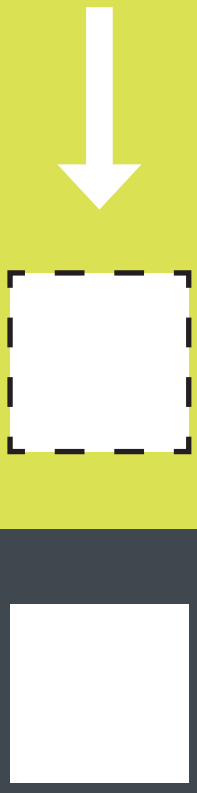
Urban Farmification

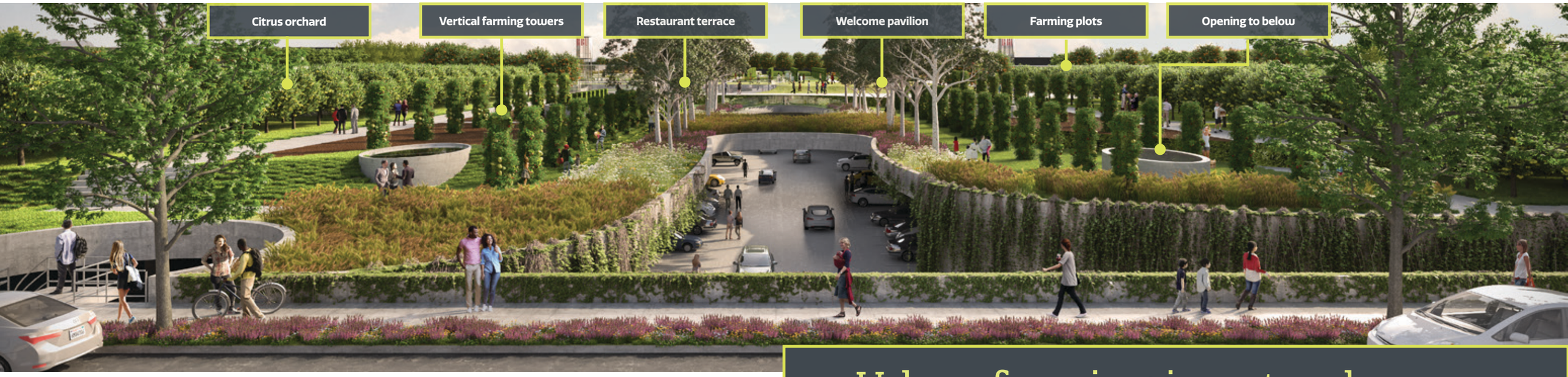
Big Box Underground



Gensler RESEARCH INSTITUTE

Urban Farmification: Big Box Underground

What does urbanization and agricultural coexistence look like? What if big box retail centers pushed underground and we built urban farms atop them?



TEST SITE

Glendale, CA
17.5 acres

WHAT WE DID

We explored the opportunities and realities of submerging big box retail centers to support rooftop farming. Big box retail centers are demonstrably ripe for this process: they have large roofs, generally do not have windows, and are ubiquitous across the United States. The first big boxes, Walmart, KMart, and Target, opened in 1962 on a promise of mass production and efficiency. For this property type, we need to rethink a sustainable and inclusive integration into the surrounding community.

After choosing our site, a big box near Glendale, California, we created a practical, but inviting design for submergence. To promote openness, we leveraged daylighting when allocating vehicular entryways, truck-loading areas, and store entrances. Aboveground, our design aims to be community-centric—an open invitation to social space through rooftop farming.

Our design features a decisive shift away from inexpensive materials that characterize big box stores. Robust structural materials for the underground space were needed, such as protection slab and waterproofing membrane, as well as a reinforced skeleton that can bear additional weight. We conducted a preliminary building performance analysis through Syska Hennessy Group, Inc., which included a climate, energy efficiency, and daylighting analysis. The large roof area of this project offered a perfect fit for powering the building with solar energy—and could potentially achieve net zero energy, our efficiency goal.

