



Agriculture in Urban Environments: The Way Forward to Feed the World?

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Received: November 05, 2018; **Published:** November 12, 2018

The world is now experiencing its biggest growth in urban population in history with more than half the world's population now living in cities and towns around the globe [1]. By 2030, this number is expected to reach 5 billion, bringing large economic, social and environmental changes to the planet. According to the Harris-Todaro model [2], rural migrants based their migration decisions mainly on wage differentials, economic incentives and a likelihood of getting a job in their destination usually an urban centre. In both the developed and the developing world, not all rural-urban migrants realize their dreams of landing a job. This results in a rise in urban joblessness which leads to high urban poverty rates especially among migrants [3]. In most countries in the world, the urban migrants are challenged by access to adequate shelter, health, and social services, often paying off higher percentages of their limited financial resources to house, feed and cloth themselves compared to the rest of the population [3]. Faced with these problems, people turn to what they know how to do; grow their own food for subsistence. Urban agriculture is one of the strategies being adopted to improve well-being and reduce poverty among city dweller [4].

Studies on food composition data from several developed countries show significant declines in mineral composition of fruits and vegetables from 1930s to 2004 [5]. Food composition data from the U.S. (1930s vs. 2004) and the U.K. (1930s vs. 1980s) were collected to test the hypothesis that mineral composition of fruits, nuts and vegetables show a historical dissimilarity [6]. The findings showed reductions of between 10 to 75% in the Ca, Cu, Fe, K and Mg contents in fruits and vegetables. A similar comparison of the mineral concentration of vegetables, fruits and cereals from Finland with the results of the same food published in the 1930s reported significant decreases in trace elements Cu, Mn, Ni, and Zn [7]. These reductions in nutrient concentration, described as the diluting effects, were attributed to plant breeding that breeds for high yielding varieties which demonstrate rapid growth, pest

and disease resistance but may not be good at extracting and transporting soil nutrients within the plant and consequently may not be nutrient rich [8].

There is a common belief, proven or not, that the chemicals used in conventional agriculture are having a negative effect on crops and therefore human health [9]. The market for organic food has increased dramatically as its consumers seek to avoid pesticides and genetically modified foods as a reaction to concerns about their safety and effects on human health [7]. An estimated 37.2 million hectares was devoted to organic food production in 2011, a three-fold increase from 1999 with a current global market of US\$ 63 billion [10]. With price as the main constraining factor for consuming organic food worldwide [11], people in urban centres, mostly the urban poor, tend to grow their own organic food in either backyard gardens or community gardens.

With access to fresh fruits and vegetables increasingly becoming a challenge in cities [12], thus the rise in urban agriculture in these cities and their peripheries. One study estimated up to 90% of a city's demand for perishable vegetables and 41% of total food supply has been met by urban agriculture [13]. Rates of urban population involved in agriculture have been estimated to be as high as 80% in Brazzaville (DR Congo), 68% in five of the biggest cities in Tanzania [14]. Urban agriculture has also been reported to contribute significantly to household incomes with figures varying from 11% in Indonesia to 70% in Vietnam and Nicaragua clearly demonstrating the importance of urban agriculture [4]. Urban dwellers in the developed countries also practice urban agriculture in the Austria, Canada, Japan, the United Kingdom, the United States among others [12], although income generation may not be their main motive. The cultivation of a home garden or participation in a community garden has been shown to result in an increased intake of fresh vegetables and reduce food insecurity [15]. Encouraging such gardens among urban dwellers could be a strategy in

reducing non-communicable diseases which have been linked to lower intake of fresh fruits and vegetables. They could serve as a source of local medicinal plants whose use is on the rise for mostly urban dwellers and create green spaces which are known to positively impact on human health [16,17]. As good as this may sound, the source of irrigation water for such urban gardens is important. In some developing countries where urban gardeners rely on waste water for irrigation, the result has been an increase in infectious diseases caused by pathogenic bacteria found in the waste water used for irrigation [18]. Similarly, the use of waste water for irrigation in urban agriculture has been related to the spread of antibiotic resistance, a growing global problem. Besides the risks of contamination, home gardening for vegetables and fruits could be a means of increasing food production which will need to more than double current production levels within the next decades to meet the nutritional needs of the world's population that has been estimated to reach 9 billion by 2050 [19].

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Volume 2 Issue 12 December 2018

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