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Edible backyards: climate change and urban food (in)security in Africa

Bright Nkrumah*

Abstract

Background: Food insecurity is continuously seen as a major problem in Africa, and as a challenge confronting millions of Africa's urban population. Although some city residents produce their own food and, therefore, are food secured, others continuously find it difficult to access arable land in order to keep animals or cultivate crops. Climate change, in addition, seems to worsen the food insecurity situation of the region's urban population, especially in the face of drought and flooding waters. To this end, this study recommends that urban agriculture (UA) is well positioned to mitigate the adverse effect of climate change and improve food security.

Results: The study found that the current problem posed by climate change to Africa's urban food security is expected to worsen. Many urban populations are at risk of becoming victims of climate change through severe food supply problems caused by floods, droughts and hailstorms that affect food production in the hinterlands. African urban population has a role to play in finding appropriate solution to sustain food security, especially through UA.

Conclusion: The study concludes that African governments should endeavour to create the necessary conducive environment to encourage urban residents to engage in animal husbandry and food production.

Keywords: Climate change, UA, Adaptation, Vulnerability, Africa

Background

Each year, hundreds of Africans migrate from rural to major cities in search of a better life [1]. Most of these cities continue to serve as platforms that provide greater economic opportunities to several youths, and has, thus, triggered mass rural–urban migration. This rapid migration according to Davis represents a new era for the African continent, considering that for the first time in history, more people reside in urban instead of rural areas [2]. More people in urban areas imply that more food is needed. While some African countries produce sufficient food capable of feeding their entire population, not everyone has adequate access [3]. One reason which accounts for this problem is that many urban dwellers are increasingly finding it difficult to access healthy and nutritious food due to major disruptions to food supplies [4]. For in many parts of African cities, flooding may

occur many times in a month, mostly through rainfall which does not reach defined channels, or even overflows from channels. The impact of these flooding on urban population does not only cause local damage to urban agriculture (UA) and transport, but has an indirect effect of disrupting movement of food supplies from the hinterlands to urban areas [5]. This situation poses a serious threat to the ever-growing urban population, especially in the face of climate change.

According to Cribb, one key factor which could exacerbate Africa's food insecurity is the (ab)use of the region's best agricultural land for urban development (power grids, transport, recreational centres and shopping malls) [6]. Ultimately, besides population growth, infrastructural developments generate substantial proportions of gas emissions. It was against this backdrop that Adekan observes that West Africa's foremost manufacturing city, Lagos is more likely to be hit by continuous flood [7]. She provides a number of explanations for this projection throughout her work, but expresses it best when she classifies 'uncontrolled expansion of the built-up area' and

*Correspondence: bright.nkrumahup@gmail.com
Department of Political Studies, University of the Witwatersrand, Private Bag 3, Wits 2050, South Africa



'urban development as being a large creator of risk for much of the urban population, most especially the urban poor who live in more hazardous physical and human environments along the coast' [7]. Thus, by extension, local manifestations of climate change are more likely to seriously compromise the vulnerability of urban resident since the viability and productivity of existing food production systems in many parts of Africa will be affected [3]. The concept of vulnerability, according to Kelly and Adger, implies the 'ability and inability of individuals and social groupings to respond to, in the sense of cope with, recover from or adapt to, any external stress placed on their livelihoods and well-being' [8]. Inherent in this definition is the identification, adoption and implementation of policy-relevant, robust recommendations and conclusions relevant to immediate and long-term needs of the people concerned. To this end, the next section looks at Africa's increasing urbanisation, vulnerability and adaptation of UA to climate change. The paper will, however, begin by first setting out the meaning of two important themes which run concurrently throughout this paper: food (in)security and climate change.

Discussion

Africans beliefs and concerns about climate change and food (in)security

It is important to recall the words of English economist, Thomas Malthus, in his 1789 *Essay on the principle of population*, where he projected that population growth would ultimately surpass food production [9]. Given that majority of Africa's population are now living in and/or migrating to urban centres, they are becoming increasingly disconnected from direct food sources. Their food (in)security situation is worsened when food cultivated in cities is further threatened by extreme weather conditions and climatic variability [4].

The phrase food (in)security was arguably first coined in the 1970s. Since then, different institutions and scholars have ascribed different meanings to it. According to one such institution, food security is attained when every individual has 'physical and economic access at all times to adequate food or means for its procurement' [10]. Even though this definition is widely accepted, the responses, scale and causes of food insecurity continuous to attract significant debate. In somewhat stark contrast to the above definition, Hendriks provides an expansive definition of this term. She notes that food security is mainly absence of hunger or where there is availability of 'food supply, access, adequacy, utilisation, safety' [11]. The concept of food security, in sum, has informed scholarly and policy debate at the local, national and international levels over the last four decades [3].

