

## Chapter 2

# Urban Agriculture in Africa: What Has Been Learned?

Gordon Prain and Diana Lee-Smith

### Introduction

Though the crisis in world food prices exploded during 2008, the problem of urban food insecurity in Africa has been a fact of life for many low-income urban dwellers for decades, and especially since the period of structural adjustment in the 1980s (Maxwell 1995). It is not that there is no food; it's that poor urban consumers cannot afford it. This is the stark but simple truth lying behind much of the agriculture that is widespread within and around African cities. What urban households have known and practiced for generations, urban decision-makers have begun to recognize much more recently: urban agriculture is a livelihood strategy.

The series of meetings convened on this theme around 2002 as described in the previous chapter began to discuss policies that might give more support to the practice. But as the earlier regional meetings convened by Urban Harvest had made clear, information was lacking about urban agriculture in the early 21st century. Which socio-economic groups were now most actively involved? Was food security or wealth generation the major goal for urban families? What was the relative contribution of livestock and crop production to the urban economy and society? How was agriculture combined with other occupations in household livelihoods and what were the roles of men and women? To what extent did it mobilize urban, peri-urban, and rural natural resources for productive ends, and what conflicts existed, especially for land and water? Was urban agriculture safe? Did its health benefits outweigh any possible risks?

Furthermore, anachronistic legislation prohibiting agricultural activities of different kinds continued to be on the books of many African cities, keeping open opportunities for harassment and corruption on the side of the authorities and insecurity on the side of the producers. Those seeking to change the legal and administrative frameworks toward more enabling regulations and by-laws needed greater

---

G. Prain (✉)

Urban Harvest, International Potato Center (CIP), Lima, Peru  
e-mail: g.prain@cgiar.org

evidence of the positive contribution of urban agriculture to poverty alleviation and assurances that it was not a major pathway for health hazards (Cole et al. 2008).

It is in this context that the stakeholder consultations in which Urban Harvest participated between 2000 and 2002 led to the identification of three key areas for its research:

- *Urban agriculture, livelihoods, and markets.* What is the contribution of agriculture to urban livelihoods? How does it contribute to household food security, savings on food purchases, or generating income? How does it vary in terms of production, processing, marketing, and household consumption systems along the rural–urban transect? What technology interventions can enhance agricultural contributions to livelihoods?
- *Urban ecosystem health.* What are the positive or negative contributions of urban agriculture to the urban ecosystem and human nutrition and health? Does it recycle urban and peri-urban liquid and solid wastes, thus contributing to a healthier, more productive urban ecosystem? Does it provide pathways for diseases or their vectors to enter the urban ecosystem? What are the nutritional benefits? What are the feedback mechanisms between people’s actions and population, community and environmental health?
- *Policy and institutional dialogue and change.* What national or local policies influence the practice of agriculture in cities? Which institutions are involved? What methods can be developed for building communication and consensus among the different stakeholders? What institutional alliances or platforms can support more sustainable urban agriculture? How can policy and regulation be improved and agriculture institutionalized in local governments?

The research presented in this book advances understanding of agriculture in selected African cities in relation to this thematic structure. In complex city ecosystems, which include informal economies and social networks, poor households depend on multiple income sources and a wide range of non-material assets to ensure their livelihood. Inadequate assets can leave households vulnerable to economic, environmental, health, and political stresses and shocks. This is the vulnerability context. Drawing on existing conceptual frameworks in sustainable rural livelihoods and urban livelihoods research (Farrington et al. 1999; Rakodi & Lloyd-Jones 2002) and in the area of ecosystem health, a research framework was elaborated linking the three themes to the major areas of urban development (Fig. 2.1).

This chapter reviews what has been learned about urban agriculture in Cameroon, Kenya, and Uganda, in relation to the three themes of livelihoods, ecosystem health, and policy and institutional dialogue and change. In relation to the third theme, we focus here on some outcomes of policy dialogue, but return to the subject in Chapter 15, especially to describe the change process. And, while we review here the learning from the three countries on ecosystem health, it should also be noted that the topic of health and urban agriculture is dealt with in greater detail in our companion book (Cole et al. 2008).

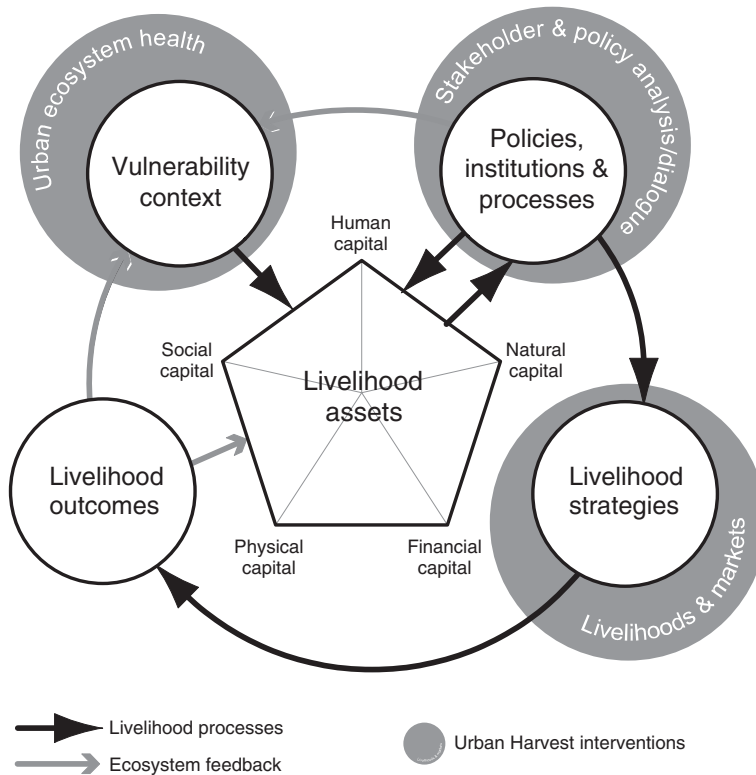


Fig. 2.1 Urban Harvest sustainable livelihoods framework, adapted from DFID

## Urban Agriculture, Livelihoods, and Markets

### Conceptual Approach

As seen in Fig. 2.1, five types of capitals or assets are distinguished, from which households develop their livelihood strategies:

*Natural capital* mainly involves the amount and quality of accessible land, water, and biodiversity. Households access these in a variety of ways ranging from formal land titles or membership in irrigation associations to casual cultivation of public spaces and illegal or informal use of wastewater and solid organic wastes.

*Physical capital* includes buildings, equipment, domestic animals, transport, seeds, and other inputs. Livestock-raising depends on the physical capital of the animals themselves and the housing which affects their health and productivity. Crop production needs equipment and sometimes structures like screen houses. Means of transport can dramatically change access to inputs and the marketing possibilities of crops and animals.

*Human capital* includes manual labour, different types of practical skill, different types and sources of knowledge, and good health or wellness. The human capital of a household includes the different knowledge and skills of women and men, the indigenous knowledge of the older generation, and the modern education of the young.

*Financial capital* is made up of available income and savings, and also formal and informal credit access. Because this type of capital depends on relations of trust, it is closely related to the fifth type of asset, social capital.

*Social capital* includes support acquired through formal or informal membership in networks and groups, often involving different kinds of reciprocal services, including the exchange of psycho-social welfare. Trust is the currency needed to enter these arrangements and it is strengthened or weakened through participation in them.

