaluates geothermal resources in regions with agricultural potential, focusing on their use in Agriculture-Based Specialized Organized Industrial Zones (TDIOSB) designed for greenhouse farming. Geothermal greenhouses integrated into TDIOSBs not only increase local agricultural production, but also play an important role in regional economic development. The assessment includes environmental and technical factors such as water consumption, infrastructure needs and CO<sub>2</sub> emission reduction. In addition, the study examines future employment opportunities and the broader socio-economic impact of these greenhouses. The findings highlight the importance of geothermal energy in promoting sustainable agricultural practices, fostering regional development and contributing to the national economy. By utilizing geothermal resources to heat greenhouses, regions can make significant progress in agricultural efficiency and environmental sustainability.

**Keywords:** Geothermal resources, geothermal greenhouses, regional development, renewable energy, agriculture-based development, geothermal assessment