On the other hand, Climate change may be simply defined as a change in the pattern of weather, and related changes in land surfaces and oceans [12]. These changes may be triggered by either human influences (such as land use or changes in the composition of the atmosphere) or natural processes (including internal variability in the climate system or changes in the Sun's radiation). The Intergovernmental Panel on Climate Change has projected that by 2050, rainfall in Southern Africa and sections of the Horn of Africa will decline by about 10% [13]. Equatorial countries such as Kenya, Uganda and Cameroon are projected to be warmer by about 1.4 °C. The Sahara and semi-arid parts of southern Africa are also projected to be warmer by as much as 1.6 °C, whereas sea-surface temperatures in the open tropical oceans surrounding the continent will rise by about 0.6-0.8 °C (less than the global average) by 2050 [13]. As a result, Abebe notes that climate change will aggravate several existing challenges facing urban food production since it will trigger a more extreme weather conditions in Africa, which may be the major cause of famine or inadequate production of food [14].

While traditional agricultural practices in general are likely to be heavily affected by the effects of changing patterns of vector-borne diseases, both subsistence and commercial farming are more likely to be impacted by more severe storms, very hot days and variable rainfall patterns [14]. Thus, the effect of climate change on Africa's food production could be grave, especially due to livestock and crop losses from drought and flood, as well as unpredictable weathers and seasons [3]. For instance, plants such as cabbage and wheat will find it difficult absorbing nitrates into their tissues with the rises in atmospheric carbon dioxide [3]. This situation compromises the nutritional quality of foods since the lack of nitrogen leads to reduction of protein content in plants. It is, however, important to indicate that '[i]nvariably, the effects of climate change will hit hardest on the urban poor, since they are often located in the most vulnerable parts of the cities and have the lowest capacity to adapt to such changes [15]. Action on climate change is, therefore, crucial given that in light of the recent warming rate of 0.18 °C per decade, the global mean temperature currently exceeding 1 °C above the pre-industrial level, will within 30 years from now go beyond the aspirational limit of 1.5 °C set by the United Nations Paris Agreement [16]. As a reaction to this growing concern, some Africans have started exploring innovative ways of farming in suburbs, as well as developing new methods towards local agricultural production and distribution, otherwise known as UA [3]. Against this backdrop, the next section turns to answer the question, 'what is UA' and what are its prospect in mitigating the effects of climate change.

Smart food city: the environmental and social dimensions of urban agriculture

Different scholars have provided different definitions of the meaning of UA. It is important to state, however, that while definitions differ, they all embrace the notion that UA encompasses a wide range of activities carried out at many different levels, from the citywide to the domestic level [3]. The very concept of ‘urban’ agriculture, according to Peres, is contradictory at best considering that crop production and animal keeping are activities that occur in the hinterlands and not in suburbs [17]. This position was quickly refuted by Bartling who asserts that there has been a proliferation of urban food and animal husbandry, and there has been indeed a continued existence and expansion of a wide variety of food production activities in post-colonial Africa [18]. Prain adds that as in other areas of the world, livestock raising and crop cultivation have long history in urban Africa [19]. Truly, every city in Africa has a history of UA where animals were kept and some resilient farmers managed to access and cultivate crops on those strips of land in the urban setting.

In defence of UA, Mougeot notes that there is the need to provide a stronger theoretical basis for UA to enable African urban residents appreciate its relevance towards urban resilience and food security [20]. The approach of Mougeot is to bring together a variety of theoretical building blocks in order to frame an overarching definition of urban food (and animal) production. These blocks encompass: the relations between urban and peri-urban systems, product destinations, the scale of food production, the type(s) of animal and food items produced, the locations where they are produced, and the types of economic activity involved. He, thus, proffers a more consistent and comprehensive definition of UA as.

an industry located within or on the fringe of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in

and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area [20].

UA can, thus, be defined as a form of agriculture that is integrated into the urban economic and ecological system. What distinguishes an urban from rural agriculture is that the former is embedded in and interacts with the urban ecosystems. Four distinguishable features of UA are: the use of its final products, method of production, size or scale and location of the farming activity. Table 1 provides a detail account of these four features.

As shown in Table 1, UA in Africa transcends community or private gardens. It encompasses activities such as (peri)urban farms, hybrid agricultural activity which incorporates gardening and farming, animal keeping, poultry, commercial bee and hobby, edible landscaping, institutional and demonstration gardens [3]. Other types of African UA are small scale gardens often run by schools, churches, civil societies and community groups. Besides providing a platform for social interaction, these gardens provide participants with opportunities for physical activity, community pride, and culturally appropriate food (including access to fresh vegetables and fruits). In very simple ways, UA is a socioeconomic tool which provides platforms for social networking, while providing employment opportunities for the unemployed. Some affluent suburban residents, on the other hand, are motivated to cultivate crops based on desire to reduce the distance their food has to travel before consumption, and as a means of supplementing their income [3].

