

True Smart and Green City?
8th Conference of the
International Forum on Urbanism



Qatar University
College of Engineering
Department of Architecture & Urban
Planning

SUSTAINABLE URBANISM: TOWARDS EDIBLE CAMPUSES IN QATAR AND THE GULF REGION

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Abstract

- Producing food on a campus not only reduces the food print, that is the energy that is required to bring the food from distant factories and fields, but also allows more efficient resource use and recycling of water and waste.
- A permaculture or systems approach to food production can contribute to increasing biodiversity on the campus, with careful combinations of plants that repel harmful insects but attracts multiple species.
- This research looks at the different practices and modes of producing food in dry lands and proposes an application at Qatar University campus.
- It builds on previous research on Food Urbanism in Doha, and on a prototype Edible Boulevard and Edible Rooftop Garden being implemented at the College of Engineering.

Introduction

- Qatar, Bahrain, Kuwait, Oman, Saudi Arabia and the United Arab Emirates have food security issues that depend exclusively on international trade with a percentage that ranges from 80% to 90% of their economic activities (Bailey & Willoughby, 2013).
- In many cases, they import the majority of their food and produce their sweet water from desalination
- It is important to find new approaches to design cities that integrate food production while balancing resource utilization.
- Universities, being key institutions in processes of social change and development, play explicit role in spreading knowledge and producing highly skilled personnel to meet perceived economic needs

Food Security and Sahara Desert

- Qatar National Food Security program was founded in 2008 with an aim to reduce Qatar's reliance on food imports through the realization of the principle of self-sufficiency.
- The Sahara Desert pilot project that is currently being implemented to increase Food Security in Qatar.
- This presents a unique research platform to demonstrate and optimize environmental technologies that will enable restorative growth in desert areas around the world and, thus, address major issues of food security within Qatar and the rest of Middle Eastern countries.

Edible Campus

- The issue of food and water security can be addressed through universities, with the aim to encourage students to grow their food in campus.
- Corresponding design approaches (productive landscapes and edible campus gardens) are scrutinized by case study.
- The Edible Campus Project is proposed to be implemented in Qatar University campus – inspired by other projects such as the Edible Campus Project at the University of California, Santa Barbara (UCSB) - aiming to address local food insecurity by repurposing underutilized spaces for food production, turning waste into food, and engaging students as growers and producers.

University of Southern California.
Students Planting Seedling at Department of
Public Works' Eucalyptus Grove



Literature Review

- A range of theories and approaches have been forwarded in order to investigate the idea of productive landscapes and edible gardens in Doha.
- In his paper Holdsworth (2005) has discussed how productive urban landscapes directly connect urban to rural surrounds.
- Likely, in his paper Grimm demonstrates that urban food systems have a potential of creating environmentally, socially and economically productive communities (Grimm, 2009).
- This reflects that continuous productive landscapes have the potential to become a tool to sustainable growth in urban communities.

Literature Review

- Urban food systems and design based on the theory Food Urbanism should be researched since food relates to the organization of a city and how it becomes infrastructure that transforms the urban experience.
- Dubai's "Food City" which is a speculative plan developed by a Landscape Architecture firm (GLCA).
 - artificial roof landscapes,
 - renewable energy systems,
 - aquatic farms,
 - vertically stacked landscape surfaces, and
 - thermal conditioning.

Literature Review

- In Dubai, in 2007, and as a part of an ongoing effort to address environmental concerns, an onsite Bio-Garden has been developed at the Jebel Ali Golf Resort to produce a range of fresh fruits, herbs and vegetables for use in the restaurants dining outlets.

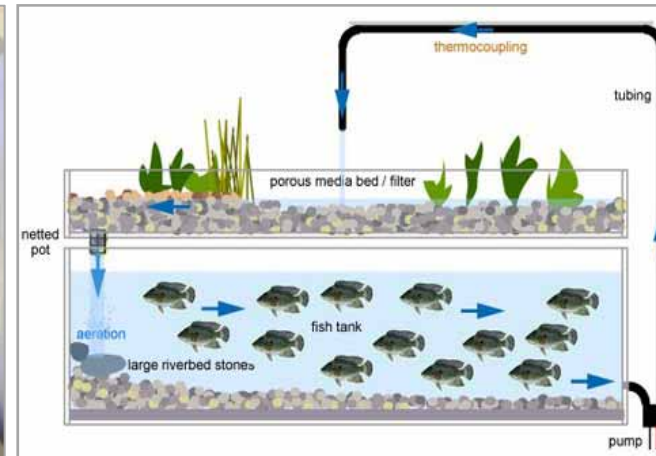


Figure 1. Plants and Herbs Grown using the Aquaponic Gardening Method at the Jebel Ali Resort and Hotel

Literature Review

- Alongside these governmental projects in the Gulf, there are examples of local community or residential food production by individuals.
- In Qatar, Indian expatriate workers, who hail from rural communities, develop extensive vegetable and fruit gardens.
- Also Qataris themselves have farms where they grow food.
- creating edible gardens in Doha can develop it as a sustainable city that is self-sufficient with food production.
- A healthy urban food system means a healthy and sustainably growing community that is economically, environmentally and most importantly a socially productive community.

