

Water for Food in the Cities: The Growing Paradigm of Irrigated (Peri)-Urban Agriculture and its Struggle in Sub-Saharan Africa

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Summary

The urban population of Sub-Saharan Africa (SSA) will soon exceed its rural population, which demands for a paradigm shift in agricultural research and development. Besides urban sanitation, feeding the cities will become a major challenge of the urban millennium. Urban and peri-urban agriculture (UPA) has significant share in the food supply of many cities in SSA as it supports non-traditional urban diets, particularly with perishable vegetables, fresh milk and poultry products. It also contributes to employment, livelihoods and poverty alleviation. Urban and peri-urban vegetable production, which is intensive throughout the year, depends largely on the availability of water for irrigation. As urban and peri-urban water sources are often polluted, vegetable contamination is common and limiting the official recognition of this informal sector. There are, however, increasing signs of support taking advantage of different options for health risk reduction, which go beyond restrictive irrigation water guidelines.

Introduction

In developing countries, the rate of urbanization is accelerating and from UN estimates the urban population is expected to nearly double in size between 2000 and 2030. According to the projection, between 2015 and 2020, urban population will exceed rural population for the first time and will continue to escalate sharply while rural numbers remain more or less static (UN, 2002). This development inspired the General Secretary of the UN, Kofi Annan, to announce the “urban millennium” (UN-Habitat, 2001). Africa in particular is experiencing one of the fastest rates of urban growth. As population grows, so is the demand for employment, urban infrastructure and food. One of the consequences of urban growth is that the urban resources are put under much pressure. While the World Summit in Johannesburg emphasized the need for appropriate sanitation, ensuring food security and appropriate nutrition for the urban population is a similar challenge particularly for the poorest urban and

peri-urban households. In recent times, the increase in urban food demand is opening door for farming systems in and around the cities which often specialise on perishable products, such as vegetables, milk, and eggs, while taking advantage of every open space, market proximity, and the general lack of functional refrigerated transport and storage facilities. These farming systems are part of a phenomenon called **Urban and Peri-urban Agriculture (UPA)**, which contributes currently nearly 30% of world food production (Smit et al., 1996). In terms of aggregate supply, UPA complements rural agriculture in that it provides products that rural agriculture cannot supply easily (e.g. perishable products). This also substitutes for food imports and reduces the pressure on rural resources but also transport, storage and packaging.

Urban and Peri-Urban Agriculture in Sub Saharan Africa

In many cities of SSA as in other developing regions, farming activities are found almost everywhere: behind houses, along roadsides, on roofs, along and between railway lines, in parks, along rivers, under power-lines, and in high-, medium- and low-density areas. At least 20 million West Africans currently live in urban households with some kind of urban agriculture (Drechsel et al., 2006). In many cases, this production is for subsistence needs to reduce household expenses while contributing to the daily diet. Subsistence production appears to expand during economic crises and helps many poor households who spend from 60% to 80% of their limited income on food (Smith, 2002). The United Nations Development Program estimated in 1996 that 800 million people are engaged in urban agriculture worldwide. Of these, 200 million are considered to be market producers employing 150 million people on full-time basis (Smit et al., 1996).

Market-oriented production is usually informal and takes place on open urban spaces, preferably in inland valleys and lowlands with water access or close to streams and drains, which allow dry-season production of highly valuable crops with corresponding profits. Also peri-urban areas often attract highly specialized irrigated systems even for foreign export taking advantage of the proximity of city airports and harbours. Examples are pineapple farmers around Accra in Ghana or Basil leaf farmers on the beaches of Lomé in Togo. Also irrigated ornamental and flower production is a common and profitable UPA system although high investment costs are needed (Drechsel et al., 2006).

Depending on cultural specifics and production system these activities can have a very specific gender involvement with women in charge of production and/or marketing and often it is the only source of family income. A survey in 13 countries of West Africa showed that in 16 of 20 cities, men are mostly involved in open-space urban vegetable farming while in most cases, women dominated the vegetable retail sector (Drechsel et al., 2006).

