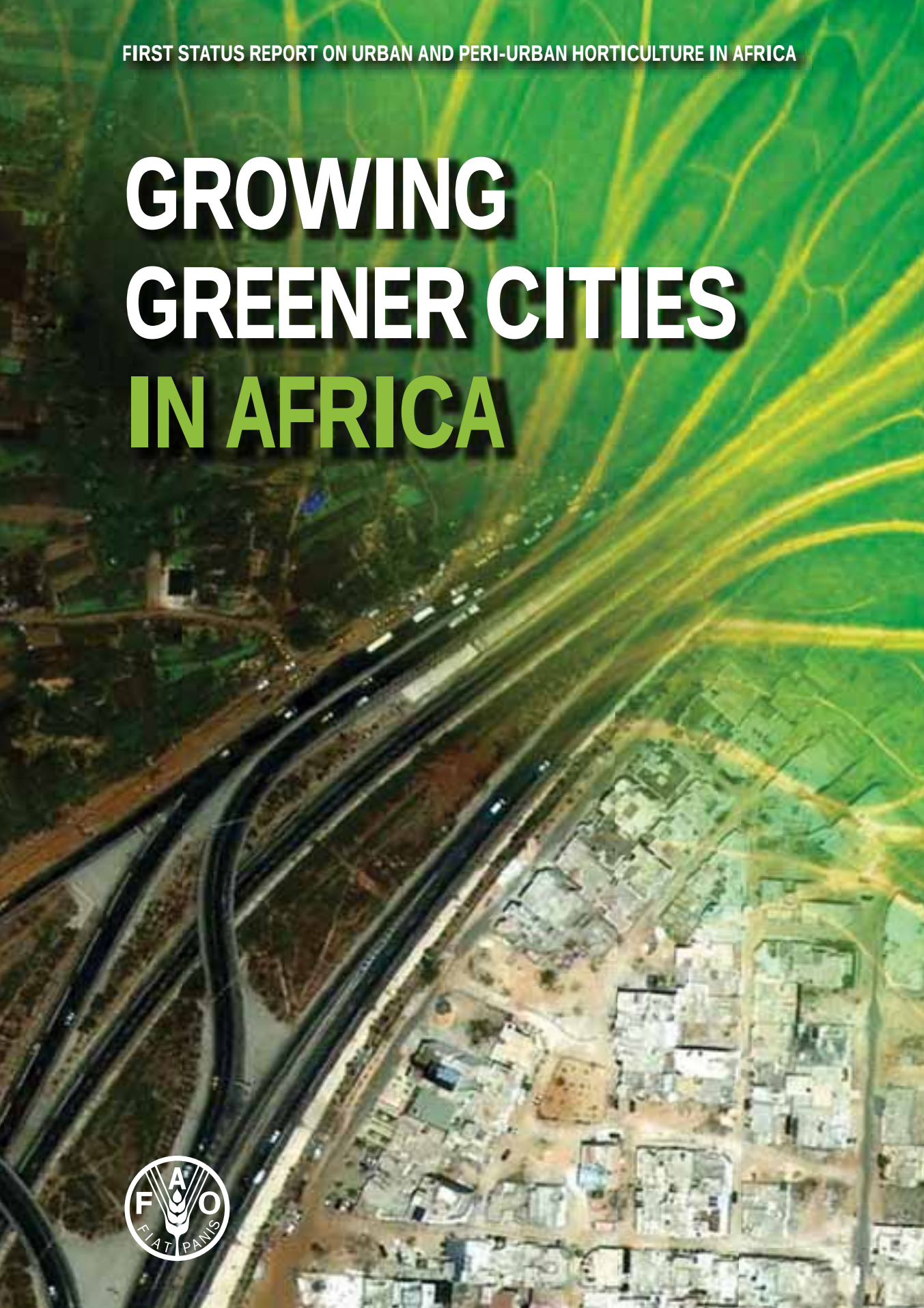
FIRST STATUS REPORT ON URBAN AND PERI-URBAN HORTICULTURE IN AFRICA

GROWING GREENER CITIES IN AFRICA



Growing greener cities in Africa

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Foreword

Africa's urban population is growing faster than that of any other region. By the end of the current decade, 24 of the world's 30 fastest growing cities will be African. Within 18 years, the urban population of sub-Saharan Africa is projected to reach almost 600 million, twice what it was in 2010. African cities already face enormous problems: more than half of all residents live in overcrowded slums; up to 200 million survive on less than US$2 a day; poor urban children are as likely to be chronically malnourished as poor rural children.

The challenge of achieving a "zero hunger" world – in which everyone is adequately nourished and all food systems are resilient – is as urgent in African cities as it is in rural areas. African policymakers need to act now to steer urbanization from its current, unsustainable path towards healthy, "greener" cities that ensure food and nutrition security, decent work and income, and a clean environment for all their citizens.

This report draws the attention of policymakers to urban and peri-urban horticulture, and how it can help to grow greener cities in Africa. Production of fruit and vegetables in and around urban areas has a clear comparative advantage over rural and other sources in supplying urban residents with fresh, nutritious – but highly perishable – produce all year round. It generates local employment, reduces food transport costs and pollution, creates urban green belts, and recycles urban waste as a productive resource.

Drawing on surveys and case studies from 31 countries, the report describes the current state of urban and peri-urban horticulture across the African continent. Its major finding is that the commercial production of fruit and vegetables provides livelihoods for thousands of urban Africans and food for millions more. But market gardening has grown with little official recognition, regulation or support. In some cities, it is becoming unsustainable: to maximize returns, market gardeners are using ever larger quantities of pesticide and polluted water.

Developing sustainable market gardens to serve African cities requires, first, that policymakers recognize the sector's current contribution to the urban food supply and to urban livelihoods. Then, they will need to zone and protect land and water for market gardens, and encourage growers to adopt eco-friendly "Save and Grow" farming practices that produce more, while reducing food contamination risks and protecting the environment. All stakeholders will need to cooperate in building an efficient urban fruit and vegetable supply system, one that provides fresh produce at a price all residents can afford.

Growing greener cities in Africa will help us to win the "zero hunger" challenge.

