CHANGING THE URBAN FOODSCAPE: GASTRONOMIC CENTER FOR FOOD EDUCATION AND AGROTECHNOLOGY

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Abstract
This study proposes a Gastronomic Center as a new development for Jeddah to enhance the city and Kingdom. The center would lay groundwork for research and innovation in agriculture and provide culinary education opportunities for locals. In the longer run this may benefit the Kingdom’s economy and give it the ability to become more self-reliant. The center would also be a new social hub around the theme of healthy lifestyle, boosting local culture and tourism. The research includes case study analysis and design requirements for unique spaces covered of vertical farm projects and culinary institute projects. Based on this, a detailed program was designed. Additionally site analysis was carried out at Northern part of Jeddah in Ash Shati District in order to facilitate site zoning and building configuration. In this study, a tower project was designed with two main components: a vertical farm and a culinary school. Additional components include student residence, research facilities and a public zone.

Keywords – Urban foodscape, Gastronomic center, Food education, Agrotechnology

INTRODUCTION
The term “vertical farming” was coined in 1915 by Gilbert Bailey, an American geologist, but the concept itself is not new [1]. Vertical farming has existed for many centuries, some of the earliest examples being that of the Hanging Gardens of Babylon or Aztec fields in South America or rice plantations in parts of Asia, utilizing the concept of terraced fields for efficient agriculture and irrigation [2-4].

The modern form of vertical farming considers it with the use of controlled environment agriculture technology (CEA technology) where the environment is automatically controlled to produce crop at its optimum quality. Today our global population is ever-increasing, predicted to surpass 9 billion by 2050, and our agricultural lands have been destroyed and eroded from years of misuse and abuse [5]. The vertical farm could localize farming in many places and allow lands to recover themselves.

While small vertical farming projects have taken root in urban and rural environments, there is yet to be a large-scale commercial Vertical Farm built. This concept was developed in a classroom just before the turn of the century by Dr. Dickson Dispommier, who is considered the father of vertical farming [6]. On-going research persists, and as our world population increases and our environmental situation remains bleak, the concept of the vertical farm with controlled environment agriculture technology is becoming increasingly attractive as an option.

CASE STUDY OF VERTICAL FARM PROJECTS AND CULINARY INSTITUTE PROJECTS
The chosen case studies analyse both urban and vertical farm projects and culinary institute projects, particularly focusing on the function and flow of each project and analysing notable elements. The following list of case studies will include three vertical farm projects and one culinary institute projects:

a. EVF Experimental Vertical Farm, Chile
b. Urban Farm, Urban Epicenter, New York City
c. SPARK Homefarm, Singapore
d. Whipped Stream Gastronomic Center, Belgium

e. EVF EXPERIMENTAL VERTICAL FARM, CHILE
Experimental Vertical Farm (EVF), Chile proposed by designer Claudio Palavecino Llanos (Figure 1) [7]. EVF is the name suggests a proposal for an experimental prototype of a vertical farm, located in Santiago, Chile. The vertical farm addresses the issue of shortage of viable agricultural land in relation to a growing population. According to statistics, only 7% of land in Chile can be used for agriculture, 63% of which has suffered desertification, and 50% erosion, as a result of bad agricultural practices[8, 9]. In order to feed a growing population, preserve Chilean land and allow it to recover, as well as promote local food production, a vertical farm could offer a reasonable long-term solution. This case isn’t only confined to Chile however; growing populations, destruction of agricultural lands and need for growing locally and sustainably are all global issues. Therefore the project is designed as a prototype to not only implement in multiple locations within Chile but possibly globally, but with modifications as per different regions’ requirements.

