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## 1. Irrigated Vegetable Farming in Urban Ghana: A Farming System between Challenges and Resilience

Pay Drechsel, Andrew Adam-Bradford and Liqa Raschid-Sally

*This chapter serves as an introduction to the book and provides brief information about urbanization in West Africa, and in Ghana in particular, the general role of urban agriculture and the common use of polluted irrigation water. It describes our focus on irrigated smallholder vegetable production and our understanding of the terms ‘urban’, ‘peri-urban’ and ‘wastewater’. The chapter reflects on some of the key challenges of the farming system, its dynamic and resilience. It also gives an overview on the structure of the book, the origins of the data and the main objective of this publication.*

### 1.1 The Urbanization Challenge

Globally, more people are living today in urban as opposed to rural areas. In West Africa, which hosts the megacity of Lagos, the population living in urban areas has increased from only 4% in 1920 to 45% in 2011. The 50% benchmark has been passed in Ghana as in the quickly urbanizing coastal belt of West Africa, while the drier and less populated northern belt of West Africa remains so far mostly rural. For Ghana, a population split of 50.9% urban to 49.1% rural (Table 1.1) has been estimated based on the 2010 census (GSS 2012c).

**TABLE 1.1.** Trends in urbanization, Ghana 1960 – 2010

Census Year	Urban Population	Percentage Urban	Annual Exponential Urban Growth Rate
1960	1,551,178	23.1	-
1970	2,472,456	28.9	4.7
1984	3,934,796	32.0	3.3
2000	8,274,270	43.8	4.6
2010	12,545,229	50.9	4.2

Sources: GSS (2012c)

In some of Ghana’s peri-urban areas, urbanization is galloping along with high annual growth rates of 6 to 9% (GSS 2002; 2012a). However, passing the 50% benchmark should not imply that more than half of Ghana’s population lives in larger municipalities, towns or cities. Each country has its own definition of ‘urban’ and in Ghana, settlements of 5,000 persons and above are classified as urban. Globally, the lower limit above which a settlement is considered urban varies considerably, ranging between 200 and 50,000 inhabitants (UN-DESA 2012).

In Ghana, all regions experienced rapid urban growth in the immediate post-independence decade (1960 to 1970), which has been largely attributed to inter-regional migration following the relaxation of the restrictive rural-urban migration laws of the colonial period, while urban growth since then is increasingly a result of natural growth in towns and cities and reclassification of villages as they attain the threshold population of 5,000 capita (GSS 2012c). However, economic migration remains important across West Africa and requires careful urban planning to avoid the development of informal settlements and slums along the urban-rural continuum.

## 1.2 Urban and Peri-urban Agriculture and Food Security

Central to the urbanization phenomena is the increase in urban food demand and changes in diets that are coupled with increased demands for a wider range of food types that serve the emerging middle-class markets. These changes challenge food production, rural-urban linkages, transport and traditional market chains. Specialized urban and peri-urban farming systems appear, like large-scale poultry production or high-input vegetable farming.

Urban and peri-urban agriculture can be broadly defined as “the production, processing and distribution of foodstuff from crop and animal production, fish, ornamental plants and flowers within and around urban areas” (Mougeot 2000). Although the terms ‘urban agriculture’ and ‘peri-urban agriculture’ are often used synonymously, we will use these terms as appropriately as possible. A major question for quantitative studies is where the urban and peri-urban areas start and end and where the rural ‘hinterland’ begins (Brook and Davila 2000; Simon et al. 2006). In our context we will refer to ‘**urban**’ as the administrative city boundary while ‘**peri-urban**’ is used for lands outside the immediate perimeter of the city but within a radius of up to 40 kilometres (km) of the city center (see chapter 2).

In Ghana, *urban* crop farming comprises three common systems: (i) intensive market production on larger open spaces, (ii) rainfed farming on plots designated for construction, usually more common in low density settings or at the urban periphery, and (iii) home gardens (or back yards) cultivated primarily for home consumption (Table 1.2). In this book, we will focus on the first category, i.e. smallholder farming for city markets with a focus on irrigated vegetable production in urban areas. These farming systems are usually found on open lands along streams, which are often owned by the Government and unsuitable or prohibited for construction purposes, but favorable for seasonal or year-round irrigation. These farming sites can be far away from the place the farmer lives and are also called “off-site” farming compared to “on-site” home gardening, like back yard cropping.

