



## Next Generation of Urban Agriculture

This article introduces innovations in urban agriculture that shape The Blue Economy, which is known as ZERI's philosophy in action. This article is of part of a broad effort by the author and the designer of the Blue Economy to stimulate open source entrepreneurship, competitiveness and employment. For more information about the origin of ZERI <[www.zeri.org](http://www.zeri.org)>

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### **The World Market for Urban Agriculture**

Since 2010 half of the world's population lives in cities. There are an estimated 800 million people involved in urban agriculture worldwide producing at least 15 percent of the world's food output. Urban agriculture as implemented today is not primarily a source of cash, but rather a tool to provide food security. Only in a few countries more than a third of production is sold on the the market, hence the limited data on sales and turnover. In Madagascar and Nigeria, the share of income derived from urban agriculture exceeds 50 percent of the revenues of those who are part of the bottom of the pyramid. Low income urban dwellers spend between 40 and 60 percent of their daily income on food increasing the need to provide more nutrition locally. By 2015 at least 25 cities are expected to have 10 million or more inhabitants. This requires the importation of at least 6,000 tons of food each day into each city. Since the cost of food transportation from the farm into the city shop can represent up to 90 percent of the overall margin, food sold in the city is beyond the means of the poor who have to survive scavenging resulting in chronic poverty, malnourishment and health risks.

In order to respond to the needs of the 250 million urban poor worldwide, food production in the cities must at least double in order to respond to the basic needs. The City of Havana is perhaps the most successful using urban agriculture to provide food security. There are 300,000 backyard patios covering 2,500 hectares and the number is expected to increase to half a million small gardens by 2015. More then 40 percent of the households are involved in urban agriculture, including the widespread use of hydroponics securing a healthy 2,600 calories daily per capita. After the collapse of the Soviet Union and the hunger that struck the nation, Cuba in general and the capital of



Havana in particular succeeded within a decade in eliminating malnutrition. While over that same decade each adult Cuban lost on average ten kilo's of body weight, 22 percent of all new employment in the country has been created in urban agriculture. Harare, the capital of Zimbabwe also boasts a thriving urban agriculture. Over a quarter of the poor in Harare practice this type of farming which contributes up to 60 percent of the city's food consumption. Eighty percent of urban agriculture in Harare occurs on public land and by now - as a sign of the inventiveness of people to overcome malnutrition and poverty - 25 percent of the city's land is covered by small scale farms.

The urban poor are not restricted to the Third World. In the United States 50 million people are food insecure, and in Europe there are an estimated 30 million undernourished citizens. A city like Chicago has 600 community gardens with 300,000 square meters of vegetable roofs. Detroit counts 1,300 community gardens. The cost of starting a 2,000 square meters plot is calculated at \$25,000 within reach of micro-financing schemes available, not necessarily easy accessible.

### **The Innovation**

Urban agriculture is considered small scale and unproductive. The key challenge is to provide quality control and increase productivity. The introduction of permaculture and hydroponics in an urban environment offered a first breakthrough. Permaculture originated from the logic of the combination of the three kingdoms of nature (plants, animals and minerals) the wisdom of biologists up to the seventies. This has since been replaced by the theory of the five kingdoms (bacteria/monera, algae/protista, fungi, plants and animals). This expanded efficient local farming to mushrooms and algae as has been demonstrated in Case 3 and 21. However, in view of the need to double the output of urban farming which could reduce the cost of food for the urban poor by up to 90 percent by eliminating the need for transportation, warehousing and cooling, more ambitious ideas and entrepreneurship are needed. While the urban farming has worked fine in tropical climates, the question is also how viable is it in cold and temperate environments?

Mohamed Hage, born in Lebanon is a natural entrepreneur. He started an advertising-supported membership website about robotics and electronics, quickly evolving into Cypra Media, one of the largest full-service email marketing providers in his adoptive Canada. An avid outdoor person with a passion for excellent cuisine and fresh food as he remembered from his early years in a Mediterranean climate, he started reflecting on a new agricultural model that can be implemented across major cities. Living in Montreal, Canada weathering rough and cold winters, he imagined how greenhouses on rooftops could supply the food the city needs. While he is tech-savvy, his know how in farming was limited. He created an alliance with academia from McGill University and explored ways to use his entrepreneurial skills to bring a business model that goes



beyond community gardens that operate only half of the year. He imagined a year round operation in spite of the cold winter climate.