Modibo T. Traoré
Assistant Director-General
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First status report on urban and peri-urban horticulture in Africa

This report is based on case studies prepared by national correspondents in 21 African countries for the International Symposium on Urban and Peri-urban Horticulture in the Century of Cities (Dakar, December 2010), on the results of an FAO survey of urban and peri-urban horticulture in Africa, conducted in August 2010, and on a review of recent literature.

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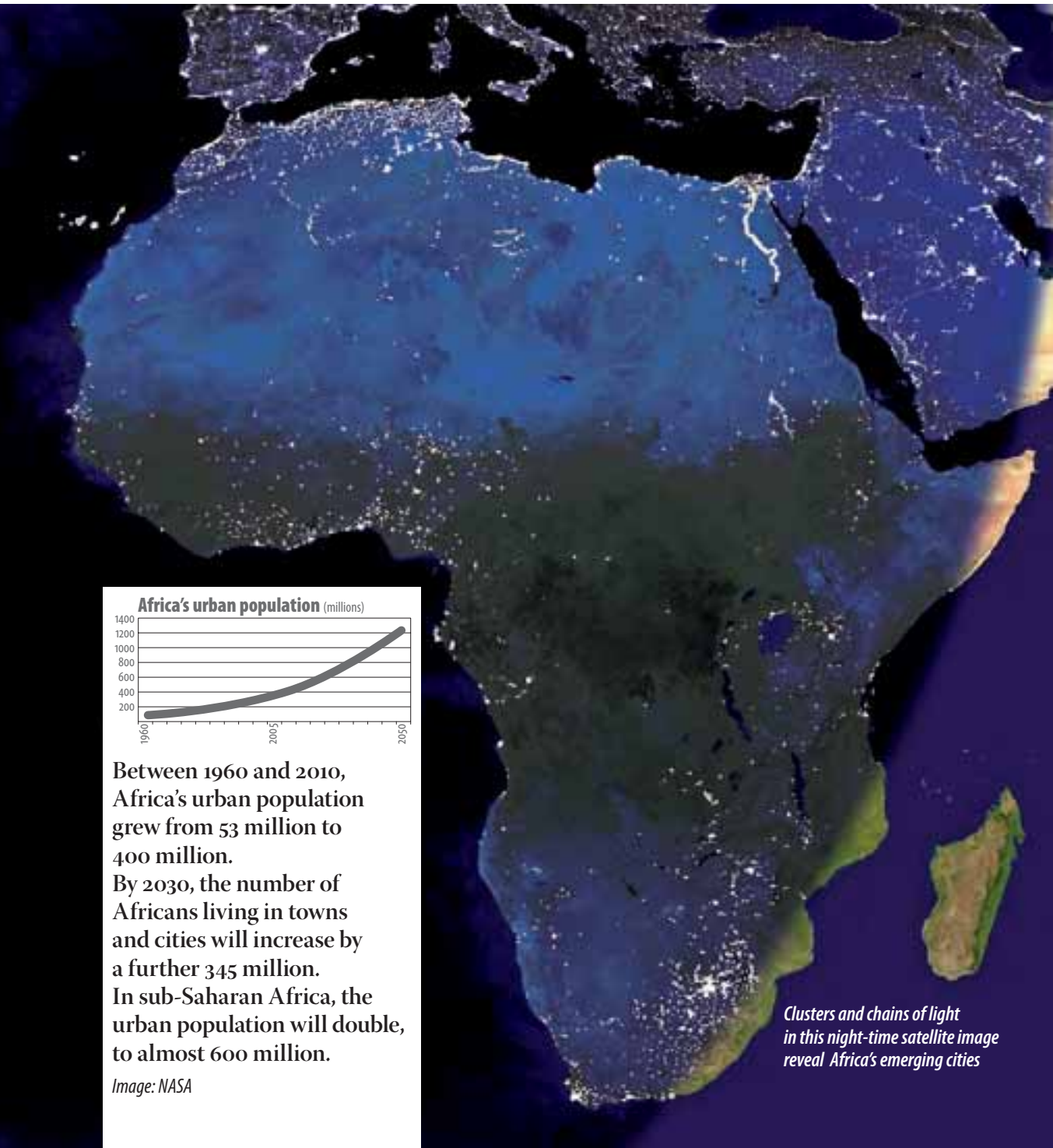
A new day in Africa

Urbanization of the continent is at a turning point. But which way will it turn?



Between 1960 and 2010, Africa's urban population grew from 53 million to 400 million.
By 2030, the number of Africans living in towns and cities will increase by a further 345 million.
In sub-Saharan Africa, the urban population will double, to almost 600 million.

Image: NASA

Clusters and chains of light in this night-time satellite image reveal Africa's emerging cities

A new era of shared prosperity?

Booming economies fuel optimism that the end of endemic poverty is in sight

Many African countries have recorded strong economic growth over the past decade. Annual foreign investment in Africa rose from US$9 billion in 2000 to US$55 billion in 2010.
Seven of the world's 10 fastest growing economies are African.
The region's GDP is expected to grow by 5.6 percent in 2013.

Photo: A billboard in Lagos, Nigeria. Africa is the world's fastest growing cellphone market (Reuters/George Esiri)

Or time to "re-imagine African urbanism"?

Past economic growth has only exasperated levels of urban inequality, hunger and poverty

Africa has the world's biggest slum population – 210 million people.
In sub-Saharan Africa, 200 million urban residents live on less than US$2 a day, 180 million are without adequate sanitation, and 50 million use unsafe drinking water.
Half of Nairobi's slum children are chronically malnourished.
The main cause of urban malnutrition is poverty: a healthy diet would cost the average poor household almost all of its income.