Households deploy these assets in livelihood strategies – petty trading, self or hired employment, agricultural production as well as migration, joining organizations, seeking formal education or training, and so on. Household members engaging in these strategies must also engage with the structures and processes that make up the public life of the city. These include institutions such as markets, local government, educational systems, policies and regulations about doing business, about keeping animals, about using land or water resources, or about the handling of wastes. The types of resources a household commands will determine how far these structures and processes can be influenced favourably – through a social connection or financial resources to buy compliance – and how far they impede the household from implementing livelihood strategies and achieving livelihood outcomes, for example, improved food security or more disposable income to use in education of children.

These livelihood processes and outcomes can in turn exert positive and/or negative ecosystem feedback on the livelihood assets – through increasing or decreasing certain capitals – and on the vulnerability context.

### ***Livelihoods in Space***

The spatial dimension is an important focus of the studies reported in this book. There are two aspects to this. First, livelihoods vary along the continuum from rural to inner urban location because of differences in the presence of and access to assets; differences in the vulnerability context; and differences in the institutions, policies, and processes that households must deal with. Secondly, urban households may have spatially dynamic livelihood strategies, with members drawing on assets widely distributed within and beyond the urban areas and seeking opportunities to deploy household assets in different places. In some cases, this leads to multi-locational households (Baker & Akin Aina 1995).

The study of Kampala by David et al. (Chapter 6) analyzes how livelihoods and the role of agriculture vary along the continuum from low-density peri-urban areas around the city to heavily populated settlements near the city centre. Kampala City Council classifies areas where agriculture is found in four types: peri-urban (peripheral), peri-urban transition, urban new (dense slum), and urban old, using criteria of population density, land availability, and the prevalence of crop and livestock production. These types were found to differ with respect to natural capital assets, specifically the amount of land available for farming and access to water surfaces. Occupants of new slum areas of Kampala can access nearby wetlands as their main farming location whereas three-quarters of cultivation in the inner city is done on very small plots around the homestead. In peri-urban areas, plots are bigger and there is greater choice of location. Local races of livestock are likewise more common in peri-urban areas where they can be free-range or grazed, whereas zero-grazing and bird cages are essential in the space-constrained urban old and new areas where improved breeds do better.

The availability of physical capital along the rural–urban continuum also shapes agriculture. The further one moves into Kampala city, the more common it is for producer households to live in rented accommodation, with correspondingly higher levels of instability and greater likelihood of limited cultivation of fewer, shorter duration crops. The exception is the cultivation of banana, widely found in inner urban areas, not only in Kampala but also in Yaoundé.

The various studies in Yaoundé analyzed urban agriculture spatially in relation to its changing political boundaries, although there was no consistent or official classification of the continuum as in Kampala. The fertile inland valleys (a type of wetland locally referred to as *bas-fonds*) are important agricultural systems in urban Yaoundé, where they act as sinks for urban wastes used as nutrients and are closely linked to urban markets. The dominant production systems identified are also correlated with a spatial distribution related to livelihood assets. Commercial crop farming dominates in the inner urban setting with its access to the *bas-fonds*. Nearly all the household-based livestock enterprises had a commercial orientation, the larger ones in the peri-urban areas and the smaller ones in the urban areas. Like Kampala, Yaoundé is a tropical highland city. As the density of housing, businesses, and roads declines in the peri-urban areas, households farm larger mixed plantings of maize, leafy vegetables, and root crops as well as keeping livestock.

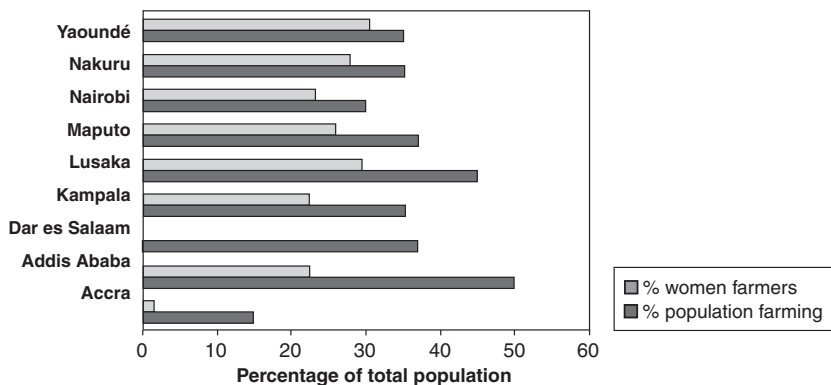
The second dimension of a spatial analysis of livelihoods and urban agriculture concerns the way producing households seek to access different assets and opportunities to deploy their resources in different locations as part of their livelihood strategies. In Nairobi, market gardeners in urban and peri-urban areas access compost produced from domestic organic wastes by urban recyclers and manure from Maasai cattle-herders in Nairobi's rural hinterland (Chapter 10). In Nakuru, Kenya (see Chapter 11), livestock-keepers use the manure from urban-raised livestock to fertilize crops on both urban and rural plots, underlining the importance of multi-locational households and casting doubt on the usefulness of maintaining strict distinctions between urban and rural livelihoods (Satterthwaite & Tacoli 2002, p. 55; Simon et al. 2006).

Very often agriculture-related and other types of livelihood strategies explore opportunities in a geographical region or sub-region, accounting for the flows of cash, food, social support, and cultural commitments across this space. In Yaoundé, one of the most common forms of association among urban women producers is based on common ethnic links to home villages, a pattern commonly found right across East and Central Africa (Chapter 3). The same chapter describes how similar patterns of trust (social capital) drive the market flows of cassava into Yaoundé.

### *Who Is Using Agriculture as an Urban Livelihood Strategy?*

So far we have been talking about urban livelihoods and agriculture in relation to households in general, but through these studies we understand that both low- and high-income urban households are involved in agriculture, for different reasons and with different strategies. We also recognize that household members have different degrees of involvement in agriculture and that women contribute in a major way to livelihoods through farming.

Relatively few studies of urban agriculture have provided accurate quantitative assessments of the urban population involved, or the proportion of those farming who are women. Figure 2.2 presents most of the available data on this issue from previous studies in Sub-Saharan Africa, though one needs to be cautious with the very different types of data sources and their reliability. Aside from a couple of outliers on the lower and upper limits (Accra and Addis), there is nevertheless some consistency across these studies, which have a median percentage of those farming of 35 percent, of which around two-thirds are women.



**Fig. 2.2** Proportion of urban population farming in selected cities of Sub-Saharan Africa  
 Source: Yaoundé: UNDP (1996); Nakuru: Foeken (2006); Nairobi: Mwangi and Foeken (1996); Lee-Smith (2001); Maputo: UNDP (1996); Lusaka: UNDP (1996); Kampala: Nabulo et al. (2004, 2006); Dar es Salaam: Sawio (1998); Addis: Yilma (2003); Tegegne (2004); Accra: Obuobie et al. (2004); Maxwell et al. (2000)

Note: the 15% figure for Accra is based on inner urban areas and the estimate for peri-urban is thought to be much higher

The studies reported in this volume on Yaoundé and Kampala throw more detailed light on these earlier estimates. While the Yaoundé study did not sample both farming and non-farming populations to estimate the prevalence of agriculture as a livelihood strategy, it did examine official statistics. Although these show that farming increased almost 10-fold during 1957–1987, this was far smaller than the growth of the overall population (almost a 100-fold increase), meaning the farming population fell from about 18 to 2 percent of the economically active population. As the authors point out, this grossly underestimates the situation in a city where 60 percent of the 150 km<sup>2</sup> urban area is still dedicated to agriculture and where farming is a component of mixed livelihood strategies, mostly carried out by women. Indeed, the empirical studies by these authors indicate that women account for 87 percent of the urban farming population, including 79 percent of those primarily growing commercially. So, the facts that agriculture is often part of mixed livelihoods, that it is mostly women's work (often invisible to official statistics), and that in Yaoundé as in many other African cities its legal status is ambiguous, combine to make these official statistics highly unreliable. The UNDP figure, given in Fig. 2.2, was more likely correct.