**TABLE 1.2.** Three major categories of urban crop farming in Ghana.

Farming System	Characteristics
<b>1. Market production</b>	Smallholder farming by several farmers usually on larger undeveloped open land, often near a water source. Exotic vegetables irrigated year-round or seasonal; flowers and ornamentals; in rainy season often also cereals, especially maize.
<b>2. Mixed market and/or subsistence farming</b>	Smallholder farming on (fenced) plots designated e.g. for construction, where one person who can be plot owner, caretaker or neighbour is cultivating in the rainy season e.g. maize or okro.
<b>3. Subsistence production</b>	Family operated home gardens or back yard farming at small scale; fruit trees, plantain, maize, cassava, local vegetables, seldom irrigated. Mostly (but not only) for home consumption.

The United Nations Development Programme (UNDP) estimated in 1996 that about 800 million people are actively engaged in urban agriculture worldwide and 200 million<sup>1</sup> are considered to be market producers (UNDP 1996). Urban market gardening focuses in many regions on easily perishable (exotic) vegetables with short shelf life, which complements rural food production where cold transport to the cities and cold-storage facilities are not available. Today, a significant share of perishable vegetables consumed in Ghana's cities is also produced in their urban and peri-urban areas (see chapter 4). The same applies to Dakar, Bamako, Dar es Salaam, and many other African cities, where depending on crop and season, between 60 and 100% of the consumed leafy vegetables, like lettuce, are produced within or close to the respective cities<sup>2</sup> on irrigated open spaces (Mbaye and Moustier 2000; Drechsel et al. 2007; Smith 2002). This high percentage indicates a noteworthy contribution of urban vegetable farming to balanced urban diets (Zezza and Tasciotti 2008). Apart from increasing food security through direct supplementation of households' food, urban agriculture in developing countries can also increase employment and income, which in turn, will enable people to purchase food to improve their diet or increase their general food security. In Ghana, the beneficiaries of urban vegetable production are up to 2000 urban farmers, 5300 street food sellers, and 800,000 daily consumers within the major cities plus an unknown number of traders (Table 1.3; for details please see chapter 9).

<sup>1</sup> These UNDP figures are vague estimates, but there is so far no better assessment available.

<sup>2</sup> Some data, like "urban agriculture produces 90% of 'all' vegetables" consumed in Accra (CENCOSAD 1994), are misleading. High percentages only apply to certain leafy vegetables, while for example tomatoes and onions are produced far away and certainly 'outweigh' for example, lettuce or spring onions. Care has thus to be taken to state which vegetables are meant and if any share refers to fresh or dry weight, or volume.

**TABLE 1.3.** Estimated number of urban farmers, street food kitchens, and urban consumers along the lettuce and cabbage value chain in Ghana based on survey and sector data.

Urban farmers producing lettuce and cabbage	Street restaurants offering salad side dishes	Daily consumers of salad side dishes in Ghana cities
Ca. 1700-2000	Ca. 3,600-5,300	Ca. 500,000-800,000

Source: IWMI estimates, 2008; updated 2014 (unpublished)

### 1.3 Sanitation, Water Quality and Irrigation

Other than increase in urban food demands, the upsurge of urban populations has far outpaced sanitation infrastructure and service delivery. This does not only apply to Ghana. About 2.6 billion people in the developing world lack access to basic sanitation. While WHO/UNICEF (2013) estimates that only 18% of Ghana’s urban population has access to improved sanitation facilities, they also recognize that 70% of the urban population has access to shared facilities. However, none of these figures reflects what eventually happens to the captured excreta. Basically, 85% of wastewater generated from urban centers worldwide ends up in the environment in its untreated form. Also in Ghana only a minor share of the fecal sludge and wastewater are really treated and less than 5% of the population has sewerage connections.

Most domestic gray water passes through storm water drains into streams and/or the ocean (Chapter 6). Urban and peri-urban smallholders in search of irrigation water find it almost impossible to source unpolluted surface water or end up using water from drains. Thus the discussion of irrigated urban and peri-urban agriculture in Ghana is also a discussion of sanitation challenges, water pollution and food safety. In the context of this book we will use, for reasons of simplicity, the term ‘wastewater’ for all types of water polluted with fecal matter, from insufficiently treated **raw wastewater** to the **stream water** which it will pollute. All these forms are used in urban vegetable production across Africa, although polluted stream water is the most common type within urban and peri-urban settings (Chapter 7). IWMI (unpublished) estimated for Ghana an area of up to 40,000 hectares (ha) seasonally irrigated with our definition of wastewater around cities and towns. This is several times the equivalent of the total area currently under formal irrigation (schemes) in the country.