Food Urbanism in the Context of Qatar

- Qatar is a small peninsula with an area of approximately 11,000 km², bounded by the Arabian Gulf on all sides except in the south where it touches the eastern province of Saudi Arabia.
- The arid desert climate of Qatar is characterized by scanty rainfall with an annual average of about 80 mm (over the period 1972–2005).
- Total cultivated area of Qatar is 6,322 ha, including 67 ha of greenhouses with an arable land of 2,651 ha, which includes 1,190 ha of vegetable crops and 1,461 ha of field crops (2005 data).

Food Urbanism in the Context of Qatar

- The land suitable for irrigation is 52,128 ha and most of it is classified as having marginal suitability for irrigation.
- Qatar imports over 90% of its food, and seawater desalination counts for 99% of water sourcing and which presents a very high factor of Food and Water “Insecurity” with a large dependence on technology and imports.
- Urban agriculture contributes to food security and food safety in two ways:
 - increases the amount of food available to people in cities, and
 - it allows fresh vegetables, fruits, and meat to be made available to urban consumers.

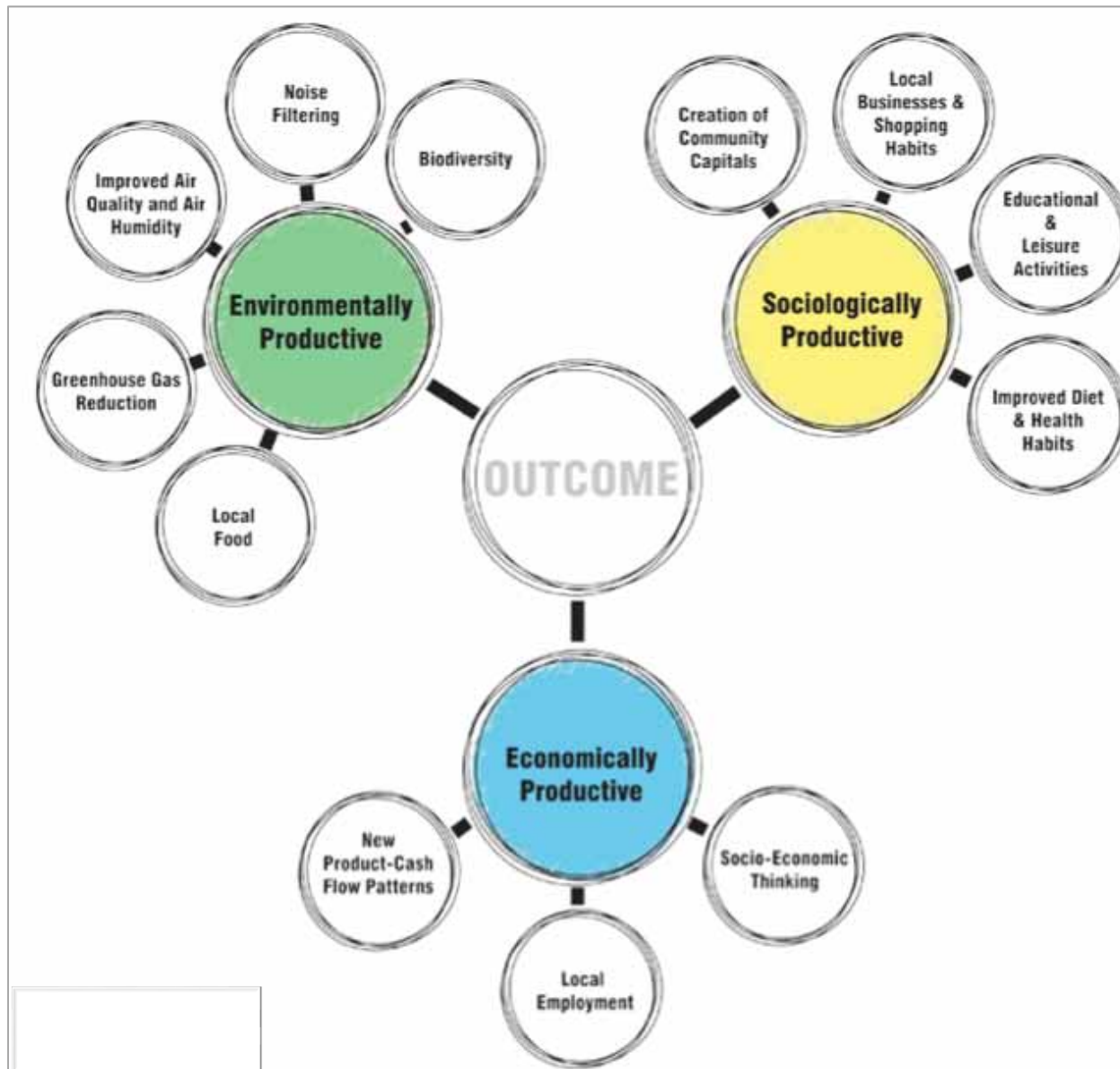


Figure 2. Urban Food system Outcomes

Results and Discussion

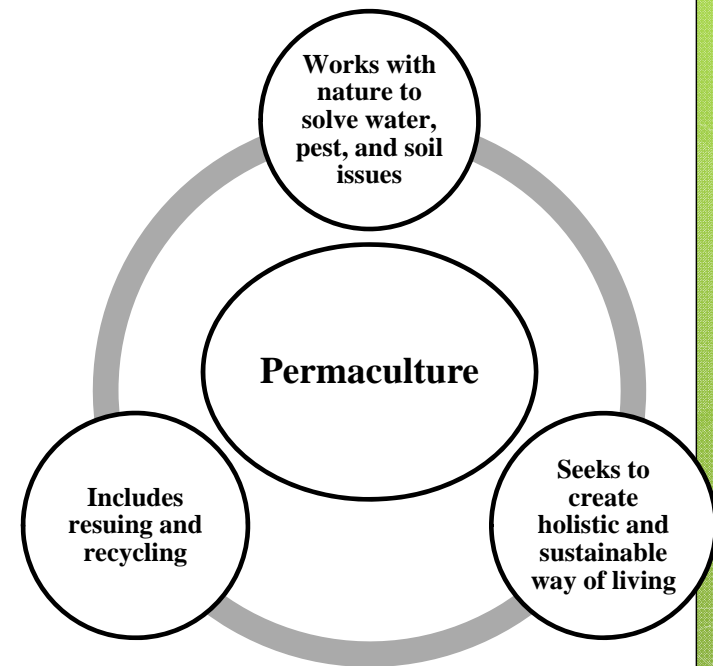
- The Edible Campus research project was suggested to identify ways of increasing campus sustainability by providing students access to fresh, local food through urban agriculture.
- Urban agriculture increases food security, nutrition, and urban biodiversity (van Veenhuizen, 2006).
- Intended to develop better integration of “whole systems thinking” in designing projects. The research methodology seeks to answer three basic questions:
 - What are the practices of food production in Qatar?
 - How can these practices be applied and replicated/adapted in architectural designs and the retrofitting of existing buildings at the Qatar University Campus?
 - What new technologies can be implented into new and/or existing buidlings and landscapes to increase ressource efficiency and food production?

Results and Discussion

- A blog / website was created for the project as a means to communicate the information to a larger public and to share it amongst the researchers.
<http://blogs.qu.edu.qa/foodurbanismdoha/>.
- Of the different typologies presented in the literature, the Edible Schoolyard is of particular interest in relation to the prototype garden being implemented by the research team at the College of Engineering campus.
- The concept of Edible Schoolyard emphasizes the role of education in creating healthier communities.
- The Case Study of the Permaculture Compound Garden was interesting to demonstrate that these practices can be implemented in Qatar and in the University Campus.

Detailed Investigation into the Case Study: Al-Waab Oasis Permaculture Garden in Doha

- This case study presents a comprehensive implementation of the Permaculture concept that supports food urbanism in terms of offering long-lasting agriculture and healthy environment.
- This case is implemented by a Canadian master gardener and Permaculture expert who lives in Doha.