The Kampala study provides us with a more fine-grained understanding of the significance of agriculture within the overall urban population. As discussed above, Kampala City Council (KCC) and the team of researchers working with them have viewed urban agriculture in spatial terms and recognized that the phenomenon will be different at different points along the peri-urban to urban continuum. Drawing on a KCC census of selected urban and peri-urban parishes and case studies of selected locations along the continuum, the authors were able to confirm this insight. They found that the involvement of the population in farming varied from just over 25 percent in a newly urbanized area of Kampala to 96 percent in one peri-urban zone. Whereas a second urban zone sampled showed a similar proportion of households involved in agriculture (28 percent), suggesting similar levels of agriculture in more built-up areas of the city, the second peri-urban area sampled was found to have 38 percent of households in farming. The big variability in the importance of farming at the peri-urban interface underlines the enormous range of activities in this transition zone (Simon et al. 2006).

The KCC census found other demographic differences, such as larger households in the peri-urban compared with the urban areas, the peri-urban households being closer in size to rural households, which have on average 4.9 members in Uganda compared with 4.2 in urban areas (Uganda Bureau of Statistics [UBOS] & ORC Macro 2001). Yet the survey of urban farming households showed a much larger size of seven persons in all four areas studied, urban and peri-urban, consistent with Maxwell's earlier findings of a statistically significant difference between farming and non-farming urban households in Kampala (Maxwell 1995). In Yaoundé, the size of producing households was also found to be large, averaging 7.9 persons compared to 6.6 for all households in the city. The median farming household size in Nakuru, Kenya, was also found to be 5–7 persons compared to 2–4 persons for non-farming households (Foeken 2006, p. 181). It is not clear whether households

that produce are poorer and need to farm for food security, or whether farming enables them to support more people.

We learn more about this when we consider the socio-economic status of producing households. Then it becomes clear that, while most urban producing households are indeed poor, this is mainly because of greater family size. Earlier studies in the region have shown that in some cities such as Nakuru, the poor are proportionally less represented among urban agricultural producers than the better-off (Foeken 2006) and that this is particularly marked among households raising larger livestock such as cattle. Given the investment and maintenance costs of large livestock, this is understandable. Thus in the Nakuru studies on crop–livestock interactions and the health risks associated with urban dairy production, the socio-economic profile of the sample was biased toward better-off households because of their greater involvement in this sector (Chapters 11 and 12). In Kampala, farming households in the peri-urban areas are better off than those in the outer and inner urban areas, measured by income, access to land, and house ownership.

### *Contribution of Agriculture to Household Income and Savings*

There is now clear evidence that agriculture in rural areas is no longer the single activity of families, nor even, in many cases, the main activity (Ellis 2000; Bebbington 1999). In peri-urban and urban areas of the developing world, the diversity of livelihoods is even more in evidence. Keith Hart, a British anthropologist who coined the term “informal sector” to describe the employment situation in African cities, provided the following description from 1960s Accra:

Mr. A. D. worked as a street-cleaner...as an afternoon gardener...and as a night watchman...In addition to this annual income of approximately £320, he grew vegetables on his own plot of land which brought in another £100 or so. (Hart 1973, p. 66)

This person had been 20 years in Accra, showing such behaviour is not restricted to short-term migrants. In fact, it is a way of life for millions of urban Africans. Hart points out the rarity of a single income stream for low-income urban families. With the urban population in Sub-Saharan Africa more than four times what it was when Hart conducted his study, the urban employment situation has become even more acute and the practice of multiple livelihoods strategies more intense (Kessides 2006).

In all the cities studied in this volume, agriculture is clearly only a part of diverse livelihoods (Table 2.1) while still providing a significant contribution to income. Formal employment, business, and trade tend to dominate, except for the commercial producers in the inland valleys of Yaoundé, who can sell dry-season vegetables grown using waste-water irrigation for more than double the wet-season price. Few employment alternatives are as lucrative and incomes are estimated to be about 50 percent above the minimum wage. Likewise, the Kampala study notes that its findings, of 70 percent of heads of farming households earning more than



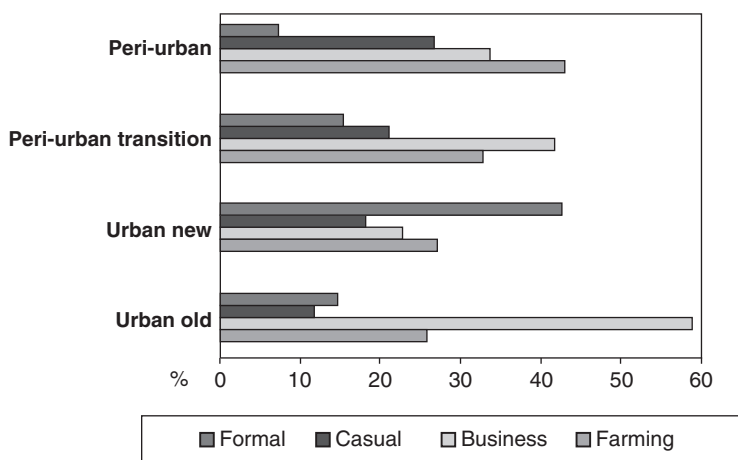
**Table 2.1** Principal income source for households involved in urban agriculture

	Yaoundé		Kampala	Nakuru
	"Commercial"	"Subsistence"		
<b>Farming</b>	<b>70</b>	<b>33</b>	<b>22.9</b>	<b>46.6</b>
<b>Non-farming</b>	<b>30</b>	<b>67</b>	<b>77.3</b>	<b>53.3</b>
Business/trading			35.8	15.5
Casual employ			14.5	15
Formal employ		67	27	22.8

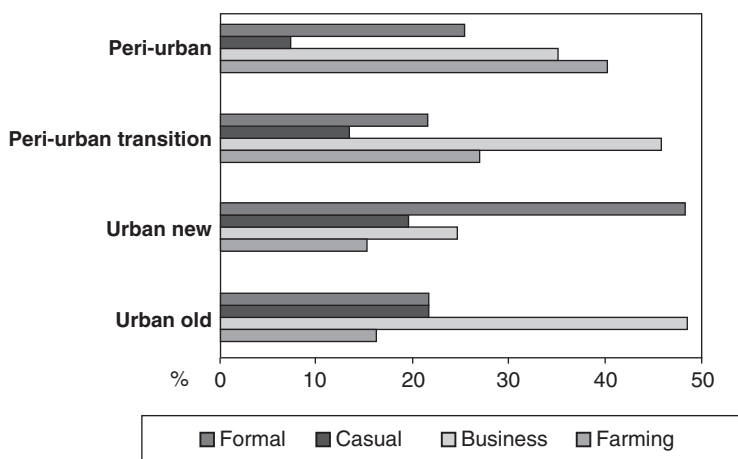
national annual income per capita (US\$330), are consistent with other studies of urban farming.

The spatial pattern in Yaoundé, with intensive commercial vegetable and maize production in the valleys running through the inner city and less commercial activity in the peri-urban uplands, is another example of how location within the urban environment affects opportunity and strategy and the types of households involved. Agriculture is the major livelihood strategy for producers in the well-endowed urban inland valleys, whereas for those dependent on rain-fed upland agriculture in peri-urban areas it is more of a food security strategy that supplements other income sources. On the other hand, Kampala is much wetter than Yaoundé and has a more abundant rain-fed agriculture in the peri-urban areas including many low-lying wetlands next to Lake Victoria. Consequently, agriculture plays a bigger part both in the deployment of household labour and in generating income than in the built-up urban areas (Figs. 2.3 and 2.4).