### **The First Cash Flow**

Mohamed mobilized two million dollars and created Lufa Farms, a name inspired by the lebanese plant luffa (*Luffa aegyptiaca*), that was used in his home as a vegetable sponge and in the early days functioned as a growth medium for hydroponics. He mobilized a diverse team and integrated all the know-how locally available to built the first ever rooftop agricultural garden, adjusted to the snow loads of the Canadian winter while meeting urban building codes. It required a lot of patience to pull the well researched and funded project through. It took one year to change the city's zoning codes to permit farming in the center of town. He overcame all technical and legal challenges in four years and now supplies food to people in the inner-city meeting their daily needs for fruits and vegetables 12 months a year.

The facility is located in the Ahuntsic-Cartierville of Montreal, close to the Marché Central on a 3,000 square meter rooftop. It supplies 1,000 fresh food baskets a week at a unit sales price of C\$22 to C\$42. While private donations and free scientific, technical and engineering support permitted to materialize this first operation, more facilities are needed to make the business profitable. While the roof structure does not permit the farming of potatoes or carrots, since the amount of earth could not be supported by the roof, he focuses on tomatoes, cucumbers, peppers, chilies, eggplants, lettuce, bok choy and herbs for a portfolio of approximately 25 to 30 varieties of produce grown on the roof. To complement the missing components for a full family basket, Mohamed partnered with organic urban farms.

A study confirmed that this approach to urban farming generates pesticide free, GM free food on a space that is ten times smaller than a conventional farm. All water required is collected rainwater and the different temperature needs throughout the year are management through "hot and cool" zones adjusted to the ideal growth conditions of the produce. An increase in productivity by factor ten, a decrease of transport energy by factor 8, a reduction of energy costs of the building, self-sufficiency in water when agriculture is responsible for 80 percent of all drinking water consumption in the world, makes this operation an interesting case of the Blue Economy. The success of this first operation earned Mohamed in 2011 the "Next Generation Award" bestowed to him by the City of Montreal.

### **The Opportunity**

The systemic approach to convert available roof space, to use storm water, to manage temperature controls inside buildings, by supplying inner-city food at competitive costs, without the need for chemical controls, cutting dramatically on transport, generating a dozen full time jobs, and the association of peri-urban and urban farming in a package



that responds to the food needs of citizens provides a perspective of how the challenge of doubling inner-city output can be achieved, especially in the temperate and cold climates where the building of a green roof was already a revolution. The United States has 1.4 billion square meters of available space on flat rooftops covering commercial and office buildings. Based on the Montreal experience of the Lufa Farms this would imply that 50 million families could receive a fresh vegetable basket every working day of the week while generating 470,000 additional jobs. It does imply that there is no reason for having 50 million urban poor, provided there are the entrepreneurs like Mohamed who are prepared to change the rules of the game to become competitive and sustainable. On top of this, it would represent a major contribution to healthy nutrition in a country where a large portion of the population suffers from obesity.

The successful implementation of such a large scale strategy to provide healthy and local food requires a cluster of new partnerships along the lines that Mohamed successfully forged. He works with construction engineers, green house technicians, organic farmers, marketing and distribution experts, internet wizards, cooperative enterprises, real estate investment funds, architects, local politicians and nutritionists all required along with the building developers to pull this innovative approach off. The goal is not just to produce food but to make a competitive offer that provides the local development based on local resources we propose in The Blue Economy, and build up assets beyond what investors have seen lately. What is clear though that all have to go beyond their core business in order to exploit the full potential of their assets and cash flow and this requires a new generation of entrepreneurs.

Gunter Pauli is the author of the Report to the Club of Rome:  
“Blue Economy: 100 Innovations - 10 years - 100 million jobs” published in 35 languages worldwide.

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