Detailed Investigation into the Case Study: Al-Waab Oasis Permaculture Garden in Doha

- The implementation process was based on the idea of test beds that are distributed in the house's backyard and on the top roof.
- Gather empirical data about what grows well in Qatar and demonstrate the wide variety of food that can be grown, even with the harsh growing conditions.
 - Demonstrate how Permaculture techniques can help increase food security
 - Provide a tangible demonstration of how implementation of Permaculture practices helps to increase and benefit soil structure by use of compost, manure, straw, diversity of plants
 - Demonstrate that natural pest management practices can be used instead of harsh chemicals
 - Increase bio-diversity with a mix of vegetables, and beneficial plants to bring beneficial insects to site



**Permaculture Techniques used in
the Compound Garden**

Soil building (compost and manure)

Trees for wind breaks

Companion planting

Grey water recycling

Crop rotation

Composting

Chikens for soil turning

Planting nitogen-fixing trees

Creating a food forest

Mulching with straw to decrease water usage and add nutrients to soil

Test beds are prepared ito ensures a full utilization of the organic wastes

Permaculture Edible Garden at Qatar University

- The first stages of an Edible garden associated with the new Women's Engineering Building at Qatar University have already been implemented.
- The task involved a design stage where plans and drawings were generated in the form of design proposals.
- A part of the garden was planted with seeds and young plants, including tomatoes, eggplant, cabbage, broccoli, squash, and corn.
- The concept of Permaculture is defining the theoretical framework of the edible garden and green roof prototypes.

DESIGNING FOR FOOD SECURITY: PRODUCTIVE LANDSCAPES IN QATAR

Edible Garden at CENG Qatar University | UREP 14 - 072 - 5 - 016 | <http://blogs.qu.edu.qa/foodurbanismdoha/>

WHAT IS PERMACULTURE?

"Permaculture is the conscious design and maintenance of agriculturally productive ecosystems, which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people — providing their food, energy, shelter, and other material and non-material needs in a sustainable way."

EXISTING PLANATION



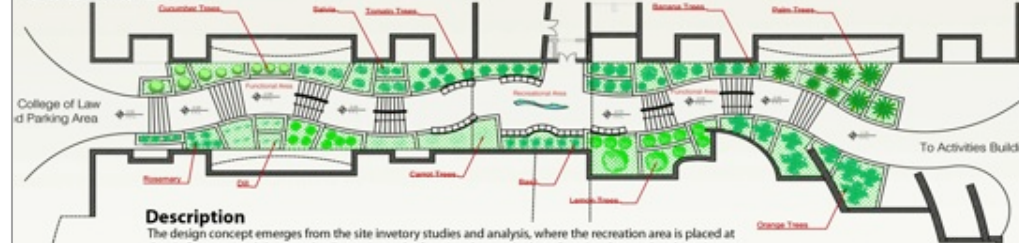
DESIGN PROPOSAL 1



Description

The design concept is layered planting. As the garden will be viewed from different directions, a design idea is to plant tall plants in the middle with graduated sizes down to the borders throughout. This creates interesting spaces for the CENG students to enjoy their travel time to reach the recreation area. Additionally, locating the plants depends on their characteristics: nice-smelling plants grouped together and tasty plants are grouped together, ending-up with the Aroma Path and the Flavor Path.

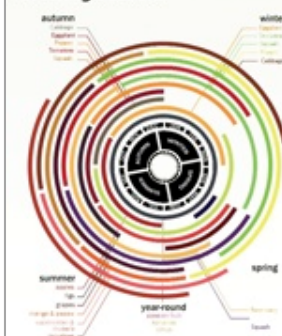
DESIGN PROPOSAL 2



Description

The design concept emerges from the site inventory studies and analysis, where the recreation area is placed at the air-flow area and the steps leading to it are the functional areas. At these functional areas the plantation process takes place. Tall shade trees are placed at the South direction, such as Palm and Orange trees. Whereas, at the North direction productive shrubs and bushes are placed, such as Tomato trees and Rosemary.