Urban Farm, Urban Epicenter, New York City
Urban Farm, Urban Epicenter proposed by designer Jung Min Nam (Figure 2) [10]. The Urban Epicenter is a mixed-use project that focuses on vertical urban farming, along with supporting functions. The project offers social, commercial and residential spaces to allow itself to be seen as a civic and cultural landmark too. The project includes a public zone with a farmer’s market, a plaza, pedestrian walkways and open spaces, with the private farming areas above on gently sloping floors to provide continuity in these areas. The farming zone is supported by a water recycling system, with each level at a slightly different angle from the previous one to allow maximum sunlight within interior spaces. Alongside the private farming zone are offices and apartments. For people living in the building, they have the experience of seeing their food being grown firsthand. The typical farming floor, which are the core floors of the building, consist of four main elements namely private/farming support, public, farming area and void (farmer’s market). The floor plates slope towards the south where vegetables are grown because sunlight is most concentrated in the south side of the tower.
SPARK Homefarm, Singapore
SPARK Homefarm proposed by SPARK Architects (Figure 3) [11]. Singapore’s Home Farm is a mixed-use project that addresses two main issues. The first issue is the need for urban agriculture to feed growing cities sustainably. The second is to find a better way of life for the older population in Southeast Asian cities, where the percentage of older people is much higher than it previously was. While producing local crop the Home Farm would simultaneously serve the older population of the city in their retirement, offering a combination of leisure, learning, income and social engagement, if they are capable and so wish, in living and working at the Home Farm. The main section showcases the outdoor produce market and the indoor organic supermarket on the ground floor, with the agricultural centre located on the first floor. The aquaponic vertical farm is located in front of the apartments, providing both fresh vegetables and shade and privacy for the apartments behind. The third floor has a void deck for both residents and the public to access, along with the traditional soil-based farm. The roof has a shaded roof garden.

Whipped Stream Gastronomic Center, Belgium
The designers of Whipped Stream, International Gastronomic Center, Brussels, Belgium are Viktor Nilsson and Pierre Maccario (Figure 4) [12]. Whipped Stream is a gastronomic center which focuses on educating people about the culinary arts and the creative process behind it, taking them on a vertical journey with three major steps which are Imagination, Practice and Result. The building has a spiral form to facilitate this vertical journey. The spiral creates a smooth flow of upwards movement through the journey of food and the entire area is easily divided into three strips: for chefs, for public and the intermediary interaction space. Snow and rainwater are collected on the roof and then filtered in a tank to be used for irrigation of greenhouse plants and ventilation purposes. Solar panels provide energy to heat air. Heated air cools and ventilates the entire building via the central atrium that spans the height of the building. The internal environment is well lit and ventilated mainly due to the central atrium that allows light in through the roof and air to circulate throughout the building. Each level up is slightly misaligned to the level below and walls are tilted to allow more natural sunlight into the building on the outside edges.

PROGRAM ANALYSIS
Program Assumption
During the study of case studies and design standards, an average ratio of space per person was determined for a culinary education facility and a farming space. The Culinary Education Facility is 10.5 m² per person and the Farming Space is 10.5 m² per person. The ratios happened to be roughly equal, and when combined, gave a total user to space ratio of 21 m² per person. Using this ratio, the area and capacity of the project was determined.

Gastronomic Center is proposed in this study with a total building capacity approximately 1400 people per shift in this building complex. The recreational zone, commercial zone and nutrition and fitness center receives the most visitors collectively. The vertical farm building and the culinary educational facilities receive a more limited number. This is because the purpose of the vertical farm building is to produce crops, conduct agricultural research activities with agricultural educational components. The culinary educational facilities offer courses for cooking and related skills and so is targeted at a specific audience. The other facilities though are more easily open to the general public. Table 1 shows the zoning assumption for the project.
SITE ANALYSIS

Selected Site
The chosen site has a circular shape with one straight edge, with an area of approximately 30,000m². It is located in the Northern part of Jeddah in Ash Shati District, facing the Corniche on one side and the Corniche Road on the other side (Figure 5). It is close to many new developments, including residential and recreational projects but the area is still relatively less populated than other areas of the corniche. Therefore it is able to welcome new and innovative projects, taking advantage of the prestigious waterfront location. A prominent near-by landmark is the floating mosque. This site was chosen for several reasons but the main one being that it wanted to be easily accessible to the public to any and all people while highlighting its novelty and importance, and creating a new centre of attraction in the growing coastal city.