THE CONTEXT

Urban sprawl is necessitating creative community planning, alternative design solutions, and a reinvigorated agriculture industry. In our subject city, Los Angeles, urban sprawl has excised farming from a city that was once home to one of the nation's largest concentration of dairy farms. The Inland Empire is now crowned the big box capital of the United States. Across the US, we are losing more than an acre of farmland every minute. Urbanization and rural restructuring mean that large cities will have trouble sustaining an adequate level of produce. Urban centers are reworking consumption patterns by creating alternative food networks like farmers' markets and food cooperatives. These shifting consumer behaviors, paired with ag-tech innovations, are laying the groundwork for a progressive agriculture industry.

Markets exist in a social context—so big box districts can boost efficiency of their space through meaningful social connections. To understand how our design decisions effect the surrounding community, we utilized the term "social capital", or the norms and networks that facilitate collective action toward shared goals. Abundant evidence draws on the relationship between social capital and positive social goods like charities, nonprofits, public parks, and other media that facilitate interpersonal interactions out in the community. Social capital has also been correlated with community-level financial performance. Counties with a higher Social Capital Index tend to have a higher-value cash ratio, lower deficits as a percentage of total municipal budgets, more accurate expenditure forecasts, and greater spending on services per capital.

Urban farming is not only a sustainable solution, but one that creates new communities.

Image by: Calzada Visualization

WHAT'S NEXT

Big box retail is far from the only property type that includes rooftop farming—some of our projects add another element to the conversation on sustainable and community-building design solutions. In London, Growing Underground recently opened its first underground farm through converting air-raid shelters from World War II into a 7,000 square foot tunnel filled with sprouting herbs. The Washington, DC-based company Up Top Acres has brought rooftop farming to both residential and office projects. Up Top Acres opened The Farm at 55 M Street in April 2017, and includes a 15,000-square-foot farm. In addition to cost savings for the property, this project supports a 35-member CSA program and a weekly market stand.

In Los Angeles, the opportunities for urban farmification are endless. To reinvigorate communities with wide implementation of our design solutions, we need to investigate contiguous lots across districts—and there are many areas to join parcels. There are 8,600 empty lots in Los Angeles, and more than 63 million square feet available for potential "Big Box Underground" space in Los Angeles County.

In a 130-day temperate growing season, our site can provide 3,940 people with their total yearly vegetable needs.

THE RESULTS

Our proposed design solution would result in energy savings of 10 percent compared to a typical big box. A subgrade structure makes it easier to bring the interior temperature to within the optimal comfort parameters because there is less fluctuation in ground temperature. Further, the earth-sheltered solution achieves a low environmental impact, even while using high-energy consumption materials like concrete, steel reinforcement, and masonry. Depending on rooftop space allocation, previous research has established that if about 50,000 square feet were devoted to solar panels, the building could achieve close to net zero energy. We estimated our total construction cost at $65 million with a 25-year time to profitability.

Our plans call for a Cartesian planting system with the flexibility for different crops. For a ballpark idea of revenue generation, a typical one-acre plot of avocados or peaches can reach about $100,000 annually. This flexible space for community engagement is not only income generating, but is expected to increase profits for the business underfoot, and serve as a social capital creation system for the surrounding community.

DESIGN IMPLICATIONS

Early adopters will have to take the long view on investment. To achieve faster profitability, our plans must leverage all sources of income and cost saving. Notably, the cross effects of urbanization and rural restructuring are yielding new legislative solutions. The Urban Agriculture Incentive Zones Act aims to increase the use of privately owned, vacant land for urban agriculture and improve land security for urban agriculture projects. Additionally, our clients are integral to our cost-saving paradigm. All experiences and perspectives are needed to realize our design plans.