At first glance the Yaoundé pattern of income from agriculture seems to reverse that of Kampala described above, but further analysis is needed. As has already been mentioned, in both these systems in Yaoundé, women are the primary household members involved in farming, but in the uplands, households have not only more



**Fig. 2.3** Primary activities of farming households along peri-urban to urban continuum, Kampala (% of households surveyed)



**Fig. 2.4** Main sources of income of farming households along peri-urban to urban continuum, Kampala (% of households surveyed)

income streams but also higher education levels than those cultivating the inland valleys. This latter variable has been strongly associated positively with lower levels of poverty in Cameroon and elsewhere (World Bank 2004) and underlines the need to look at crop and animal production in the broader context of income, food security, and social capital.

For almost all farming households in the cities examined in this volume, agricultural produce is for eating as well as selling. Commercial producers of traditional leafy vegetables in the inland valleys of Yaoundé still consume about 25 percent of these vegetables themselves, about 50 percent of their “commercially produced” maize, and raise other crops specifically for home consumption. In Nakuru, 50 percent of the kale which is eaten – kale is one of the most important vegetables that accounts for 21 percent of the value of foods consumed – comes from their own plots. This illustrates the importance of local food production not only as a direct food source for enhancing food security but also as a means of saving income for other purposes. The authors of the Kampala study make this same point: “food production as a form of savings was still clearly the main purpose for which households were farming in 2003.”

The Kampala data suggest that this trend is more marked in peri-urban than urban areas, where commercial sales account for 19 percent in one urban case and 52 percent in another. In the peri-urban areas surveyed, commercial sales accounted for only 24 and 13 percent. As already noted, especially in Kampala and Nakuru, commercialization was more associated with livestock production, with its opportunities for sale of products such as milk and eggs in addition to meat. Livestock production is also associated with higher income households as discussed above. Some data from Kampala suggest further investigation is needed to explore a possible link between urban and peri-urban location and the keeping of livestock.

Women in Sub-Saharan Africa are associated with agricultural production for subsistence rather than commerce (Hovorka & Lee-Smith 2006; Chapters 3 and 12 above). Nevertheless, the data from both Yaoundé and Nakuru in Chapters 3 and 12 suggest that this relationship is a cultural norm that could be changing in the practice of urban agriculture. Women frequently carry out the majority of urban farm labour, including tasks culturally assigned to men, such as managing livestock, but may not control the income generated, as noted in Nakuru. But in Yaoundé, it is women who dominate both subsistence and commercial production. The very rich picture painted in these studies of the patterns of farming and their purposes and outputs raise possibilities for defining further research that may help improve incomes and offset hunger.

### *Urban Agriculture and Markets*

Products need to be marketed if farmers are to derive income from agriculture, and while much effort has been invested in finding ways to “link farmers to markets” in rural settings as a key strategy for poverty reduction, there has been less attention to marketing urban produce. Several chapters in this book investigate the extent to which urban and peri-urban producers take advantage of their closer links to markets while two chapters (8 and 13) deal exclusively with marketing of crop, agro-forestry, and/or livestock products in Kampala and Kisumu, respectively. The continuing high levels of home consumption reported in these studies – even if for generating savings – suggests that urban farmers in all three countries studied could take much more advantage of their proximity to market than they currently do.

The authors of Chapter 8 seek to identify best-bet marketing opportunities, taking into consideration current demand and supply as well as production conditions in both urban and peri-urban areas of Kampala. They identified 40 products in high demand across some or all categories of outlet, from supermarkets and catering services to small groceries or kiosks. This demand was not being met, even in the small kiosks. Of the seven most important products for generating income, only one – poultry – was found right across the peri-urban to urban transect, while seven of the eleven most commonly found products were primarily food security crops. Two strategies were identified for taking better advantage of market opportunities:

- Focusing on increasing volumes of existing products with low risk, such as poultry and mushrooms;
- Focusing on products with higher returns (fruit, vegetables, and pig-raising) but developing strategies to reduce the higher risks, such as collective action through producer associations.

The authors of Chapter 13 examined value chains for agro-forestry products in Kisumu, Kenya, looking at the origins of products, marketing channels, and price margins. Products coming from urban, peri-urban, and rural production systems

were differentiated, as well as those going to wholesale and retail urban markets and those being sold on to other urban centres. Three types of value chain were found, with different kinds of linkages between producers and consumers and highly variable margins between value chain actors in the three channels. The study found that peri-urban farmers were less motivated to grasp new opportunities than those in urban areas. This important difference, also found in Kampala, has been noted elsewhere (Warnaars & Pradel 2007). Thus farming populations in and around cities include both risk-averse behaviour typically associated with low-income marginal rural agriculture and the more risk-taking enterprise attitude associated with informal urban businesses. While the Kampala data link these attitudes respectively to peri-urban and urban farmers, suggesting behaviour linked to a spatial continuum, this may well vary and needs to be the subject of specific research.

Like Kisumu, Yaoundé presents opportunities for production and marketing of agro-forestry products in urban and peri-urban areas, as described in Chapter 3. In both places indigenous plant species used in culturally specific ways are involved, whether for food or medicine, and this raises other issues in relation to how livelihoods and marketing interact with complex social and environmental concerns.

The 19 types of medicinal plants being traded in Kisumu were mostly collected wild from surrounding peri-urban areas because of cultural beliefs against their cultivation.<sup>1</sup> Wilderness and nature conservation are important aspects of natural capital. As in many parts of Kenya, the study found a dearth of supply of fuel or construction materials, partly due to logging bans implemented in response to severe deforestation. However, the authors note the existence of urban and peri-urban open spaces in Kisumu which could be taken advantage of for tree-planting, representing a largely untapped opportunity for livelihood and market development.

It has been demonstrated for Nairobi (Basweti et al. 2001) that seedling nurseries offer an important source of income for significant numbers of people in urban and peri-urban areas and make a contribution to urban greening. The Kisumu study notes that the authorities are “comfortable” with these enterprises that essentially “squat” on public space along the main access roads, because of their contribution to the environment and to beautification.

The Kisumu and Yaoundé agroforestry studies reveal not only competition but also collaboration along market chains, including exchange of technical information and skills such as grafting. The Yaoundé study identified opportunities for seedling nursery owners in rural and urban areas to benefit economically from collaboration. Previously unidentified demand for indigenous tree species could end up linking urban enterprises, with limited access to these species but with ready access to markets, with rural enterprises, which have access to a diversity of indigenous species but poor connection to markets. The market for African leafy vegetables has been demonstrated in Yaoundé (Gockowski et al., 2003 and Chapter 3) as also in a

---

<sup>1</sup>Although not elaborated in the chapter, these beliefs appear to relate to the power of these medicines deriving from their wild growth and its absence in cultivated versions (Schippmann et al. 2002).

similar study in Nairobi (Mwangi et al. 2007). The similar development of market-chain information and collaboration could help in these production systems, for example in the case of nutrients from waste as agricultural inputs. This is dealt with in the section on ecosystem health below.

Unlike urban and peri-urban agriculture in general, nurseries were found to be dominated by men. In Kisumu, young adult men aged 25–40 run these businesses and men account for 90 percent of ownership in Yaoundé, a city where women otherwise are responsible for 87 percent of agricultural enterprises. These men were often well-educated, owned more than one nursery, and employed labour. It appears that the interdependence of nurseries in terms of technical support and even marketing collaboration involves networking among men from which women are largely excluded.

