



**POLITECNICO
DI TORINO**

Honors thesis

Master of Science in Sustainable Architecture

Abstract

GREEN DEAL

Greenhouse devices in the urban voids of historical fabrics

The case of Cuenca-Ecuador

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by

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By 2009, South America was the most urbanized region on the planet, with approximately 84% of its population living in cities (Inostroza, Baur, & Csaplovics, 2013). Likewise, the city of Cuenca in Ecuador, in less than 30 years has tripled its urban area and currently has one of the highest growth rates in the country and the region (Ortiz, 2019). This growth demands solutions on issues related to unemployment, hunger, poverty, pollution, etc. Furthermore, the COVID-19 global crisis has worsened the situation and has proved the need to transform cities towards resilience and to create new public spaces within a comprehensive and sustainable scope to ensure the access to basic needs such as food.

The rural-urban migration, affects the food production sector. It has been empirically linked with the structural transformation process: as urban population shares increase, employment tends to shift from agriculture towards industry/manufacturing, or services (Michaels et al., 2012). Nowadays the food system results incapable to satisfy a healthy and sufficient nutrition in developing countries, moreover the scattered expansion of cities, implies, a possible lack of quality local food supply over time and a change in consumption towards imported processed foods.

Sustainable practices such as urban farming seem viable in order to change the scenario. The urban agriculture is a strategy for spatially and temporarily reconnect food production, waste disposal, and consumption to strengthen resilience, improve community relations and skills and climate change adaptation (De Zeeuw et al. 2011). The urban acupuncture is a valuable method that strategically intervenes in small-scale areas of complex urban fabrics with big scale effects, and could be used to introduce urban cultivation, boost local food production and small economies.

The delicate historical center from Cuenca, was declared as a Cultural Heritage in 1999 by UNESCO and has undergone many public policies and interventions in order to conserve its heritage and increase its touristic attractions (Cabrera, 2019). However, it has been facing processes of gentrification, which led to the abandonment of spaces or on the contrary, historical buildings converted into overcrowded degraded slums.

Besides, the agriculture is part of the city's tradition. Its all-year mild climate and its vast soil allows the sowing of different crops. Moreover, in the traditional architectural typologies, there was a private patio devoted to family farming, however, over time, the new needs and the outstanding prices of land, have reduced areas for farming in the urban areas and the old patios have been changing to give space for parking or commerce. Consequently, from an aerial view, it is easy to find some left "in-between" spaces in the orthogonal blocks. (Fig. 1, Cobos, (2020)).

Fig. 1



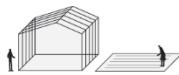
The thesis consists in five parts. First, an overview of the urban planet, the situation of Ecuador and pandemic's impacts. Second, a theoretical approach to the urban agriculture and the use of urban acupuncture to introduce cultivation in the urban voids of a complex context. The third part analyses the basic concepts and strategies for greenhouse devices, soil culture and soilless cultivation methods, especially hydroponic techniques. The fourth chapter presents two case studies at different scales: a project related to urban acupuncture for urban regeneration as a public policy and a case study that shows technical and technological chances for urban farming. The last part is the application of the theoretical research: a review of the state of the art of the city, the development of an adaptable, sustainable and replicable local productive food system that originates in the cores of the blocks and expands to the city (fig. 2), that introduces agriculture on two existing urban voids through affordable, modular, adaptative greenhouse devices to ensure food security and boost social dynamics (fig. 3).

Fig. 2

**URBAN VOID INTERVENTION STRATEGIES
FOR URBAN AGRICULTURE INTRODUCTION**

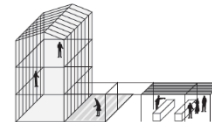
**SQUARES
/SMALL SQUARES**

- GREENHOUSE DEVICES
- OPEN MARKET
- TRADITIONAL SOIL AGRICULTURE



**LARGE SCALE
COURTYARDS**

- GREENHOUSE DEVICES
- OPEN MARKET
- TRADITIONAL SOIL AGRICULTURE



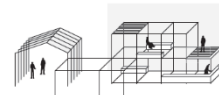
**BLIND
FACADES**

- VERTICAL FARMING
- MARKET
- LEISURE AREAS



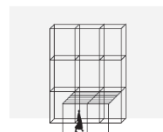
**CORES OF
BLOCKS**

- OPEN ORCHARD
- OPEN MARKET
- LEISURE AREAS
- GREENHOUSES



PASSAGES

- GREEN WALLS



**VACANT
LOTS**

- GREENHOUSE
- + MULTIFUNCTIONAL SPACE
- TRADITIONAL SOIL AGRICULTURE

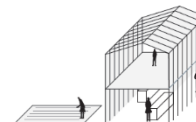
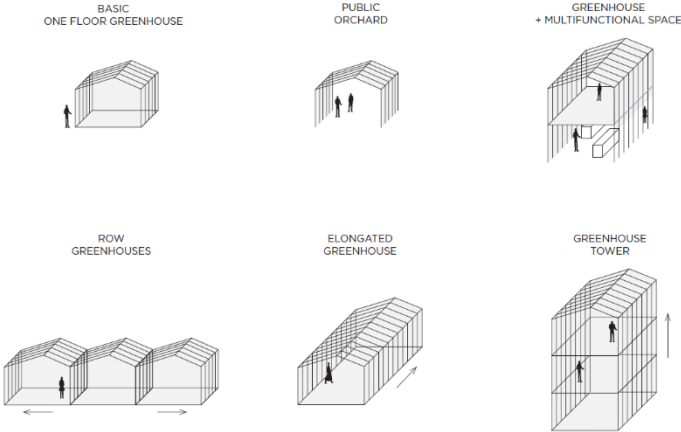


Fig. 3

TPOLOGIES OF ADAPTATIVE GREENHOUSES



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