Water use

Open-space urban agricultural production can become a profitable venture if market proximity is combined with water availability for irrigation. This permits dry-season production and supports intensive year-round production. Different sources of water are used for UPA in SSA. In Lagos, for example, peri-urban farming depend solely on the Fadama (wetland) where farmers are able to cultivate continuously throughout the year using water from flowing river, ponds, dugwells or washbores. A survey of irrigated UPA by IWMI showed that shallow hand dug wells are commonly used e.g. in Niamey, Lome, Dakar, Kumasi and Cotonou, but also streams were available. Deep wells are reported for example from Bamako while Accra's urban farmers mostly use water from drains or polluted streams. Some UPA farmers in Nairobi, Ouagadougou and Dakar use wastewater directly from city sewage for agriculture. Pipe water is seldom used because of the cost. Water lifting devices commonly used include buckets, watering cans (Accra, urban Kumasi, Lagos), treadle and motor pumps (Lome, peri-urban Kumasi, Lagos) while water application methods in most cases involve overhead irrigation with watering cans or spraying from hand held hose, while sprinkler and furrow irrigation is seldom, largely dependent on tenure security (Drechsel et al., 2006). The volume of water used depends on the type of crop, its water requirement and intensity of cultivation. In urban Kumasi, for example, about 600- to 1500 mm of water is applied in year-round irrigation of leafy vegetables, compared to about 200 mm in peri-urban dry-season irrigation (IWMI, unpublished; Cornish and Lawrence, 2001).

The positive impact of this type of production is related in the first instance to the direct benefits that accrue to the households involved in UPA. Backyard production supports self-employment, income from sales of surpluses, and savings on food expenditures. Open-space production, on the other hand, is straight for the market and can be a full-time job. A review of profits from mixed vegetable production in open-space urban agriculture showed that monthly net income ranges in wide margins between US\$10 and more than US\$300 per farmer, mostly depending on the

size of the farm, extra labour and a highly efficient water lifting device (e.g. motor pump) for irrigation (Table 1). If a farmer can produce throughout the year, he/she will jump over the poverty line of USD 1 per day, but without water access production might be limited to a few month and other income sources are required in the dry season.

Table 1: Monthly net income from irrigated mixed vegetable farming in West and East Africa (US\$ per actual farm size)

<i>City</i>	Typical net monthly income per farm in US\$	GNI per capita (US\$ per month)
<i>Accra</i>	<i>40-57</i>	<i>27</i>
<i>Bamako</i>	<i>10- 300</i>	<i>24</i>
<i>Bangui</i>	<i>n.d. -320</i>	<i>22</i>
<i>Banjul</i>	<i>30 – n.d.</i>	<i>26</i>
<i>Bissau</i>	<i>24</i>	<i>12</i>
<i>Brazzaville</i>	<i>80-270</i>	<i>53</i>
<i>Cotonou</i>	<i>50-110</i>	<i>36</i>
<i>Dakar</i>	<i>40- 250</i>	<i>46</i>
<i>Dar Es Salaam</i>	<i>60</i>	<i>24</i>
<i>Freetown</i>	<i>10-50</i>	<i>13</i>
<i>Kumasi</i>	<i>35-160</i>	<i>27</i>
<i>Lagos</i>	<i>53-120</i>	<i>27</i>
<i>Lomé</i>	<i>30-300</i>	<i>26</i>
<i>Nairobi</i>	<i>10-163</i>	<i>33</i>
<i>Niamey</i>	<i>40</i>	<i>17</i>
<i>Ouagadougou</i>	<i>15-90</i>	<i>25</i>
<i>Takoradi</i>	<i>10-30</i>	<i>27</i>
<i>Yaoundé</i>	<i>34-67</i>	<i>53</i>

Note: GNI = General Net Income (UN statistics); n.d.= not determined/reported
Source: Drechsel et al. (2006)

On the macro level, the contribution of UPA to the Gross Domestic Product may be small, but the importance for certain commodities and balanced diets, such as via vegetables might be substantial as different reviews showed (Nugent, 2000).

An economic comparison of irrigated urban agriculture, dry-season irrigation in peri-urban areas and rainfed farming in rural areas was carried out in and around the city of Kumasi in Ghana (Danso et al., 2002). It was found that urban farmers on irrigated land earn about 2-3 times the income they could earn in traditional rainfed agriculture (Table 2).

Table 2. Comparison of revenue generated in rainfed and irrigated farming systems

Location	Farming system	Typical farm size (ha)	Net revenue (US\$)/ ha/year	Net revenue (US\$)/ farm holding/year
Rural/ peri-urban	Rainfed maize or maize/cassava	0.5-0.9	350-550	200-450 ¹
Peri-urban	Dry season vegetable irrigation only (garden eggs, pepper, okro, cabbage)	0.4-0.6	300-350	140-170
Peri-urban	Dry-season, irrigated vegetables and rainfed maize (or rainfed vegetables)	0.7-1.3	500-700	300-500
Urban	All-year round irrigated vegetable farming (lettuce, cabbage, spring onions)	0.1-0.2	2,000-8,000	400-800

¹ The smaller figure refers to the smaller farm area, the larger one to the larger area. For easier comparison, the assumption is that farmers sell all harvested crops. It is possible, however, that farmers producing maize and cassava consume a significant part of their harvest at home. Source: Danso et al. (2002)