Photo: Kibera slum in Nairobi (Reuters/Thomas Mukoya)

Many cities are already "green"

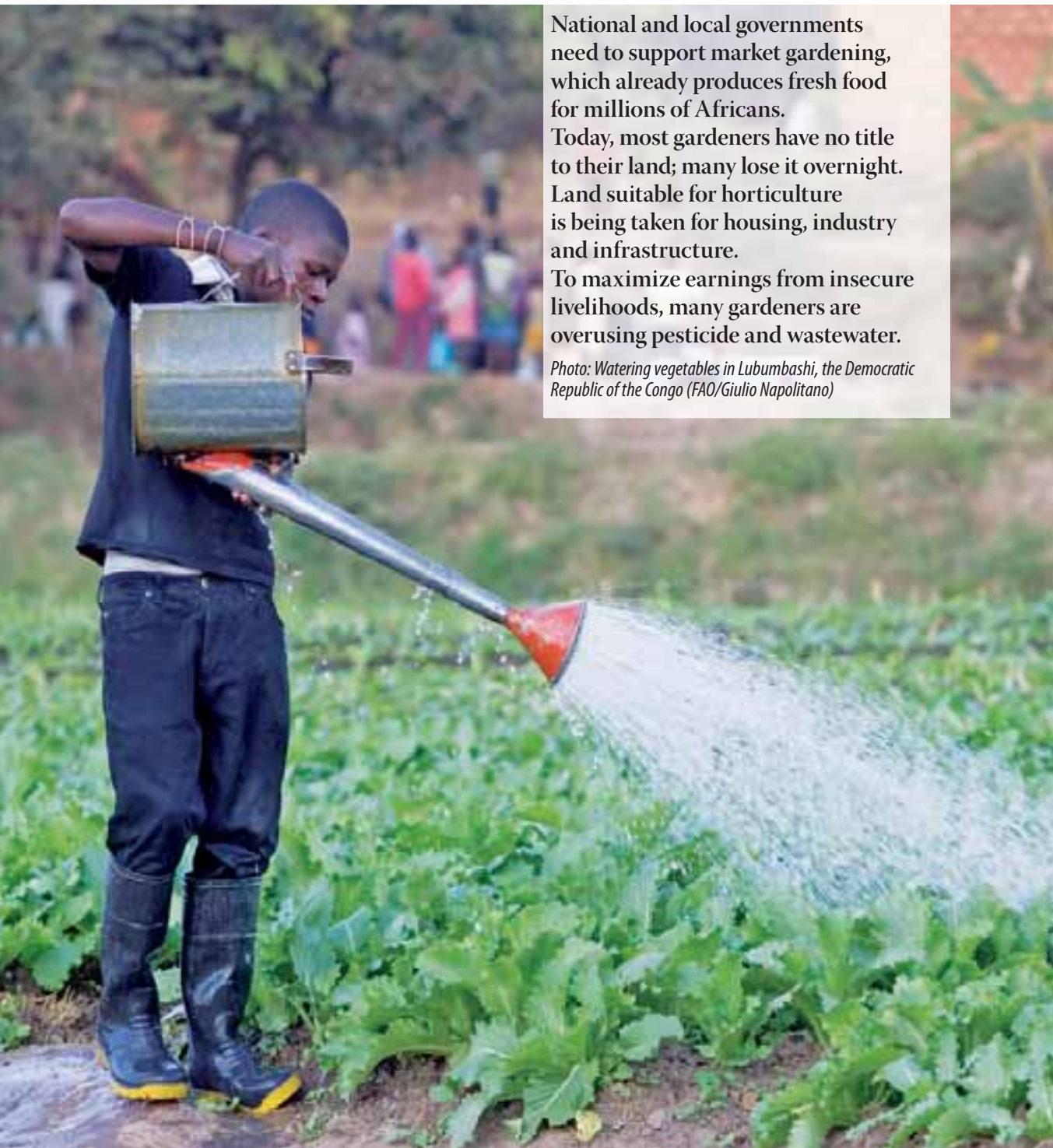
Forty percent of households in sub-Saharan cities are also urban farmers

Millions of urban Africans cultivate vegetables and fruit trees in home gardens, both for their families and for sale. In Dakar, 7 500 households "grow their own" in micro-gardens. In Malawi, 700 000 urban residents practise home gardening to meet their food needs and earn extra income. Low-income city gardeners in Zambia make US$230 a year from sales.

Photo: Preparing a garden in Kigali (FAO/Giulio Napolitano)

The key to greener cities: market gardens

But in most of urban Africa, gardens have grown with little recognition, regulation or support



National and local governments need to support market gardening, which already produces fresh food for millions of Africans.

Today, most gardeners have no title to their land; many lose it overnight.

Land suitable for horticulture is being taken for housing, industry and infrastructure.

To maximize earnings from insecure livelihoods, many gardeners are overusing pesticide and wastewater.

Photo: Watering vegetables in Lubumbashi, the Democratic Republic of the Congo (FAO/Giulio Napolitano)

Fruit and vegetables need land and water

Urban managers should zone land for horticulture and treat wastewater for re-use in market gardens

Market gardens create green belts that protect fragile areas, contain urban sprawl and build resilience to climate change.

Large areas of land could be zoned for horticulture: Kigali has reserved 15 000 ha for agriculture and wetlands; Lagos has 4 400 ha of suitable land.

Also needed is a "circular" approach in urban water management: treated wastewater is safe and can supply most of the nutrients needed for horticulture.

Image: Land reserved for horticulture has survived Maputo's exponential growth (DigitalGlobe)

...and gardeners need to "Save and Grow"

Objective: grow more and better quality produce while nourishing the urban agro-ecosystem

Eco-friendly cultivation practices can help African cities grow more fruit and vegetables while lowering contamination risks, cutting production costs and increasing growers' income.
Well-fed with compost, soil produces more using less fertilizer, less pesticide and less water (using biopesticide and compost, gardeners near Dakar increased their incomes by 60 percent). Drip irrigation and rainwater harvesting also reduce demand on urban water supplies.

Photo: Senegalese market gardeners study improved cultivation practices (FAO/Olivier Asselin)

An efficient horticulture supply chain

All stakeholders need to cooperate in optimizing the flow of produce from grower to consumer

A good start is to encourage gardeners to form their own self-managed cooperatives, which can help them to diversify production, negotiate better prices, and improve post-harvest management.

City authorities should facilitate loans for agro-processing units, and plan clean, decentralized markets.

Informal markets save poor households time and money, and provide an alternative to unhealthy street foods.

Photo: Fruit and vegetable market, Cairo (FAO/Ami Vitale)

Overview

by NeBambi Lutaladio and Graeme Thomas

There is general agreement that the urbanization of Africa is at a turning point. The question is: *which way will it turn?*

Since 1960, the continent's urban population has grown from 53 million to more than 400 million. In no other region of the world has the urban population grown so quickly. According to the latest United Nations projections, between 2010 and 2030 the number of Africans living in towns and cities will increase by a further 345 million. In sub-Saharan Africa, growth will be even more dramatic: the urban population is projected to double, from 298 million to 595 million.