Wastewater use in agriculture is not new, and with the general global increase in water scarcity, it is seen as a key component of Integrated Water Resource Management (IWRM) supporting fresh water savings for domestic purposes. However, the use of (raw or diluted) wastewater in its untreated form could have negative impacts on public health and the environment. In Ghana, and the wider subregion, the major health concern is with **fecal-oral**

**diseases** transmitted through pathogens (Amoah et al. 2011; see also chapter 9), while the flow of industrial effluents into urban and peri-urban streams is relatively low as larger industries are found only along the coast. So far water pollution from heavy metals does not exceed common irrigation standards (see chapters 6, 8, 9). Likely exceptions are streams passing gold mining areas, vehicle repair yards or tanneries.

#### **1.4 Dynamics and Sustainability of the Urban Agricultural Phenomenon**

Crop production on urban open spaces appears to be a market-driven, highly productive and profitable phenomenon (Drechsel et al. 2006). However, it is often constrained by tenure insecurity and non-agricultural land demands. While market proximity supports urban farming, urban expansion constrains it. Also the common use of polluted water limits the official support of irrigated urban farming. However, despite these constraints, the phenomenon of urban farming appears to be persistent and resilient to its changing environment, although individual farmers might have to shift to other sites when their plots are taken for construction (Drechsel and Dongus 2010). A comparison of different land-use categories in the same inner zone of Accra, between 2001 and 2008, showed a general decrease in open spaces and urban farm areas by over 50% (Forkuor, unpublished, see also next chapter). However, the analysis did not consider that in less densely populated city areas towards the city boundary vacant plots are often transformed into farmland. Moreover, up to 70% of all urban farmers in Ghana indicated that they had continuously cultivated their plots for more than 10 to 20 years. This is not only remarkable in view of limited tenure security, but also in a tropical context, which normally only supports shifting cultivation, especially on poor soils, and urban soils can be of particularly disturbed, moist or poor nature. Farmers cope with tenure insecurity and poor soils through targeted investment in highly effective manure, simple and movable technologies (watering cans) and the cultivation of short-duration crops for immediate cash returns. If farmers are expelled, they might move to another site in the vicinity or towards the fringe of the growing city. The Dar es Salaam example which was carefully analyzed over years supports this observation, as the same amount of area that disappeared emerged elsewhere during the observation period (Drechsel and Dongus 2010). In general, urban open space farming therefore resembles shifting cultivation in its dynamism, and also in terms of resilience through its ability to recover after disturbances with a spatial shift. Thus, the overall phenomenon of urban open-space farming appears to persist although

individual farmers or farmer groups might have to change sites unless they are on land that is flood prone or excluded from construction.

## 1.5 Book Objectives and Structure

This book is a state-of-the-art summary of the current information about open-space urban vegetable production in Ghana and the challenge of wastewater irrigation. Topics covered in this book include, *inter alia*, the general importance of urban vegetable farming, common farm practices, economics and externalities, gender issues, produce quality and possible health risks, safe wastewater use, stakeholder perceptions, land access and land security. The information is mainly based on different studies initiated and supported by IWMI in Ghana over the last 10+ years. Many local and international partners contributed to these studies as the Acknowledgements and affiliations of our chapter authors show. The book complements, as a Ghana country case study, the related overview on informal irrigation in urban West Africa (Drechsel et al. 2006).

Following this Introduction, the book is divided into three larger sections:

- **Practices, actors and economic aspects**
- **Possible health risks**
- **Strategies to enhance safety and productivity**

The first section (**Practices, actors and economic aspects**) starts by giving a short description of the main farming sites and cropping systems found in vegetable irrigation in Ghana's major cities (Chapter 2). Characteristics of urban farmers and traders, and related gender roles are described in chapter 3. Chapters 4 and 5 describe financial, economic and marketing aspects, and show who eventually eats exotic vegetables in the city.

The second section (**Possible health risks**) emphasizes irrigation and soil fertility management practices as well as health risks for farmers and consumers where irrigation water quality is poor. It shows common contamination levels of water and vegetables found in Ghanaian farms and markets (Chapters 6 to 9), followed by a description of stakeholder risk perceptions (Chapter 10).

The third section (**Strategies to enhance safety and productivity**) looks at options to strengthen farmer organizations and financing urban agriculture (Chapter 11 and 12), land-use planning (Chapter 13) and options for health risk reduction as studied in Ghana (Chapter 14). Related institutional and policy aspects are discussed in chapter 15.