Growing Seasons



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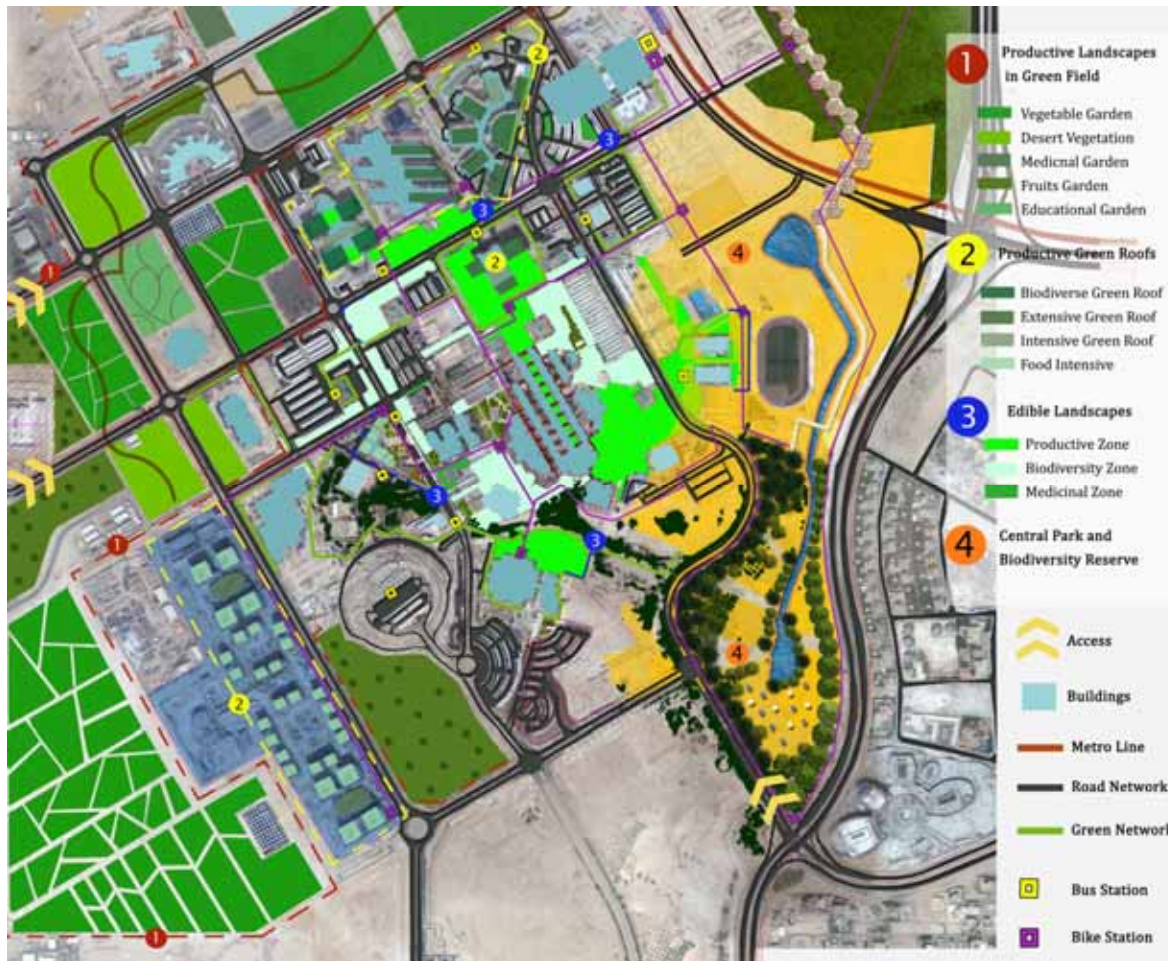
Conclusion

- Systems Thinking and Food Urbanism needs to become a part of the design curriculum in Architecture Schools so that students will think about Resource and Waste systems, in order to develop more symbiotic designs and urban plans.
- Practical knowledge can be gained by developing prototypes such as the Villa and Compound garden, and the Permaculture Edible Boulevard and Green roof of the Department of Architecture and Urban Planning, at the College of Engineering in Qatar University, Doha, Qatar.
- A prototype such as that which was, and continues to be developed at Qatar University to increase the production of food on the campus, is proposed as a catalyst to extend the productive and edible landscapes to the whole campus.

Students presenting their ideas for EC on the the Roof Garden Stage



Qatar University Edible Campus Project by Undergraduate Students 2015



Explaining Composting Bin to VIPs at Edible Roof Garden Opening



Conclusion

- The University is an opportunity to share knowledge, skills, experiences, and ideas, and to spawn further multi and interdisciplinary research and community initiatives.
- It has the potential to influence many future architects and urban planners of the region, and experts in other fields as well.
- The benefits of Permaculture are being investigated, and the principles and techniques may find interest in Doha and elsewhere in Qatar, the Gulf, and other Arab countries, as the results of the research project are obtained and presented.

Acknowledgement

- This research and oral paper presentation are made possible by UREP 14 - 072 - 5 – 016 from the Qatar national research fund (a member of Qatar foundation). The statements made herein are solely the responsibility of the author(s).
- The researchers are funded by Qatar University, College of Engineering, Department of Architecture and Urban Planning Graduate Program.

Students Visiting the Prototype Edible Garden At College of Engineering



Edible Boulevard Prototype Garden Designed by Students Reem, Nussyba and Asmaa with UREP Grant