<table>
<thead>
<tr>
<th>Zone Number</th>
<th>Zones</th>
<th>Zone type</th>
<th>Percentages (%)</th>
<th>Capacity</th>
<th>Actual Total Net Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Unused Spaces</td>
<td></td>
<td>20.0</td>
<td></td>
<td>8600</td>
</tr>
<tr>
<td>-</td>
<td>Logistics</td>
<td></td>
<td>10.0</td>
<td></td>
<td>4300</td>
</tr>
<tr>
<td>1</td>
<td>Administration</td>
<td>Business</td>
<td>2.0</td>
<td>100</td>
<td>800</td>
</tr>
<tr>
<td>2</td>
<td>Recreational Zone</td>
<td>Business</td>
<td>7.5</td>
<td>450</td>
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</tr>
<tr>
<td>3</td>
<td>Commercial Zone</td>
<td>Business</td>
<td>3.5</td>
<td>290</td>
<td>1510</td>
</tr>
<tr>
<td>4</td>
<td>Nutrition &amp; Fitness Centre</td>
<td>Business</td>
<td>2.0</td>
<td>163</td>
<td>932</td>
</tr>
<tr>
<td>5</td>
<td>Agricultural Zone</td>
<td>Business</td>
<td>30.0</td>
<td>245</td>
<td>13053</td>
</tr>
<tr>
<td>6</td>
<td>Culinary Complex Facilities</td>
<td>Warehouse/</td>
<td>6.5</td>
<td>200</td>
<td>3040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Business</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Student Accommodation</td>
<td>Residential</td>
<td>18.5</td>
<td>98</td>
<td>8206</td>
</tr>
</tbody>
</table>

TOTAL

100 1546 43883

CRITERIA ANALYSIS

Table 2 tabulates the score of each specified criteria and the justification. The covered criteria are site demographic, accessibility, visibility, surroundings, landmark, views and possibility for expansion.

Based on the analyse result in Table 2, the selected site seems ideal in terms of the particular location, the surrounding empty land, and the accessibility and the visibility. This project has the potential to become a very unique landmark for both locals and visitors to the city. Due to its vertical nature in an area with few towers, it will be visible to parts of the city further away.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight/Out of 5</th>
<th>Score</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic</td>
<td>3</td>
<td>1</td>
<td>Mostly upper class demographic in closer proximity. However, in an open area on the corniche though, which is open to and receives every kind of community in the city.</td>
</tr>
<tr>
<td>Accessibility</td>
<td>4</td>
<td>4</td>
<td>Very easily accessible due to lack of surrounding development and main roads around site that receive minimal to moderate traffic. Direct pedestrian access from Corniche side additionally, so vehicles can be parked at distance and people can access site on foot.</td>
</tr>
<tr>
<td>Visibility</td>
<td>4</td>
<td>4</td>
<td>No immediate surrounding developments so very easily visible. Project includes a vertical tower, so visible beyond immediate surroundings, and forming part of Jeddah’s skyline.</td>
</tr>
<tr>
<td>Surroundings</td>
<td>5</td>
<td>4.5</td>
<td>Surroundings include mostly bare land, a palace, few residential towers and some cafes and restaurants, attracting an audience already but leaving plenty of room for a new development.</td>
</tr>
<tr>
<td>Landmark</td>
<td>3</td>
<td>3</td>
<td>Beach Tower and Medd Café are two notable landmarks. The tower is residential so is not visited by outsiders but known for its hole in the centre of the structure. Medd Café is an upcoming hot spot for the city’s youth.</td>
</tr>
<tr>
<td>Views</td>
<td>3</td>
<td>3</td>
<td>Not as many green views or surrounding parks, but this can be created within the project via landscaping.</td>
</tr>
<tr>
<td>Possibility for Expansion</td>
<td>2</td>
<td>1.5</td>
<td>Plenty of bare land available around site for expansion but limited opportunity for more vertical developments due to waterfront regulations and building a tower to the south of the site would block the palace’s view.</td>
</tr>
</tbody>
</table>

% Viability 21 91% Viable

DESIGN OVERVIEW

Figure 5 demonstrates the proposed configuration of placing zones on the site. A few specific details such as a courtyards and traffic and pedestrian entry, exit and movement through the site are signified by the red arrows. Figure 6 and Figure 7 demonstrate the approximate stacking diagram and the configuration of the main section of the tower in the project respectively.