Many African countries have recorded strong, sustained economic growth over the past decade, raising hopes of a new era of shared prosperity. In the past, economic growth has been a key driver of Africa's urbanization. Other factors have certainly contributed: the post-independence "Africanization" of public services; the slump in commodity prices in the 1980s, which crippled agriculture-based economies; structural adjustment programmes that slashed social and development services, especially in rural areas; wars and civil conflicts that raged across the continent; and relatively high urban fertility rates and falling mortality rates.

However, a recent World Bank analysis of economic and census data between 1970 and 1995 found that African countries with the fastest growth in GDP also had the fastest growth in urban population. Even those who believe that urban population growth has slowed, or is even negative, concede that improved economic performance could stimulate renewed rural in-migration and accelerate urbanization.

Well, that economic growth is now here, and it finds many cities totally unprepared for the projected increase in population. African policymakers must find solutions urgently to the following challenges:

Urban poverty. An estimated 43 percent of urban residents in sub-Saharan Africa are poor, surviving on less than US$1 a day. But urban poverty may be *underestimated* – national poverty lines often ignore the higher cost of living in cities. Using a poverty line of US$2 a day, the poverty level is close to 70 percent, or more than 200 million people.

The most glaring manifestation of urban poverty in Africa is its enormous slums, which are home to more than 210 million people, or 52 percent of the continent's urban population. Between 1990 and 2010, the number of people living in slums in sub-Saharan Africa almost doubled, from 102 million to 199.5 million.

Most slums are squatter settlements built, in contravention of planning regulations and building standards, on unserviced

land, usually state-owned, by low-income residents or migrants from rural areas. They proliferate on city peripheries and in zones unfit for habitation, such as steep slopes, gullies and floodplains. Not only do their inhabitants have no legal title to their homes; they must meet most of their basic needs by breaking the law through unauthorized economic activities and, when they can, by tapping into municipal water and electricity supplies.

Many cities do not have the resources to provide slums with basic services. Others do not even include slums on their maps, and use bulldozers to remove the problem. But the problem persists and is worsening: slums now absorb about three-quarters of sub-Saharan urban population growth.

Urban malnutrition. The prevalence of malnutrition among urban children in sub-Saharan Africa has increased faster than the urban population itself. More than half of the children in Nairobi's slums are chronically malnourished. A 2006 study in Angola, the Central African Republic and Senegal found that poor urban children were as likely to be stunted as poor rural children.

The main cause of urban malnutrition is poverty. Since the poor spend most of their income on food, increases in food prices or a drop in earnings compromise the quantity and quality of their diets. During the 2007-08 global food crisis, when food prices also soared in Africa, the poor had no choice but to spend more on food, or eat less. More expensive items, such as fruit and vegetables, were the first to be dropped.

In South Africa's urban settlements, the level of dietary diversity is "very low" (in a seven-day period, more than half of women interviewed ate no fruit or vegetables at all). A healthy diet would cost the average settlement household almost all of its income. The urban poor may actually pay more for food than wealthier households: lacking cash and the refrigerators needed to store food, they are obliged to buy smaller quantities at a higher per item price. To make ends meet, poor urban families turn increasingly to cheaper alternatives, such as starchy staples or "junk food" rich in low-cost fats and sugars.

Disease and ill-health. Densely populated slums suffer a high incidence of infectious diseases, such as HIV/AIDS, influenza and tuberculosis. Frequent outbreaks of cholera and diarrhoea are linked directly to unsanitary living conditions. A study in sub-Saharan Africa found that rural-urban differentials that once favoured urban children's survival chances – including better access to improved water and sanitation – had been wiped out, or even reversed.

Between 1990 and 2010, the number of residents in sub-Saharan cities without access to hygienic sanitation facilities increased from 82 million to 180 million. By recent estimates, no more than 15 percent of sub-Saharan Africa's urban population have access to a sewer network. In Nairobi and Kampala, slum dwellers without access even to latrines have invented "flying toilets" – plastic bags that are filled and discarded.

The proportion of the urban population with access to piped water has fallen since 1990, from 50 percent to 39 percent. The primary source of water for 24 percent of sub-Saharan urban residents is groundwater from boreholes and wells. Each year, a growing proportion of households turns to surface water for drinking. Uncollected

In South Africa's urban settlements, the level of dietary diversity is "very low". In a seven-day period, more than half of women interviewed ate no fruit or vegetables at all.

garbage also poses a serious health hazard. In Lagos (Nigeria), authorities were reluctant to upgrade waste-clogged drains in slums because they "fell outside accepted urban regulation and planning".

Meanwhile, urban diets that are high in energy, but low in micronutrients, are behind the increasing prevalence of obesity and non-communicable diseases, such as hypertension and heart disorders.

Low and insecure incomes. As many as nine out of every 10 urban workers in Africa are employed informally, working very long hours for very low incomes, without secure contracts, social protection or benefits. In sub-Saharan Africa, more than 80 percent of informal workers are *self*-employed, entirely dependent on their own initiative and resources for survival. In 2007, about 85 percent of Africa's working population made less than US$2 a day, almost unchanged since 1997, while the total number of working poor had increased by 82 million in the same period.

The youth population of Africa is growing faster than that of any other region. In 2010, an estimated 695 million Africans – or more than 68 percent of the total population – were under 30 years old. By 2030, their numbers could reach 986 million. It is estimated that 74 million jobs will need to be created in Africa over the current decade simply to prevent youth unemployment from rising. Even optimistic assumptions indicate that most urban workers will remain trapped in informal jobs until well beyond 2020.

Climate change. Higher temperatures and less predictable rainfall are likely to accelerate eco-migration from rural areas to large and mid-sized cities. Many African cities have "ecologically unfriendly" configurations that compromise their resilience to climate change. Lack of vegetation and the use of heat-retaining building materials raise city temperatures, which leads to shrinking water tables; hotter days in Ouagadougou will lead to shortages of water needed for drinking and sanitation. In low-lying coastal areas, flooding is already a threat to many large cities, including Accra, Durban (South Africa), Lagos, Luanda and Maputo.