## Urban Ecosystem Health

### *Conceptual Approach*

Because urban agriculture is connected to so many different natural, physical, and human-designed systems, a very broad approach is needed to understand its relationship to health, including the health of livestock and the environment as well as of humans (Cole et al. 2008, p. 34). A number of the chapters in this volume address the subject within this broad approach, using a range of concepts. The term “ecohealth” itself has emerged in recent years as researchers explored some of these multiple system connections, assisted by IDRC’s programme on “Ecosystem and Human Health,” or “Ecohealth.” Focusing on interacting social, political, economic, and ecological parameters, ecohealth broadened approaches to human health away from simply bio-medical concerns (Cole et al. 2008, p. 9). It encompasses the concept of a healthy, well-functioning ecosystem, in which human health is dependent upon ecosystem function, since humans are part of the ecosystem.

The livelihoods framework (Fig. 2.1) links the urban ecosystem health theme to the vulnerability context of households. Although external economic and political stresses and shocks such as price rises, drastic policy changes, or political upheavals often characterize households’ vulnerability context, stresses and shocks are also related to the health of the ecosystem. Poor sanitation, the accumulation of wastes, disease prevalence including zoonoses, sudden epidemic outbreaks, and low levels of micronutrients in the local food system, all increase the vulnerability of households, weaken their ability to accumulate and deploy household assets and so make moving out of poverty more difficult and moving into poverty more likely.

Different chapters in this book examine the way that urban agriculture impinges on urban ecosystem health, especially its potential to increase or decrease ecosystem health risks and thus vulnerability. The role of livestock in ecosystem health is especially interesting and is addressed in Chapter 12. While livestock can introduce vital micronutrients into local food systems, they also can be the source of disease

affecting humans. Chapter 9 is a summarized version of our companion book addressing how to ensure “Healthy City Harvests” from urban agriculture (Cole et al. 2008). While drawing on concepts and perspectives in the field of public health, it is rooted in an urban ecosystems health approach. For example, an important public health tool utilized in the studies reported in Chapter 9 is Health Impact Assessment (HIA), which has often focused heavily on risk assessment. But studies of urban agriculture, including those reported in this chapter, have retained a balanced examination of both health benefits – such as from food security and improved nutrition – and health risks – such as from chemical and biological contaminants (Lee-Smith & Prain 2006).

Many of the chapters of this book seek to understand the positive and negative impacts on ecosystem health of different urban agricultural activities, such as the case of livestock mentioned above. Research in Nairobi and Nakuru (Chapters 10 and 11) not only report the potential environmental and economic benefits of recycling solid wastes for composting, but also show how their use in agriculture can be a pathway for negative human health effects, especially when the wastes contain heavy metals. These chapters take a broad ecosystem perspective of the production and recycling of these wastes, viewing them as potential resources with multi-directional flows along the continuum among rural, peri-urban, and urban areas. They are at once a wealth of nutrients potentially benefitting urban agro-enterprises economically and contributing to solving the city’s environmental problems (Smit & Nasr 2001) while at the same time representing a flow of contaminants potentially posing health risks to producers and consumers. This is also examined in Yaoundé in Chapter 4. Another concept related to urban ecosystem health is “greening” of the city. As mentioned in the previous section, increasing the areas of vegetation in a city through agriculture or urban forestry helps reduce heat island effect by increasing levels of evapotranspiration (Ohmachi & Roman 2002, p. 172). While not directly addressed by the studies in this volume, this is one of the positive spill-over effects of many individual livelihood decisions reported.

### ***Benefits and Risks of Livestock-Raising***

The capacity of urban agriculture to provide good food to households and alleviate hunger, thus contributing to meeting one of the main Millennium Development Goals, is arguably its greatest potential benefit. However, rigorous studies showing the impact of urban agriculture on food and nutrition security in cities, such as the one contained in this book, are rare. The statistical study undertaken in Kampala between 2003 and 2005 (Sebastian et al. 2008; Yeudall et al. 2008) and summarized in Chapter 9 of this volume confirms the validity of farmers’ statements that keeping urban livestock benefits them in terms of nutritional as well as income contributions to their livelihoods (Cole et al., 2008, pp. 104). While numerous studies show that the major factor influencing household food security (HFS) is wealth, this study confirms that land for urban farming, urban livestock-keeping (especially

pig-raising), and women's education also contributed significantly. And with regard to child nutrition, the study also clearly showed that consumption of animal source foods (ASF) was associated with better nutritional status, strongly suggesting the positive role of urban livestock-keeping.

Both benefits and risks to human health of urban livestock-keeping are examined in Chapter 9 for Kampala as well as in Chapter 12 for Nakuru. There is a wide range of potential health hazards that can be transmitted from livestock to humans, through a variety of pathways, and the level of health risk needs to be assessed and managed in relation to the potential benefits. The detailed studies of Kampala and Nakuru in this book contribute to a growing body of knowledge on this topic that is based on empirical studies in cities of the global South. The Nakuru study is particularly important in giving insight into the gender dimension of urban livestock-keeping and stressing the need for better farmer education on risk mitigation. A useful output from Kampala was understanding what urban farmers already know and do about mitigating health risks and what conditions encourage them to act on this or constrain them. Access to resources, including water, are important, as is secure tenure and the right to farm. Together with the learning about the nutritional benefits of keeping urban livestock mentioned already, these are really crucial findings in terms of how urban agriculture may impact hunger and poverty alleviation.

### *Benefits and Risks of Horticulture*

Work in Yaoundé reported in Chapter 3 indicates the importance for the diets of low-income urban households of year-round availability of traditional leafy vegetables. They are an important source of nutrients for urban consumers, providing for example 8 percent of protein and 40 percent of calcium intake. For the very poor, with low consumption of animal-source foods, they are even more important. About 27 percent of consumption of these vegetables by poor, Yaoundé households comes from their own home gardens. Overall, Yaoundé households get 10 percent from their own home gardens but another 20 percent of their overall consumption is in the form of gift exchanges with relatives and friends. The inland valley horticulture in Yaoundé described earlier is a crucial source of traditional leafy vegetables for low-income consumers during the dry season.

As well as being pathways for micronutrients, horticultural crops are also potential pathways for biological and chemical contaminants, negatively affecting the health of the urban ecosystem, including human health. This is especially so in intensive urban production systems, where the uptake of soil nutrients can be mixed with pathogens and chemicals. Studies described in Yaoundé in Chapter 3 and Kampala in Chapter 9 differentiate between biological and chemical hazards. The former mostly arise from contamination by human wastes due to inadequate sanitation, while the latter arise mainly from discharges into water, soils, or the air from industries or combustion (including from vehicles). The former are pathogenic and can cause infectious disease while the latter are toxic, can bio-accumulate over time, and cause chronic disease.

Both chapters explore the origins and pathways of these contaminants with respect to the two cities. The Kampala studies are considerably more detailed, exploring many types of contaminants and different pathways. Chapter 9 looks at complex organic chemical compounds, which have hardly been examined in relation to urban agriculture previously, and derives policy guidelines for urban crop production in situations of air, soil, and water pollution based on empirical study. The study of water pollution affecting and caused by urban agriculture in Yaoundé found that the few large industries are the main sources of chemical contamination. Preventing farming is not the solution, both studies recommending better sanitation as a major way to mitigate biological health risks and emission controls for chemical risks. But public and farmer education are the crucial immediate measures required.

### ***Solid Wastes: Understanding Rural–Peri-urban–Urban Resource Flows***

Like agriculture-based livelihood strategies, the recycling of nutrients for urban agriculture needs to be understood in spatial terms. The natural resource linkages involving liquid and solid wastes can impact both positively and negatively on rural and urban spaces where wastes are taken up as part of producer households' livelihood strategies.