The Complementary Role of Urban, Peri-Urban And Rural Agriculture

Overviews given by Nugent (2000) and Smith (2002) showed significant contribution of irrigated UPA to urban food supply, especially with respect to leafy vegetables, and for low-income households. In Senegal, for example, about 60% of the vegetables consumed in Dakar are produced within or close to the city (Niang et al., 2002), while in Accra and Kumasi, the cities supply up to 90% of the most perishable vegetables (Drechsel et al., 2007). Many of these vegetables are “exotic” ones, and not part of traditional diets. But with increasing urbanization, also diets change. In Accra and Kumasi, for example, street vendors selling fast food purchase 60% to 83% of the lettuce available in the markets. The remaining share goes to restaurants, canteens and hotels. Private households take only about 2% in each of the two cities (Obuobie et al., 2006). Especially poorer urban households spend about 40% of their food budget on street food due to lack of water or space for cooking. It was calculated that about 200,000 people from all walks of life consume in Accra’s streets uncooked vegetables from urban agriculture on daily basis. If canteens and restaurants are added, another 80,000 beneficiaries of urban agriculture are possible (Obuobie et al., 2006). But this large group also comprises the part of Accra’s population at risk of food contamination due to polluted irrigation water used for vegetable production as it is common in and around most African cities (Drechsel et al., 2006).

The Challenge of irrigated UPA

Irrigated (peri)urban vegetable production appears as one of the most productive and income generating farming systems in Africa despite often marginal soils, insecure tenure and its informal character. The success, which is steered by the large urban market and demand for high value crops, also require high inputs in form of water, nutrients and pesticides. While pesticide and fertilizer/manure can be bought, it is difficult to find sites with proper, reliable and cheap water access. In this situation, farmers often make use of typical urban ‘resources’ like water from streams or drains, exposing urban farming to urban pollution. Most farmers are not aware of their personal risk involved with the use of polluted irrigation water, or face other (health) threats of higher priority (malaria, etc.). And in many cases, wastewater is the only reliable water source throughout the year, i.e. the basis of their livelihoods and no issue for discussion (Keraita et al., 2002).

Due to low industrialization, the contamination is seldom through heavy metals but through faecal matter. Studies from Ghana, Senegal or Nairobi confirmed that the

bacteriological contamination of urban water sources generally exceeds irrigation standards, for example, by WHO and FAO, and can contribute significantly to crop contamination (Niang et al., 2002; Keraita et al., 2002, 2003; Cornish and Lawrence, 2001). Other problems can be soil and groundwater pollution or salinisation. Thus despite all its benefits in terms of food supply, nutrition, employment, and poverty alleviation, urban vegetable production poses human health and environmental risks which makes it struggle for official recognition, not to mention support, especially in Sub-Saharan Africa with its complex urban sanitation problems (Obuobie et al., 2006; Drechsel et al., 2006).

However, in recent times, cities, such as Dar es Salaam (Kitilla and Mlambo, 2001) are beginning to realise that restrictive policies are bound to be ineffective. The tendency of many local governments now is to formulate more diversified and regulatory policies that seek to actively manage the health and other risks through an integrated package of measures, with the involvement of the direct stakeholders in the analysis of problems and development of workable solutions. In March 2002, the Dakar declaration was signed by seven mayors and city councillors from West Africa in support of the development of the urban agriculture sector, well recognizing the potential problems of wastewater use (Niang et al., 2002). Also a recent declaration (29 August 2003, Harare) by five Ministers of Local Government from East and Southern Africa called for the promotion of a shared vision of UPA. However, recognition is not yet action. To support the important role of irrigated urban and peri-urban agriculture, city authorities will have to work with their farmers to find the right balance between health risk mitigation and livelihood security. There are many options also in situations where better municipal water treatment is not possible in the near future thus no possibility to meet the common irrigation water quality guidelines (Drechsel et al., 2002): Instead of banning urban farmers, authorities could for example allocate areas with safer water sources for farming as done in Cotonou. But also the research community could assist with safer irrigation practices as currently under investigation in projects funded under the CGIAR Challenge Program on Water and Food (www.waterandfood.org/index.php?id=265; www.waterandfood.org/index.php?id=259). As vegetables are usually “refreshed” in markets, the Challenge Program projects are also addressing post-harvest contamination.

Conclusions

Informal irrigation in urban and peri-urban Africa has an impressive niche contribution in the supply of many African cities with perishable food and contributes to employment, livelihoods and poverty alleviation. But it also poses a potential health threat through the common use of polluted water sources. It is therefore important to find a productive balance between safeguarding consumers' health, food supply and farmers' livelihoods. This will require sensitive policies and the establishment of new multi-stakeholder partnerships between the sanitation and agricultural sectors across the urban-rural continuum, and between municipal authorities, education and research. This process is facilitated in Africa and beyond by the network of Resource Centres on Urban Agriculture and Food Security (www.ruaf.org).

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