



INTERUNIVERSITY PHD COURSE
“SUSTAINABLE LAND MANAGEMENT”
Cycle XXXVI

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Title of the Research Project	<i>Green Building Envelopes and Vertical Farms in the urban contexts for a circular economy</i>
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Summary of the Research Project

The research project aims to analyze, to experiment and to design *innovative technological and structural solutions*, in the field of the *sustainability and environmental compatibility of buildings and horticultural-floricultural-fruit bearing production systems in urban areas*, from point of view to the *circular economy*.

In this regards, *Green Walls* and *Green Roofs* will be experimented with and designed, to be installed in densely populated sites and on existing buildings, in order to the energetic retraining, the aesthetic enhancement, the urban heat island effect reduces and the air quality improvement.

Furthermore, the study will investigate the *Vertical Farms* to be implemented in disused buildings of peri-urban areas, to create an *Agri-Food District*. These will be dedicated to agricultural production, as well as the transformation, conservation, marketing, and consumption of cultivated products and moreover, will be fed by systems for the recovery of water, nutritional and energy resources. Therefore, the idea is to optimize space and resources to reduce environmental loads and soil consumption and to generate controlled production with a short supply chain.

The research will be developed through the *experimental scientific approach*, detecting the energy-environmental parameters from sample installations.

Likewise, the *modeling-simulation scientific methodology* will be carried out by means of the evaluation of the *Life Cycle (LCA)* of the works, and of the energy-environmental analyzes through *Building Information Modeling (BIM)* and *Geographic Information System (GIS)* technologies.

Thus, these project proposals will be drawn up to limit the environmental impact and *soil consumption*, and to promote *climate mitigation*, as well as supporting decision-making processes for *sustainable land management*.

[1] Blanco I., Schettini E., Scarascia Mugnozza G., Vox G., 2018. Thermal behaviour of green façades in summer. Journal of Agricultural Engineering, 49 (3), 183-190. <https://doi.org/10.4081/jae.2018.835>.

[2] Corcelli F., Fiorentino G., Petit-Boix A., Rieradevall J., Gabarrell X., 2019. Transforming rooftops into productive urban spaces in the Mediterranean. An LCA comparison of agri-urban production and photovoltaic energy generation. Resources, Conservation & Recycling, 144, 321-336. <https://doi.org/10.1016/j.resconrec.2019.01.040>.

[3] Benis K., Reinhart C., Ferrão P., 2017. Development of a simulation-based decision support workflow for the implementation of Building-Integrated Agriculture (BIA) in urban contexts. Journal of Cleaner Production, 147, 589-602. <https://doi.org/10.1016/j.jclepro.2017.01.130>.

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