The majority of solid waste in developing world cities is organic – about 70 percent in Nairobi or almost half-a-million tons every year (JICA 1997) – and this is mostly not managed by the authorities. In Nairobi less than half is collected and reaches city dumps, mostly from commercial or higher income residential areas, the rest piling up in poorer areas or dumped in streams and rivers. The authors of Chapter 10 estimate that the nitrogen, phosphorus, and potassium locked up in this resource represent a fertilizer value of about \$2 million.

There are significant marketing flows of animal manure between the rural hinterland of Nairobi and gardeners, landscapers, and horticultural producers in and around the city. There is also urban, peri-urban, and rural use of urban manures in Yaoundé and Nakuru. By contrast, less than 1 percent of organic solid waste generated in Nairobi is reused. In Nakuru, whereas over 90 percent of domestic waste generated by farming households is recycled, the vast majority of waste from non-farming households is not, and ends up dumped in open spaces or, less commonly, removed to the municipal landfill.

Nevertheless, despite the concentration of nutrients in manure, the recycling systems are imperfect. In Nakuru, on average 46 percent of urban and peri-urban produced manure is recycled, mostly for crop production within the same area, with a small amount being carried to rural farms or sold and about 14 percent being used in a variety of other ways including for biogas. Still, more than 50 percent of manure is dumped. These average figures disguise very large differences in management of manure along the peri-urban to urban continuum however. In the inner urban areas, more than 80 percent of manure is dumped, creating significant environmental

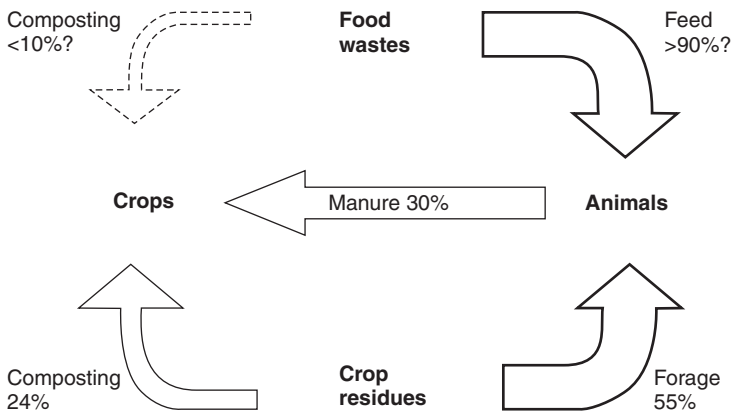


problems. In the more peri-urban areas of the city, only about 13 percent is dumped, with 60 percent recycled in urban and rural plots. The picture in Nairobi is similar, in that intensive urban marketing of rural manures compares with 60 percent of manure from urban-grazed cattle being dumped. Urban manure producers are quite disconnected from the marketing system based on rural supply from Maasai cattle.

Yaoundé provides a more optimistic scenario of the recycling of nutrients in agriculture. Apart from the intensity of horticulture in the urban inland valleys described in Chapter 3, the authors of Chapter 4 estimate that, of the approximately 10 000 tons of poultry and pig manure annually produced in the city, about 60 percent is being recycled in the urban and peri-urban areas with a further 10 percent being sold elsewhere, mostly in Bamenda, the capital city of another province. Most of the remaining 30 percent being dumped is probably pig manure, considered problematic as a fertilizer by many farmers in Yaoundé, as elsewhere. Recent reevaluation of the use of composted pig manure in Lima suggests that the level of reuse could be increased in Yaoundé through technical support. In all cases there seem to be opportunities to increase the level of recycling of manures within urban and peri-urban areas to further benefit city environments and enhance agricultural productivity.

### *Actual and Potential Benefits of Waste Recycling*

These experiences in Nairobi, Nakuru, and Yaoundé suggest that urban agriculture is currently absorbing a much more significant quantity of animal waste than vegetative waste, whether crop residues or food wastes. Taking Nakuru as an example, much larger volumes of both crop residues and domestic food wastes are being used as animal feed than for composting (Fig. 2.5). This may reflect the higher value and higher costs associated with livestock-raising compared to crop production and households' need to reduce feed costs by using domestic or farm wastes. But it also



**Fig. 2.5** Agricultural recycling of organic wastes in Nakuru

seems to indicate that the direct use of waste as livestock feed is preferred to the necessity of processing it for compost.

A further point not directly dealt with in these studies is that raising livestock also absorbs significant quantities of the domestic waste of non-farming households. A recent study of pig-raisers sampled from six parishes across the peri-urban to urban continuum in Kampala (Lubowa et al. forthcoming) found that the 144 pig-raisers recycled nearly 70 tonnes of organic wastes per week, or half a tonne per enterprise. These wastes – mostly from domestic and restaurant food leftovers, with farmers' own household wastes forming a significant but limited part, and market wastes – account for 1.3 percent of Kampala's estimated weekly generation of 5535 tonnes of organic waste. If extrapolated to the 98 parishes in proportion to their pig-raising enterprises, as much as 20 percent of the city's organic wastes might usefully be recycled as high-quality protein-rich feed.

The low level of recycling through composting compared to total volumes of organic wastes in Nairobi and Nakuru is only one part of the story. In Nairobi, because of the uneven distribution of waste production and collection, many informal settlements suffer disproportionately from the public sector incapacity to manage solid waste. Direct action on this problem by local community groups, often youth-led, resulted in significant environmental improvements in shanty areas where these groups were active, because composting was only one part of a whole process of collection, sorting, selling, or processing and reuse, of both inorganic and organic wastes. Consumers of compost in Nairobi include seedling nursery enterprises, ornamental gardens, landscapers, and farmers in the urban area and small farmers and large horticulture enterprises in the peri-urban and rural areas in central Kenya. The study suggests that demand outstrips supply for compost producers closer to the city centre with strong networks of institutional customers, while those located on the periphery, especially in informal settlements, experienced limited demand and small sales. While lack of information about points of sale was a factor, quality and potential health risks were as well. The pricing of compost in relation to its nutrient content emerged from the study as a key constraint on its use. Improving quality standards was found to be needed for both manure and compost.

Overall, the lessons from these studies on recycling of organic wastes for feed or soil amendment is that there is a huge potential for both. Manure does better than compost in marketing terms, while using food waste for feed is currently more feasible for producers than is composting. While all of these benefit environmental management, composting in particular needs to address quality issues and to increase productivity and marketing networks in order to tap into an apparently growing demand.

## **Policy and Institutional Dialogue and Change**

Given that institutional and policy change were objectives of the research work described in this book and a necessary part of making agriculture a key component of sustainable cities, the activities undertaken necessarily intervened in local urban

governance. Governance is defined here as the relationship between civil society and the state, between rulers and the ruled, the government and the governed (Gore 2008, p. 57). This concept, derived from political science, examines the power relations between the various actors, and can usefully be applied to urban agriculture (Lee-Smith & Cole 2008; Gore 2008). The notion of “dialogue” included in the name of this research theme adds a broader dimension. It derives from participatory and anthropological research approaches that have also strongly influenced the framing of the theme (Chambers et al. 1989; Röling & Wagemakers 1998; Prain 2006). It highlights the micro-level interactions, sensitizations, negotiations, and shifts in ideas from which mezzo- and macro-level policy change flows. It also underlines the role of multi-disciplinary and multi-agency platforms (Röling & Jiggins 1998, pp. 301–304) that provide a space for these interactions. Dialogue also includes the notion of social capital, meaning the degree of association, trust, mutual confidence, and social interaction characterizing relationships (Bebbington 1999; DfID 1999). Dialogue not only helps build social capital but is more fruitful and creative when partners to negotiation enjoy greater levels of social capital. Because policy and institutional change through dialogue is a key outcome for ensuring the sustainability of livelihoods and ecosystem health benefits, it is dealt with in the final chapter of this volume. Here we make some brief observations about the process of platform formation and the results achieved.