The diversity of UA makes it uniquely adaptive to Africa especially as it can be adapted to the needs of diverse stakeholders and a wide range of urban situations. It can be practised in different locations and under varying political and socioeconomic settings. Since it comprises a variety of livelihood systems (spanning from commercialised agriculture to subsistence

Table 1 Key features of UA

Location	Operational method	Size	Final products
Walls	Outdoor and indoor animal rearing	Windowsills	Plants for therapeutic
Rooftops	Aquaculture sites (ocean, canals)	Balconies	Animals and plants for consumption
Nature strips	Rivers and Ponds	Large contiguous parcels of land	Ornamental use
Road verges	Raised bed		Medicinal use
Peri-urban land zoned for rural enterprises	Aquaponics		Environmental services
Community or public managed land	Hydroponic venues		Social capital
Industrial or residential areas	Greenhouses		Ecological services
Private properties (balconies, yards and gardens)	In-soil cultivation		Re-usable waste products

production and processing, many urban dwellers can tend home gardens for household food and income without complex technology or huge capital injection [3].

In sum, UA provides more efficient utilisation of organic waste, reductions in greenhouse gas emissions (as a result of production of more food from local sources), increased job creation for new urban farmers, and health benefits from producing one's food. Even though these apparent advantages may well be correct, these claims remain merely as statements of the possible, especially as very few studies have attempted to measure with some degree of certainty these claims. Nonetheless, in light of the enormous potential of UA to mitigate climate change, it is important to turn our attention to some of the barriers which militate against urban farmers and/or suburban residents in their attempt to start or expand their farms [3].

Cities in floods and droughts: diagnosing barriers to urban agriculture

In contemporary urban Africa, virtually all human activities are somewhat regulated by government legislation or institutions. Without the requisite licence, approval or permit, people cannot undertake commercial activities, change land use or erect buildings. And where such authorisation has been withheld -or even granted- a disgruntled neighbour will eventually lodge a complaint with the relevant authority that such an activity is causing great discomfort. Consequently, in many suburbs (including Accra, Pretoria, Addis Ababa and Lagos), the practices and scope of UA has been subjected to an intricate web of legislations triggered by a string of concerns, mainly relating to public health and neighbourliness. Even though some of these regulations are often enforced by municipal government officials, the most influential regulators of UA have probably been (city, environmental, town and urban) planners [21]. To be specific, urban planners (in less developed and developing African countries) have, for many years, treated UA as activities deserving to be proscribed and at the very least regulated. As Morgan notes, admittedly in rather general terms, 'urban planners in Africa have been part of the problem of food insecurity because, until recently, they saw it as their professional duty to rid the city of UA [21].

Usually, urban farmers' proposal for the relaxation of laws governing the rearing of animals (such as chicken and goats) on their properties have often been met with rather discouraging replies from metropolitan governments, which brings to bear the constant debates whether 'rural' practices can be implemented in urban areas [22]. A member of a local government once decried '[w]ould you like to live next door to someone who's got

chickens clucking around plus the potential smell and everything else that comes with it [23]?' With some city dwellers entertaining this rather abstract notion that suburbs are no places for keeping farm animals (including pigs and sheep), urban farmers stand the chance of being ostracised or shun by their neighbours, since they may be seen as '[t]urning the city into a zoo' [23]. In stark contrast to many cities in the world where UA is shaping current debates on the nature of sustainable and resilient urban suburbs against the backdrop of contemporary challenges (mostly climate change and peak oil), UA in Africa is at times perceived as not compatible with present-day visions of an ideal city. Thus, the practice of food production in urban areas tends to be low [24]. For the foreseeable future, if African cities are to be more sustainable and resilient in the face of several existential threats, such as climate change, then states must give priority to urban farming, especially as it: (i) has the potential to help mitigate the factors causing climate change; (ii) requires fewer energy inputs; (iii) symbolises a form of localised food production and consumption. Food production in cities undoubtedly holds a lot of prospects in ensuring sustainable forms of urban life in addition to building urban resilience. Nonetheless, before this could be achieved, urban food production must be incorporated into a more comprehensive initiatives of urban planning and, also, into broader food systems for sustainability and resilience.

Conclusion

This paper explored animal husbandry and food production, and, in particular, UA as an important socioeconomic practice, both in terms of serving as a source of food (and income) for urban household and as a means of mitigating the adverse effect of climate change in Africa. The paper provided a brief overview of the changing nature of Africa's climate and food production, then engaged with UA's contributions to social and environmental sustainability and its role in fostering urban food security. To this end, the study makes an important contribution to the field of agriculture and food security by suggesting that before UA can contribute to Africa's adaptation and resilience to climate change, African leaders must: (i) de-regulate laws which hinder people from planting crops or keeping animals; (ii) provide support to church and school gardens, not forgetting to provide expert advice on gardening; (iii) gather and supply organic waste for composting and fertilising; (iv) recognising the importance of communal gardening spaces when assessing applications for development projects in residential areas; and (v) provide support for temporary land use for suburban farmers.

Abbreviation

UA: urban agriculture.

Authors' contributions

The author read and approved the final manuscript.

Acknowledgements

I will like to thank Prof Lawrence Hamilton, Wits University, for his encouragement, advice and support.

Competing interests

The author declares that he has no competing interests.

Availability of data and materials

Not applicable.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Not applicable.

Funding

No payment was sought or received for writing this paper.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 31 May 2018 Accepted: 20 June 2018

Published online: 06 July 2018

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