Shantytowns built on hillsides and floodplains bear the brunt of more frequent and intense storms. Floods that destroyed Maputo's Luis Cabral slum in 2000 were followed by serious outbreaks of dysentery and cholera. Torrential rains in Nairobi and Brazzaville cause flooding and mudslides that affect mainly slum areas.

Africa has been described as "a victim, not a driver, of climate change". But the lack of effective waste management in most cities helps to generate greenhouse gas emissions from landfill sites that are three times those of the United States of America. With increasing urbanization,

both the continent's garbage and its gas emissions will increase.

In its third report on *The state of African cities*, scheduled for publication in 2013, the United Nations Human Settlements Programme (UN-HABITAT) will call for a new vision of African urbanism, including "greener" and more sustainable growth that employs uniquely African solutions to the continent's present and future urban challenges. This report seeks to contribute to that discussion by drawing the attention of policymakers to urban and peri-urban horticulture – or UPH – and how it can help to grow greener cities in Africa.

Urban and peri-urban horticulture is, essentially, a "local food" system that provides urban populations with a wide range of horticultural crops – mainly fruit and vegetables, but also herbs, roots, tubers, ornamental plants and mushrooms – that are grown within the city or in its surrounding areas.

Horticulture provides foods that are rich sources of vitamins, minerals and phyto-chemicals – essential for good health. Dark green leafy vegetables and yellow-fleshed fruit, for example, are recommended to correct vitamin A deficiency, a major cause of blindness in African children. An FAO/World Health Organization (WHO) report has established that eating at least 400 g of fresh fruit and vegetables a day helps to alleviate micronutrient deficiencies and to prevent chronic diseases associated with unhealthy urban diets and lifestyles.

In most African cities, however, consumption is far below the recommended minimum. A study in urban areas of 10 sub-Saharan countries found deficits in seven of them, ranging from 40 to 80 percent. In the lowest income quintile, people ate on average just 80 g per day, equal to a large slice of pineapple, and spent most of their food budgets to satisfy their need for calories, not nutrients.

Providing city-dwellers with fresh food is difficult especially in sub-Saharan countries: popular vegetables, such as amaranth, sorrel, lettuce and tomato, start to spoil within a few days of harvesting. The poor state of roads leads to heavy losses of produce in transit from rural areas. It deteriorates further in the city owing to the lack of cold storage, both in markets and in the vast majority of urban households (it was recently estimated that, in 2005, less than 10 percent of sub-Saharan homes had refrigerators). The result is shortages and high prices for consumers.

FAO's Programme for Urban and Peri-urban Horticulture aims, therefore, at helping cities to ensure a year-round supply of fresh produce that meets the dietary needs of their populations, at a price all residents can afford. It does that, first, by promoting market gardening, usually within 30 km of city centres. FAO also supports action to help low-income urban households to "grow their own", as a way of improving the quality of their diet, saving cash to spend on other needs, and earning income from the sale of surpluses. For cities, urban and peri-urban horticulture has five major benefits:

Food and nutrition security. By boosting the physical supply of fresh produce, UPH improves the availability of nutritious food to low-income urban households. In Cuba, the sector accounts for 60 percent of national horticultural production, and Cubans' per capita intake of fruit and vegetables exceeds the FAO/WHO recommended minimum.

Sustainable livelihoods. Horticulture provides livelihoods that are resilient to economic downturns, and it contributes to cities' economic development. Being labour intensive, market gardening creates employment directly in production – by one calculation, one job for every 110 sq m – as well as in input supply, marketing and value-addition. Horticulture employs around 150 000 people in Hanoi.

A safe, clean environment. Horticulture uses recycled urban waste as a productive resource. In Chile, treated wastewater from Santiago provides 70 percent of the irrigation water for peri-urban vegetables. In India, some 5 million tonnes of municipal solid waste is composted each year and used mainly as a soil improver in agriculture. Horticulture creates green belts, which protect fragile areas, contain urban sprawl and build resilience to climate change; by reducing the need to transport produce from rural areas, it generates fuel savings and less air pollution; it can even lower city temperatures.

Good governance. Developing a sustainable UPH sector calls for innovative approaches to urban development. Many countries in Asia and Latin America have incorporated horticulture into their urban planning. China did so in the 1960s; today, more than half of Beijing's vegetable supply comes from the city's own market gardens.

Healthy communities. Orchards and vegetable gardens provide low-income groups with food, income and a focus for shared enterprise, which helps to build healthier, more stable communities. Gardening offers a constructive channel for young people's energy.

To assist policymakers in evaluating the potential of horticulture in their own cities, FAO sent surveys to, and commissioned case studies from, 47 African countries. The aim was to measure the extent of UPH, the types of horticulture practised, the sector's role in urban food supply, nutrition and livelihoods, current constraints to the sector, and opportunities for its sustainable development.

Surveys and/or case studies were received from 31 countries (listed on page 4), which between them account for 64 percent of the continent's urban population. Our findings, informed by a review of recent literature on the subject, are presented here.

A snapshot

First, a note on the data. Urban and peri-urban horticulture has never been surveyed nationally in any African country. Among cities, only Accra appears to have conducted a baseline survey of urban vegetable gardening, while Kampala has used household sampling to measure the extent of its urban agriculture. In their responses, therefore, countries drew on sources such as agricultural planning documents, baseline studies and research journals*.

Many studies have analysed the phenomenon of urban agriculture in Africa. One estimated that 40 percent of Africa's urban residents were engaged in some sort of agricultural activity, including production of staple crops, vegetables, fruit, milk, eggs,

* The Global Horticulture Initiative plans to test in East Africa a methodology for measuring the supply and distribution of horticultural produce. FAO is exploring ways of formalizing the collection of data on urban agriculture worldwide. In anticipation of more complete data sets, for publication in the second status report in 2017, this report limits itself to major findings and the country profiles starting on page 33.

meat and fish. In all of the 27 countries that provided data, horticulture was the main component of urban agriculture, although the production of milk, meat and fuelwood was also important in Kenya and Ethiopia. Within the UPH sector, vegetables were the main crop, with fruit production also prominent in Cameroon, Guinea and Senegal. Commercial floriculture was widely practised in Nigeria, and growing mushrooms was popular among urban residents in Malawi and Swaziland.