Most local governments want to see greater levels of food security and poverty reduction among their constituents and if this can be partly achieved through productive use of urban natural resources rather than through costly social programs, why not? The “why not” derives both from the complexity of urban agriculture itself – “at once a form of land-use, an economic subsector of agriculture and an expression of the multiple ways in which the urban and rural worlds intersect” (Bopda and Awono Chapter 5) – and the complexity of urban governance.

In the cases described in this book, local and international researchers partnered with representatives of government, universities, and civil society organizations to try to address both the complexity of urban agriculture itself and of local governance. The regional stakeholder meeting held in Nairobi in 2000 to define the Urban Harvest program deliberately sought to invite representatives of different organizations from cities in the region as a first step in building platforms for research-development collaboration in those cities. The formation of platforms was a prelude to policy and institutional change. Writers such as Röling and Jiggins, who have been at the forefront of developing the notion of platforms, have pointed out that these entities can be very variable. They can be “one-time meetings, elected committees, formally appointed boards or councils or even parastatal or government bodies” (1998, p. 303). Indeed the “morphology” of the stakeholder platforms which have formed in the three countries studied here has been quite different, especially in the range of interests represented and the extent to which the platform has been perceived as a formal mechanism for resolving conflicting interests. In some respects these platforms have functioned as think-tanks to resolve differences among higher level decision-makers, generate ideas about what next steps are needed and facilitate those steps.

The variability of policy and institutional outcomes across the three countries is described in Chapter 15, which tries to map those outcomes and understand their variability. What we have learnt is that, however committed the participation in stakeholder platforms may be, to some extent all participants are constrained by their own institutional histories and even by the historical circumstances of agriculture within the particular city. And as was indicated in Chapter 1, the history of urban institutions and policy has frequently included the marginalization or proscription of urban agriculture.

Nevertheless, despite the negative treatment of agriculture in many cities of Africa, policy change can be seen as having at least begun and to be in process in the three countries studied in this book. Perhaps because of the specific link of agriculture to the Kingdom of Buganda, local institutions in Kampala collaborated in urban agriculture management and in support to farmers. Kampala City Council seems to be unique in having developed not only a Department of Agriculture but a typology of urban farming systems and land types within its boundaries by the end of the 20th century. Such institutions were markedly absent in the other places studied, although Nakuru in Kenya had environmental initiatives addressing urban agriculture in the 1990s, through international assistance projects (Foeken, D 2005).

## Conclusion

This book tries to assess the extent to which urban agriculture is contributing to household livelihoods and to the health of the urban ecosystem on the basis of case studies in three countries and five cities. Because agriculture in cities is intricately bound up with use of and competition for resources and with regulations on public health and other sectors, we consider the relation of urban agriculture to urban governance as critical and this has been one thematic area of research. The mechanism for achieving institutional and policy recognition of agriculture has been the stakeholder platform. The most significant advances by such a platform – including its formalization – have been in Kampala, where new ordinances or laws governing urban agriculture were put in place, the City's Department of Agriculture was empowered and policy was drafted. In Nakuru likewise, new laws governing urban agriculture were developed (although they had not been put in place at the time of publication) and research support had strengthened the urban agriculture activities of the Municipal Environment Department. There was considerable progress in Kenya at the national level, with a policy process beginning partly as a result of a national workshop empowering the Kenya Agriculture Research Institute (KARI). Progress in Nairobi City Council was poor however, although a policy forum started by civil society and with a vibrant farmers' network also led to the policy process (see Chapter 15 below). The final project workshop and exposition in Yaoundé augured well for policy and institutional change there, but was not followed up by any form of assistance.

It is the sheer pervasiveness of urban agriculture, both geographically and sectorally, which makes it such an ideal vehicle for institution-building and this is the

conclusion of the Yaoundé study. As the urban dimensions of food crises and climate change become increasingly apparent, this opportunity will have to be grasped and agriculture integrated in the socio-economic and environmental planning of cities.

## References

- Baker, J & Akin Aina, T (eds) 1995, *The migration experience in Africa*, Nordic Africa Institute, Uppsala.
- Basweti, C, Lengkeek, A, Prytz, L & Jaenicke, H 2001, 'Tree nursery trade in urban and peri-urban areas. A survey in Nairobi and Kiambu Districts, Kenya', *RELMA Working Paper* No. 13, Regional Land Management Unit (RELMA), Nairobi, Kenya.
- Bebbington, A 1999, 'Livelihoods, capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty', *World Development* vol. 27, no. 12, pp. 2021–2044.
- Chambers, R, Pacey, A & Thrupp, LA (eds) 1989, *Farmer first*, Intermediate Technology Publications, UK.
- Cole, DC, Lee-Smith, D & Nasinyama, GW (eds) 2008, *Healthy city harvests: Generating evidence to guide policy on urban agriculture*, CIP/Urban Harvest and Makerere University Press, Lima, Peru.
- DfID 1999, *Sustainable livelihoods guidance sheets*, Department for International Development, London, [http://www.livelihoods.org/info/guidance\\_sheets\\_rtf](http://www.livelihoods.org/info/guidance_sheets_rtf)s [Accessed 23 June 2009].
- Ellis, F 2000, *Rural livelihoods and diversity in developing countries*, Oxford University Press, Oxford, UK.
- Farrington, J, Carney, D, Ashley, C & Turton, C 1999, 'Sustainable Livelihoods in Practice: Early applications of concepts in rural areas,' *ODI – Natural Resource Perspectives* vol. 42, p. 13.
- Foeken, D 2005, 'Urban agriculture in East Africa as a tool for poverty reduction: a legal and policy dilemma?', *ASC Working Paper 65/2005*, African Studies Centre, Leiden, Netherlands.
- Foeken, D (ed) 2006, *To subsidise my income: urban farming in an East-African town*, Africa Studies Centre, no. 7, The Netherlands.
- Gockowski, J, Mbazoo, J, Mbah, G & Fouda Moulende, T 2003, 'African traditional leafy vegetables and the urban and peri-urban poor', *Food Policy*, vol. 28, no. 3, pp. 221–235.
- Gore, C 2008, 'Healthy urban food production and local government', in Cole, DC, Lee-Smith, D & Nasinyama, GW (eds) *Healthy city harvests: generating evidence to guide policy on urban agriculture*, CIP/Urban Harvest and Makerere University Press, Lima, Peru, pp. 49–65.
- Hart, K 1973, 'Informal Income Opportunities and Urban Employment in Ghana.' *Modern African Studies* vol. 11, no. 1, pp. 61–89.
- Hovorka, A & Lee-Smith, D 2006, 'Gendering the UA agenda', in van Veenhuizen, R (ed) *Cities farming for the future: urban agriculture for green and productive cities*, RUAF Foundation, IDRC & IIRR, Ottawa, ON, pp. 125–144.
- JICA (Japan International Cooperation Agency) 1997, *Master plan study of Nairobi*.
- Kessides, C 2006, *The urban transition in Sub-Saharan Africa. Implications for economic growth and poverty reduction*, Cities Alliance, SIDA, World Bank, Washington, DC.
- Lee-Smith, D 2001, 'Crop production in urban/peri-urban agriculture in Kenya', in Kahindi, JP, Karanja, NK, Alabaster, G & Nandwa, S (eds) *Proceedings of a workshop on enhancement of productivity and sustainability of UPA through efficient management of urban waste*, 8–9 October, 2001, Nairobi
- Lee-Smith, D & Cole, D 2008, 'Can the city produce safe food?', in Cole, DC, Lee-Smith, D & Nasinyama, GW (eds), *Healthy city harvests: Generating evidence to guide policy on urban agriculture*, CIP/Urban Harvest and Makerere University Press, Lima, Peru pp. 3–13.
- Lee-Smith, D & Prain, G 2006, 'Urban agriculture and health', in Hawkes, C & Ruel, MT (eds) *Understanding the links between agriculture and health*, 2020 Focus no. 13, Brief