The main vehicular entrance is from the east side facing the landside Corniche Road. The main pedestrian entrance is from the seaside Corniche Road, in connection with the waterfront pedestrian pathway. There is one main vehicular entrance for visitors and three additional vehicular entrances for visitors, staff and services. There are multiple pedestrian entry points from the seaside front and a continuous loop of pathway all around the building for ease of movement. Roads however do not run all the way around the project in one loop, restricting vehicular movement from entry point to parking lot in the south. This is in order to minimize traffic on site and encourage walk ability through the spaces.

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The central has open space both inside and outside the building. The main tower has an open atrium. The culinary and public section of the podium is also wrapped around a central courtyard. The main entrance from the vehicular entrance also hugs an open green space. These courtyards are intended to be used for relaxation as well as housing two important features of the project which are the Farmers’ Market and the Aquaponic Tree Farm.

The location of the vertical farm tower is towards the south side of the site to maximize exposure to sunlight. As Jeddah is in an area that receives a lot of sunlight year-round, it is possible to grow crop at every side of the tower but for the plants that would benefit from more sunlight. This would make the most of the south facing side.

The student accommodation is located in the one half of the upper part of the tower itself directly adjacent to the vertical farm, taking up the north half of the tower. This allows the residential units to be shaded from harsh sunlight while also benefiting from the good seaside wind. They have the both the view of the waterfront, the podium and gardens, as well as the farm to the south of them. This is an ideal location for the student residency to maintain privacy and also be well-connected to the rest of the project.

The public portion of the podium is mainly located on Level 1, the ground floor and Level 3, with semi-public culinary education spaces on Level 2. The private culinary space is closer to the tower, in connection with the farm and the student accommodation, and connected to share facilities between the private and public zones, such as the library and multi-purpose hall.

The main parking and service ramps to the basement are located at the south-most side of the site. This area of land is much narrower, rendering it difficult to build on. The south also receives the harshest sunlight and the dusty land-side wind from the south-east. Thus it is not ideal to create outdoor spaces that would be used for a long period of time. Therefore, locating parking and service entrances and ramps is the best option. Although the land is narrow, it is also quite long, allowing for a good number of parking spaces. Trees along the perimeter of the site can be planted as a buffer for shade and protection against wind and noise.

Themed gardens and outdoor event space are located to north-most part of the site. This is an ideal location for such outdoor spaces that would be used at a length of time because the good sea wind comes from the north-west. The north side of the site is also shaded from harsh sunlight during the day by the building. This area of the site narrows right at the top so is also difficult to build on and therefore makes a perfect space for public gardens and activities.
CONCLUSION
In line with the Kingdom’s vision to become more innovative and invest in research in the science and technology fields, its recent Saudization law also promotes a greater local workforce in a land that once had a majority expatriate workforce. The Kingdom wants to become more self-sustaining and self-reliant and the project at hand would not only be a source of innovation and research but could in the long run help Saudi Arabia become more agriculturally self-sustaining. On a global scale, it is becoming more and more necessary to find alternate methods of food production and Saudi Arabia, which has always struggled with producing large quantities locally due to its typically hot and dry climate, could be one to pave the way for the future of agriculture.

The Corniche is under continuous development as the waterfront is one of the highlights of the city. The site chosen sits on a part of the Corniche that is much less developed than other areas. Therefore the project has the opportunity to create a landmark for itself, become a new hub for the community, bring development to the area and expand life on the waterfront. The special features noted in the case studies were especially used in the design of the farm tower as this was the most complex part of the design process. This included structure of the tower, interior layout and building skin. The interior form of the culinary complex was inspired by the case studies but in terms of space and technicalities, it was designed based on design standards and specific requirements for teaching kitchens. Overall, the project came together as a smooth flowing complex with multiple zones all well integrated with one another to allow for smooth flow of movement, ease of accessibility, and facilitation of visual and social interaction, while still maintaining privacy for certain users.

REFERENCES
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