

# **Urban Agriculture and its Contributions towards a Healthy and Environmentally Sustainable Food Supply in Future Metropolises**

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## Literature Review

Current estimations predict a world population of about 9.3 billion human beings by 2050. Among others the food supply is one out of five interdependent challenges that require holistic answers (Sahara Forest Project, 2016). Due to advanced mechanisation, the development and extensive use of artificial fertilisers, pesticides as well as herbicides, continuous harvesting and many other accomplishments the industrial agriculture was able to increase its yields for most of the crops in the US between 1950 and 1982 by at least 100 per cent. While earnings for the majority of crops have continually increased till this day, the ruinous impact of industrial agriculture on the environment has become increasingly apparent (Clunies-Ross & Hildyard, 1992).

The secured food supply chain is irremissible for the well-being of humans living in modern societies. To feed modern metropolises mankind relies mainly on centralized food supply chains which collect the harvest from dispersed rural areas and distribute them to the grocery stores in modern megacities (Eastham, Sharples & Ball 2011). The focus on profits within the food supply has caused a number of tremendous objectionable repercussions such as health problems, air pollution and the undermining of alternatives (Clunies-Ross & Hildyard, 1992).

The industrial agriculture system consumes fossil fuels, water and topsoil at an unsustainable rate and its contribution to numerous forms of environmental degradation, including air and water pollution, soil depletion and diminishing biodiversity are evidenced. Although industrial meat production contributes excessively more to these problems than industrial agriculture, the topic is not covered within this review due to its scope and the fact that industrial meat production fosters the proliferation of factory-style animal agriculture and pesticide use. Insecticides are even linked to elevated cancer risks and come under grander scrutiny for their connection to endocrine disruption and reproductive dysfunction (Horrigan, Lawrence & Walker, 2002).

Urban agriculture is one alternative that progressively gains adherence within urban areas. Frich (2016) claims the urban agriculture movement is supported by the idea that townspeople can achieve more than consume uncritically what wholesalers deliver and that by the identification of urban alcoves humans could bring a healthy food production into modern cities, foster solidarity, accumulate knowledge and invigorate regional value creation chains. According to Zeller (2016) the subject food production is one of the biggest global challenges of present age; while the price was the main concern for decades, the exploitation of humans, animals and the environment has become normality. Zeller (2016) moreover proposes that horticulture changes ones perspective radically due to the experience of how much energy is involved in sustainable market gardening.

The first open source book about urban gardening is already available and aims to provide cost-free education for nascent urban gardeners. Its writers emphasize that urban gardens are places for intercultural exchange and that through self-organisation people are able to provide an essential building block of life for a human well-being (Halder et al., 2014). The composite work consisting of numerous filed researches covers various topics such as community gardens, bees, soil and even decentralized water management systems and provides this knowledge freely available for interested parties.

“The city of the future is green and delicious”, claims Tracey (2011) and even calls for a food revolution by identifying urban gardening projects growing in scale throughout the chapters of his book. Starting with pots on a sunny kitchen windowsill Tracey (2011) covers topics like the backyard and front yard, the transformation of school yards into cropland and even future city farms.

In this context McAdam (2012) stresses the following:

Just then, *The Omnivore’s Dilemma* was published, and Michael Pollan laid out the problems of our age in terrifyingly simple language. The farmers were no longer feeding us: profit-driven corporations were.

At the end of 2006, I was fortunate enough to be able to drop everything and leave for a year in northern Italy, where I embarked on a master’s degree in food culture and communication at the University of Gastronomic Sciences, UNISG. This was the educational arm of Slow Food, the eco-gastronomic non-profit that came into being in Italy as a protest against fast food and has since evolved into a one-hundred-thousand-member global movement promoting food culture, tradition and biodiversity against the armies of industrial food production.

Black soil, due to its origins in the Amazonas called Terra Preta, is a dark soil which owes its typical colouring to the adding of charcoal. The usage of this indigenous soil originally made by mixing coal, manure and bones into the infertile Amazonian soil for modern agriculture. Terra Preta can be prepared in compost heaps, kitchen bokashis with or without the help of worms, slatted wood crates and has a strong focus on using what is closely available such as organic waste. Actually human excrement can be integrated in the production of black soil if desired. Thus Terra Preta fulfils the requirements of holistic proposals for the enhancement of human food supply as it integrates human waste into the food production (Scheub, 2016).

Larger scale urban agriculture projects often propose the application of new technologies in order to achieve food safety, product quality and especially predictability: A multiannual research program that has been carried out by Haan, Spruijt, and Vermeulen (2014) for the development of soilless systems for field vegetable production in Netherlands focuses on the potential of Deep Flow cultivation systems and their profitability. The results show that crops like leek, lettuce or spinach can give increased yield in soilless systems with respect to the soil bound system, mainly by faster growth and higher plant densities. Even though small scale production on soil is still cheaper because of high capital costs they agree that by upscaling, the soilless production can outperform traditional methods of cultivation (Haan et al., 2014).

Vertical Gardening is another emerging field of study which some scientist like to bring in connection with the Hanging Gardens of Babylon. This futuristic sounding form of gardening is in fact already taking shape on planet earth (Despommier, 2016). In an Interview Despommier (2016) reported about a vertical farm which had been constructed in Singapore. The brand-new building looks like a greenhouse and is four stories tall. Though the farm is still soil based, plants are potted on serial conveyor belts which migrate the plants by gravity and therefore ensure that every plant gets the same amount of sunlight during the day.

Contemporary research and visions concentrate increasingly on the combination of hydroponic systems with vertical gardens. Latest concepts include drip-style, flow-style hydroponic as well as aeroponic systems ("Mission 2015: Biodiversity", 2015). Home Town Farms is one of the first companies that produce organic food by relying on the amalgamation of those two ideas with a short supply chain (Capik, 2014).

There are still voices that claim urban agriculture such as vertical farming will produce more new complications than solutions (Cox, 2012) but there is a growing number of scientists getting involved in greater and greater projects around the globe. Some of them intending the complete redesign and reconstruction of our metropolises (Fresco & Meadows, 2016).

The consideration that cities and their citizens engage in all aspects of the food cycle and its relevance for the environmental, social, economic and spatial character that city has, shows that urban food systems touch upon many, if not most, aspects of urban life (Viljoen & Bohn, 2014).

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