- 13 of 16, IFPRI, Washington, DC, [www.ifpri.orghttp://www.ifpri.org/2020/focus/focus13.asp](http://www.ifpri.orghttp://www.ifpri.org/2020/focus/focus13.asp) [Accessed 23 June 2009].
- Lubowa, A, Prain, G & Kyomugisha, E 2010, 'The use of commercial food and other organic wastes for urban and peri-urban pig-production in Kampala, Uganda', *Urban Harvest Working Paper 5*, Lima, Peru, (Forthcoming).
- Maxwell, D 1995, *Labour, land, food and farming: a household analysis of urban agriculture in Kampala, Uganda*, Unpublished PhD Dissertation, University of Wisconsin-Madison, United States of America.
- Maxwell, D, Levin, C, Armar-Klemesu, M, Ruel, M, Morris, S & Ahiadeke, M 2000, *Urban livelihoods and food and nutrition security in greater accra, Ghana*, IFPRI – International Food Policy Research Institute, Washington, DC.
- Mwangi, AM & Foeken, D 1996, 'Urban agriculture, food security and nutrition in low-income areas of Nairobi', *African Urban Quarterly* vol. 11, no. 2/3.
- Mwangi, S, Kimathi, M, Kamore, M, Karanja, N, Njenga, M & Farm Concern International 2007, 'Creating market opportunities for poor women farmers in Kenya', *Urban Agriculture Magazine 17*, Leusden.
- Nabulo, G, Nasinyama, G, Lee-Smith, D & Cole D 2004, 'Gender analysis of urban agriculture in Kampala, Uganda', *Urban Agriculture Magazine* vol. 12, pp. 32–33.
- Nabulo, G, Oryem-Origa, H & Diamond, M 2006, 'Assessment of lead, cadmium, and zinc contamination of roadside soils, surface films, and vegetables in Kampala City, Uganda', *Environmental Research* vol. 101, pp. 42–52.
- Obuobie, E, Dreschel, P & Danso, G 2004, 'Gender in open-space irrigated urban vegetable farming in Ghana', *Urban Agriculture Magazine*, no. 12, RUAF, Leusden.
- Ohmachi, T & Roman, ER (eds) 2002, *Metro Manila: in search of a sustainable future: impact analysis of metropolitan policies for development and environmental conservation*, Japan Society for the Promotion of Science (JSPS) Manila Project, in collaboration with University of the Philippines Press, Quezon City.
- Prain, G, 2006, 'Participatory technology development for urban agriculture: collaboration and adaptation along the urban-rural transect', in van Veenhuizen, R (ed) *Cities farming for the future – urban agriculture for green and productive cities*, RUAF Foundation, IDRC and IIRR, Leusden, pp. 273–312.
- Rakodi, C & Lloyd-Jones, T 2002, *Urban livelihoods: a people-centered approach to reducing poverty*, Earthscan, London.
- Röling, NG & Jiggins, J 1998, 'The ecological knowledge system', in Röling, NG & Wagemakers, MAE (eds) *Facilitating sustainable agriculture*, Cambridge University Press, Cambridge, pp. 283–311.
- Röling, NG & Wagemakers, MAE (eds) 1998, *Facilitating sustainable agriculture*, Cambridge University Press, Cambridge.
- Satterthwaite, D & Tacoli, C 2002, 'Seeking an understanding of poverty that recognizes rural-urban differences and rural-urban linkages', in Rakodi, C & Lloyd-Jones, T (eds) *Urban livelihoods: a people-centred approach to reducing poverty*, Earthscan Publications, London, pp. 52–70.
- Sawio, C 1998, 'Managing urban agriculture in Dar es Salaam', *Cities feeding people, Report 20*, IDRC, Ottawa, ON.
- Schippmann, U, Leaman, DJ & Cunningham, AB 2002, 'Impact of cultivation and gathering of medicinal plants on biodiversity: global trends and issues' in *Biodiversity and the ecosystem approach in agriculture, forestry and fisheries. Satellite event on the occasion of the ninth regular session of the Commission on Genetic Resources for Food and Agriculture*, 12–13 October 2002, Inter-Departmental Working Group on Biological Diversity for Food and Agriculture, FAO, Rome.
- Sebastian, R, Lubowa, A, Yeudall, F, Cole, DC & Ibrahim, S 2008, 'The association between household food security and urban farming in Kampala', in Cole, DC, Lee-Smith, D & Nasinyama, GW (eds), *Healthy city harvests: Generating evidence to guide policy on urban agriculture*, CIP/Urban Harvest and Makerere University Press, Lima, Peru, pp. 69–87.

- Simon, D, McGregor, D & Thomson, D 2006, 'Contemporary perspectives on the peri-urban zones of cities in developing areas', in McGregor, D, Simon, D & Thomson, D (eds) *The peri-urban interface. Approaches to sustainable natural and human resource use*, Earthscan, London, pp. 3–12.
- Smit, J & Nasr J 2001, 'Agriculture – urban agriculture for sustainable cities: using wastes and idle land and water bodies as resources', in Satterthwaite, D (ed.) *Sustainable Cities*, Earthscan, London, pp. 221–233.
- Tegegne, A 2004, 'Urban livestock production and gender in Addis Ababa', Ethiopia', *Urban Agriculture Magazine*, no. 12, pp. 30–31.
- Uganda Bureau of Statistics (UBOS) & ORC Macro 2001, *Uganda demographic and health survey 2000–2001*, UBOS and ORC Macro, Calverton, MD.
- UNDP 1996, *Urban agriculture: food, jobs and sustainable cities*, United Nations Development Program Publication Series for Habitat II, vol. 1, UNDP, New York.
- Warnaars, M & Pradel, W 2007, 'A comparative study of the perceptions of urban and rural farmer field school participants in Peru', *Urban Harvest Working Paper Series*, paper 4, International Potato Center (CIP), Lima, Peru.
- World Bank 2004, *Enquête Camerounaise auprès des ménages, 1996. Synoptique des résultats d'enquête normalizes*, Survey Databank – World Bank Africa Region, Washington, DC.
- Yeudall, F, Sebastian, R, Lubowa, A, Kikafunda, J, Cole, DC & Ibrahim, S 2008, 'Nutritional security of children of urban farmers', in Cole, DC, Lee-Smith, D & Nasinyama, GW (eds) *Healthy city harvests: Generating evidence to guide policy on urban agriculture*, CIP/Urban Harvest and Makerere University Press, Lima, Peru, pp. 89–103.
- Yilma, G 2003, 'Micro-technologies for congested urban centers in Ethiopia', *Urban Agriculture Magazine*, <http://www.ruaf.org/node/327> [Accessed 18 June 2009].



<http://www.springer.com/978-1-4419-6249-2>

African Urban Harvest  
Agriculture in the Cities of Cameroon, Kenya and  
Uganda

Prain, G.; Karanja, N.; Lee-Smith, D. (Eds.)

2010, XVI, 300 p., Hardcover

ISBN: 978-1-4419-6249-2