Our design achieves a compelling aesthetic. Underground architecture does not have to be stylistically inert. There are multiple ways of instilling creative surface-to-subsurface relationships through features like penetrational wall openings and nondisruptive features, or subgrade components that integrate with the surrounding environment.

Annual planting: Farming in cycles

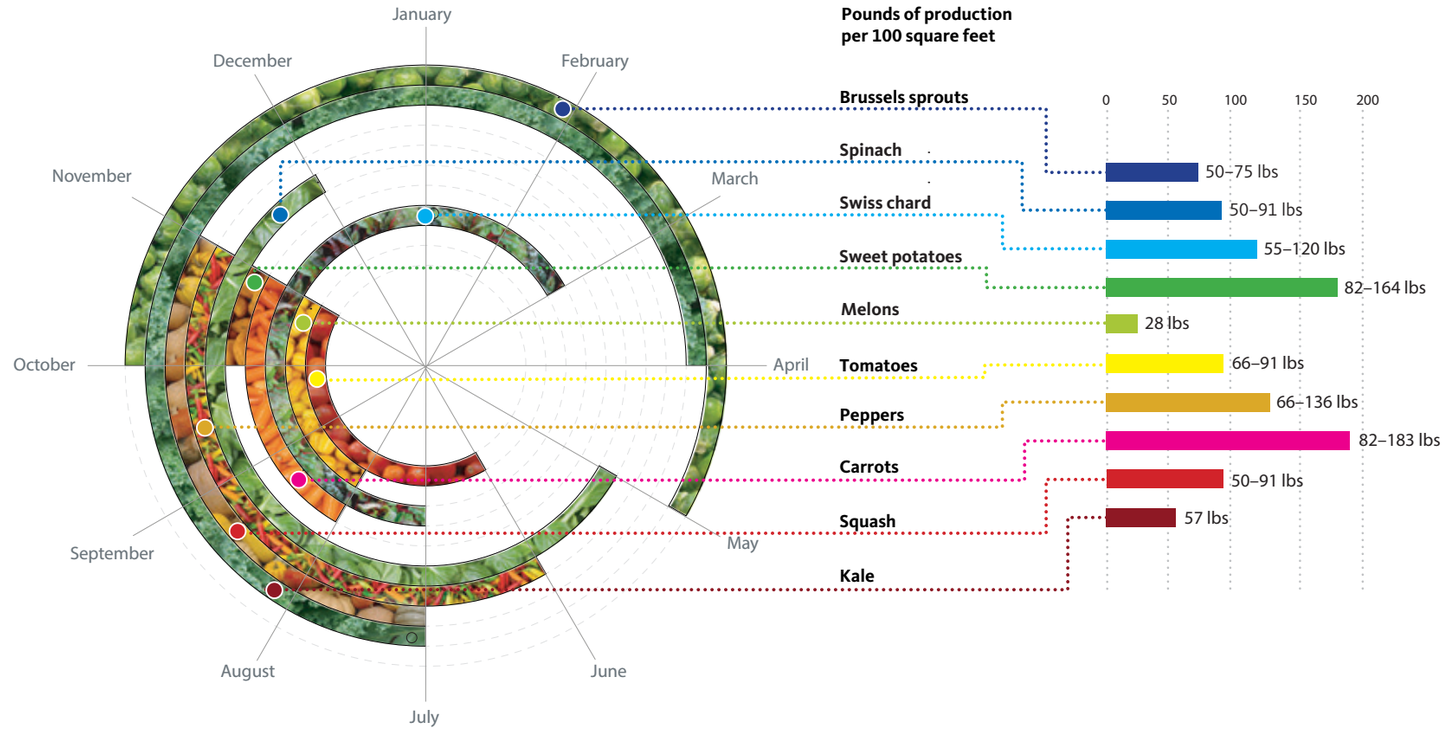


Image by: OJB Landscape Architecture

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Research Team

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Research Partners: Saiful Bouquet, Syska Hennessy Group, OJB Landscape Architecture

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