Ten countries provided estimates of the extent of horticulture in their principal cities and towns. Nationally, horticulture was practised by almost half of urban households in Cameroon, one-third in Malawi, one-quarter in Ghana, and one in ten in Nigeria. In the others – Botswana, Cape Verde, Gabon, The Gambia, Namibia and Senegal – participation was less than 10 percent. Among capital cities, the "greenest" were Lilongwe and Yaoundé, with 35 percent of households engaged in horticulture, followed by Nairobi (30 percent) and Accra (25 percent). The largest urban populations that benefited directly from horticulture, through consumption and/or sale of their produce, were in Lagos (1.08 million people), Nairobi (1 million) Douala in Cameroon (950 000), Yaoundé (630 000), Accra (600 000), and the Nigerian cities of Kano (540 000) and Ibadan (226 000).

Research in sub-Saharan Africa has identified two basic types of urban crop production: home gardening, mainly for household consumption, and production in open spaces, mainly for market sale. Survey results, case studies and other sources were used to measure the extent of those production systems in horticulture.

Home gardening was the most common form of UPH in 11 of the 27 countries. It accounted for more than half of fruit and vegetable production in cities in Burundi, Cape Verde, Malawi, Mali, Mozambique and Zambia. At the smallest scale of home gardening are micro-gardens: crates, pots, sacks, even car tyres, which are filled with soil or substrates and are used to grow vegetables and herbs. In Dakar, 7 500 inner-city households use micro-gardens to grow their own tomatoes, lettuces and cucumbers, and earn extra income selling small surpluses. In Nairobi's Kibera slum, 11 000 households have "sack gardens", which provide fresh produce and enough from sales to cover their monthly rents. Micro-gardens have been adopted by slum dwellers in Abidjan (Côte d'Ivoire), and in low-income housing estates in Kigali.

Where more space is available – in backyards or on nearby vacant land – millions of urban Africans cultivate both vegetables and fruit trees in home gardens. An estimated 700 000 urban residents in Malawi practise home gardening to meet their food needs and earn extra income. In poor neighbourhoods of Maputo, 9 percent of households consume vegetables they grow themselves. In Yaoundé, 35 percent cultivate traditional leafy vegetables which "make a significant contribution to the nutrition of the city's residents". In Zambia, a quarter of urban households grow crops and half of the production consists of vegetables. Gardening households are usually large and poor, and home production allows them to "reduce significantly" spending on food.

Community or group gardening was the source of almost half of locally grown produce in Namibian cities, and contributed from 20 to 35 percent of

Studies have described market gardening as a "particularly successful farming system driven by market opportunities", and a "sustainable livelihood strategy for poor urban dwellers".

production in urban areas of Côte d'Ivoire, The Gambia and Guinea-Bissau. Located on city- or community-owned land, community gardens provide vegetables for growers' families and for needy social groups. In Bulawayo (Zimbabwe), more than 1 000 low-income residents grow vegetables on 13 ha of allotment gardens for themselves and other low-income families. In Atteridgeville township, near Pretoria, residents of five informal settlements cultivate group gardens that yield each month around 9 kg of vegetables per household; they sell 2 kg of that for "a modest income". Several countries have school gardening programmes. With FAO support, gardens have been created at 14 schools in Bujumbura, and at 74 schools in cities of the Democratic Republic of the Congo.

Market gardening – i.e. irrigated, commercial production of fruit and vegetables in areas designated for the purpose, or on other urban open spaces – was the single most important source of locally grown, fresh produce in 10 out of 27 countries, and the second source in six others. In fact, urban and peri-urban market gardening produced most of *all* the leafy vegetables consumed in Accra, Dakar, Bangui, Brazzaville, Ibadan, Kinshasa and Yaoundé, cities that, between them, have a total population of 22.5 million. Market gardens provide around half of the leafy vegetable supply in Addis Ababa, Bissau and Libreville.

Studies in sub-Saharan Africa have described market gardening as a "particularly successful farming system driven by market opportunities", and a "largely sustainable livelihood strategy, especially for poor urban dwellers". It has low start-up costs and short production cycles, produces high yields per unit of land and water, and delivers quick returns on investment.

Throughout the region, market gardening is very low-tech and labour intensive. Growers usually cultivate small, individual plots – of around 600 sq m in Abidjan and as small as 100 sq m in Accra – on land near a reliable supply of water. They plant a wide variety of traditional and exotic vegetables, and usually irrigate them manually using 10 or 15 litre watering cans. They often organize themselves in informal associations to set the boundaries of gardens and plots.

In some cities, such as Bissau, market gardening is practised mainly in the dry season, when competition from rural areas declines and prices rise in urban markets; in others, such as Brazzaville, Kinshasa and Yaoundé, favourable climates and urban demand encourage production all year round.

The number of full- and part-time market gardeners was estimated at around 10 000 in Brazzaville, 2 250 in Bangui, 1 250 in Ouagadougou and 1 000 in Libreville. In Kinshasa, some 8 000 growers work in market gardens, some officially designated

in the 1960s and 1970s; the number of "informal" growers with plots in other parts of the city is estimated at anywhere between 7 000 and 30 000. Similarly, vegetables are grown in organized market gardens in Libreville, but part of the city's supply is produced by itinerant gardeners on temporary peri-urban plots.

African market gardening can be highly productive. In a year, one hectare of land in Accra can yield five crops of lettuce, amounting to 180 tonnes. Brazzaville's 500 ha of gardens provide 80 percent of its leafy vegetables. In Yaoundé, gardens in valleys that run through the city produce lettuce during the rainy season, and amaranth, African nightshades and jute mallow during the dry season. In Nairobi, kales, cabbages and spinach are grown year-round in plots near slums, along railways and under power lines.

Poverty usually motivates urban residents to take up commercial vegetable production. In Côte d'Ivoire, a typical market gardener is illiterate, with a family of from five to 15 people to support. In many cities, gardening provides little more than a subsistence livelihood. But in some large cities, gardeners' incomes can place them above – even well above – the poverty line. Their earnings have been estimated at up to five times higher than the national per capita income in Brazzaville, Dakar and Nairobi. The income of a gardener in Maputo is four times the national poverty line.

