



Enhancing Biodiversity Knowledge, Accessibility and Conservation through Digital Innovation: The Case of the Apennine Flora Garden (Italy)

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The Apennine Flora Garden of Capracotta (Molise-Italy) represents a unique research and conservation infrastructure dedicated to the preservation and dissemination of Apennine biodiversity. Within the framework of the NBFC–PNRR Mission 4 project, a comprehensive set of actions was implemented to improve knowledge, accessibility, usability, monitoring, and public engagement related to plant biodiversity.

The project combined ecological research, digital innovation, and science communication. A high-resolution WEBGIS system was developed to integrate and georeference botanical data, achieving up to 99% validation accuracy. This tool enables advanced data management, supporting both scientific research and conservation planning. In parallel, ecological interactions between flora, pollinators, and environmental conditions were investigated through the installation of video monitoring systems and microclimatic sensors, establishing a permanent observational infrastructure.

To enhance accessibility and visitor experience, a digital ecosystem was created, including an interactive map, a new website, and a mobile web application with audio guides and storytelling content. Additionally, extensive photographic and audiovisual documentation was produced to strengthen science communication and public awareness.

A further innovative component of the project involved the establishment of an additive manufacturing laboratory for the development of biodegradable and eco-sustainable solutions. In particular, experimental beehives were designed using 3D printing technologies and polylactic acid (PLA), a compostable biopolymer derived from renewable resources. These prototypes integrate modular design and environmental monitoring systems, offering promising applications for sustainable apiculture and pollinator conservation.

Overall, the project demonstrates how the integration of ecological monitoring, digital tools, and sustainable technologies can enhance biodiversity conservation, improve accessibility, and foster stronger connections between research infrastructures and local communities. The Apennine Flora Garden emerges as a replicable model for combining scientific research, innovation, and territorial valorization in line with national and European biodiversity strategies.