Market gardeners frequently hire labourers to assist in planting, watering and harvesting. The 55 ha Kilobelobe market garden in Lubumbashi, in the Democratic Republic of the Congo, provides jobs for up to 4 000 seasonal labourers. Gardens in Maputo and its twin-city, Matola, generate employment for an estimated 40 000 people.

FAO's review found that women do much of the market gardening in several countries. In Nairobi, most commercial vegetable growers are female slum dwellers. Women make up 90 percent of market gardeners in Bissau and 70 percent of those in Brazzaville and Bujumbura. Although horticulture in Nigeria is mainly a male occupation, increasing numbers of women work in commercial plots near Lagos. Female intermediaries often provide growers with production loans and have first rights to harvests.

In Accra, Abidjan, Dakar, Yamoussoukro and Yaoundé, market gardening is the speciality of migrants from rural areas. Vegetables are also grown by "circular migrants": farmers from Nigeria's northern states grow leafy vegetables, cucumbers and eggplants near Lagos in the dry season, and return home to cultivate staple crops when the rains start. In Madagascar, farmers from the southern highlands grow watercress on idle rice lands near Antananarivo. Where the line between "rural" and "peri-urban" blurs, city demand for vegetables has created opportunities for farmers who normally grow staple crops. During the dry season, farmers around Kumasi (Ghana) switch from cassava, plantains and maize to earn "significant additional income" growing leafy vegetables.

All the country surveys confirmed that urban and peri-urban horticulture – home or open space – makes a significant contribution to urban food security, nutrition and incomes. FAO believes that market gardening, given its already important role in food supply and people's livelihoods in many countries, holds the most potential for further development. This overview

will focus next, therefore, on constraints to the sustainable development of market gardening in Africa.

Market gardening: a closer look

Market gardening is a highly specialized form of agriculture. It has been described as "one of the most productive farming systems in Africa". In their agricultural development policies and programmes, governments invariably recognize that increasing food production in rural areas, and alleviating rural poverty, depend on giving farmers access to: land and water, credit, higher-yielding crop varieties, farm inputs, agricultural extension, agro-processing and markets. They also stress the need to ensure women's access to all of the above. But market gardening in and around African cities has not received nearly the same attention.

Access to land. The vast majority of market gardeners, in most of the countries reviewed, operate on land they do not own, under a variety of temporary tenure arrangements or without title of any kind. They make their livelihoods within notoriously "fuzzy" systems of land ownership, with overlapping formal and traditional tenure rights, and rapidly changing land uses and values.

Without secure title to land, those livelihoods can be terminated by a council order to uproot crops growing in violation of city by-laws; by a local leader reclaiming land granted under an unwritten contract; by a real estate developer staking out a subdivision for new housing; or by an invasion of low-income families come to build the first shacks of a peri-urban settlement.

That is why vegetable plots are often found on land reasonably safe from construction, such as roadsides, and near zones unfit for habitation – and food production – such as garbage dumps and industrial waste sites. Where pressure from urbanization is more intense, gardeners reduce their risk by sowing indigenous leafy vegetables that can be harvested within a few weeks, and by using low-cost (and portable) technologies such as watering cans.

In Yaoundé, valley bottom market gardeners may produce most of the city's leafy vegetables, but "all are farming illegally" because they do not have permits from the state, which owns the land. Most have been forced, at one time or another, to move. In Lagos, growers use vacant land earmarked for industrial development and can be evicted without notice or compensation. In Abidjan, loss of land to real estate development is one of the main threats to gardeners' livelihoods. In Senegal, where almost all land is legally part of the state's patrimony and land use titles are temporary, market gardeners suffer "a pervasive insecurity of tenure". Many female gardeners were forced to move out of Bissau recently to start new plots 3.5 km to the north of the city.

In the few countries where market gardening is, or was, a component of urban planning, land tenure is anything but secure. In Kinshasa's main market gardening area, Kimbanseke, traditional leaders have been selling plots for housing construction when gardeners are absent. Along the Congo River, other vegetable growers face losing their gardens to a new urban development that promises prestigious

riverfront properties and "indisputable land title". Across the Congo in Brazzaville, the market garden at Talangayi is being built on, in violation of a new law that safeguards peri-urban horticulture.

While most local authorities in Kenya tacitly accept horticulture within urban boundaries, many have, and sometimes enforce, by-laws that ban the growing of crops in public areas, which is where vegetables are often grown. In Dar es Salaam, horticulture is allowed but, since no areas have been zoned for it, gardens are often started without permission on vacant land.

Urbanization has already claimed 250 000 ha of agricultural land in Algeria since 1962 and is consuming it in Tunisia at the rate of 4 000 ha a year. Around Tunis, factories and low-density workers' settlements have spread across swathes of supposedly protected peri-urban farmland. In Algeria, urban horticulture is regarded as an extension of rural agriculture, and action to protect it is low on the list of planning priorities. Peri-urban growers in the country's second city, Oran, invest little in vegetable production, "knowing that eventually their land will be built over".

Access to water. In the dry season in Accra, a typical 300 sq m plot of leafy vegetables requires around 80 000 litres of water over a 30-day period. But in most African cities, good quality water is a scarce and expensive commodity, and water supply utilities see their customers as domestic consumers and industry. Only in countries where horticulture has been promoted as part of urban development have governments installed irrigation and drainage systems for market gardens. FAO's review found, however, that irrigation canals in Brazzaville and Kinshasa that were damaged during civil strife in the 1990s are still in disrepair.

Where irrigation and drainage are not provided for horticulture – the case in most African cities – vegetable growers make their own arrangements. In Bujumbura, many limit cultivation to the rainy season. But that is when rural farmers also grow vegetables, leading to a glut of fresh produce in city markets and much lower prices. During the dry season, tap water is rarely an option, since municipal networks normally do not reach gardening areas and, anyway, drinking water is too expensive to use on crops.

That is why dry season producers usually establish plots along permanent water courses, including rivers, streams, drains and sewage canals, or in marshy areas where they dig wells to reach groundwater. However, owing to the high concentration of habitations with rudimentary sanitation, and the failure of cities to treat most of their domestic and industrial waste, water from streams and urban drains, and even groundwater, are likely to be severely polluted.

The widespread use of "informal" sources of water for market gardening is blamed for chemical and microbiological contamination of produce. In Yaoundé, analysis of irrigation water revealed levels of faecal bacteria and parasites that were a health risk to both growers and consumers. In Takoradi, Ghana, irrigation water is sourced from "highly polluted" drainage channels. In Kigali, amaranth grown near marshes contaminated with industrial effluent contained high concentrations of lead and cadmium.

Insecure land tenure not only stifles vegetable growers' capacity to build up working capital; without land, they have virtually nothing to offer financial institutions as collateral.

Access to credit. Investing in their own production – for example, purchasing good seed of higher value vegetables, or a motor pump, or fencing to protect crops from theft – would help market gardeners improve their productivity, their contribution to the urban food supply and their own incomes. A study in Ghana found that production loans had a greater positive impact on gardeners' earnings than age, years of schooling, gender, household size or number of agricultural extension visits. However, insecure land tenure not only stifles vegetable growers' capacity to build up working capital; without title to land, they have virtually nothing to offer financial institutions as collateral. Women, who face higher legal barriers to land ownership, are particularly disadvantaged.

While some governments and non-governmental organizations (NGOs) have micro-credit schemes for informal urban enterprises, very little reaches horticulture. In Dar es Salaam, financial institutions regard urban farming as "backward" and a risky investment. Benin includes market gardeners in credit programmes for small-scale food producers, but low-income growers "lack the skills needed to make loan applications". In townships of Windhoek, 96 percent of market gardeners were ineligible for bank loans. In Kigali, the lack of secure title to land has prevented peri-urban farmers from switching from sweet potatoes, which require only small investments, to vegetables that give much better returns. Even in Maputo, where gardeners do have secure land use titles, less than half of them apply for micro-credit; most are discouraged by complex procedures and high interest rates.

In the absence of formal credit, many producers rely on informal loans from intermediaries. In Algeria, more than half of fruit growers covered their production costs with informal loans from traders. Intermediaries appear to dominate the supply of credit for the purchase of inputs in the Democratic Republic of the Congo, Ghana, Guinea-Bissau, Nigeria and Senegal.

Access to inputs. The productivity of market gardening is held back by the general unavailability of certified seed of improved crop varieties. In sub-Saharan Africa, government programmes for breeding improved vegetable and fruit varieties are practically non-existent. In the Republic of the Congo, a well-organized seed supply system that supported market gardening during the 1990s has "ceased to exist", and in Gabon the sector suffers "prolonged shortages" of good quality seed.

Most African vegetable growers, therefore, either sow saved seed or use whatever they can find in local supply shops. While saved seeds are often of traditional varieties that are well adapted to local conditions, they carry the risks of inbreeding, low germination rates and diseases that lead to

chronically low yields. When commercial seed is available, it is either imported, too expensive, and often *not* well adapted to local conditions, or of dubious origin and quality. Many growers have had bad experiences with low-quality seed carrying bogus certification.

Reliable channels for the supply of manufactured inputs, such as mineral fertilizer and pesticide that are suitable for horticulture, are also very limited. Again, growers make their own arrangements. Horticulture in Dar es Salaam draws heavily on poultry manure. In Libreville, manure is provided by poultry and pigs. In Cotonou, poultry waste is "much appreciated" by gardeners, who prefer it to mineral fertilizer. Using animal manure as fertilizer is often credited with improving environmental health by recycling otherwise dangerous wastes. But reports from Cameroon and Côte d'Ivoire indicate that animal waste is often not fully decomposed, which can affect plant growth and increase the risk of contamination of produce.

Of growing concern in many countries is the use of synthetic pesticides, obtained through informal channels by gardeners with limited knowledge of their safe application or of the risks they pose to health and the environment. A survey in Abidjan's peri-urban market gardens found 40 different products in use and dangerously high application rates. In Kumasi, some vegetable growers were spraying cocktails of two or more pesticides, including some banned chemicals, during the harvest period.

Access to extension. The increasing use of synthetic pesticides in African market gardens is linked to poor cultivation practices. Very short intervals between crop cycles and the repeated sowing of solanaceous crops, such as tomatoes, peppers and eggplants, lead to higher incidence of pest infestations and soil-borne diseases. High planting densities also encourage pest upsurges and fungal diseases. Instead of reducing densities and rotating crops, many growers try to save their investment with insecticide and fungicide.

Advising vegetable growers on good horticultural practices and the safe use of pesticide is the job of agricultural extension services. But public extension systems in most African countries have long been in decline. In many, NGOs employ more extensionists than the ministry of agriculture.

Country case studies said that technical support to market gardening is "weak" in Côte d'Ivoire and "non-operational" in Gabon. Chad has no extension programme for urban gardeners. In Benin, growers have little contact with the extension service and limited skills in nursery management, fertilizer application and phytosanitary treatment. In Enugu (Nigeria), only 20 percent of market gardeners were even aware of extension services, and extensionists there said serving urban growers "is not our job". In the United Republic of Tanzania, "urban areas are not regarded as key agricultural areas", and extension is oriented to serving rural producers.

Even where governments or city authorities have decided to support market gardening, the number of clients far exceeds capacity: in Accra, the Ministry of Food and Agriculture assigns extension officers to pay regular visits to market gardens, but half of the growers surveyed recently had not seen one during the year.

Access to processing and markets. At harvest time, the high perishability of produce means that gardeners must find immediate buyers. Extending their crops' shelf life through processing – pickling okra, canning tomatoes, or mashing chilies into paste – is a luxury: the dearth of agro-processing capacity in sub-Saharan Africa, in both urban and rural areas, is blamed for post-harvest fruit and vegetable losses that are estimated to be half of total production.

Almost all produce is sold fresh, and gardeners' incomes usually depend on the length of the marketing chain. In Ibadan (Nigeria), they keep it short by selling directly to the public at the "farm gate"; many in Dar es Salaam do so from roadside stalls. The do-it-yourself approach does not always pay: some peri-urban growers in Lusaka transport their vegetables on wheelbarrows to bus stops and from there to markets by public transport. Not infrequent breakdowns of the city's buses leave them stranded and their vegetables withering in the heat.

In most of Africa, gardeners depend on intermediaries to market their crops. Sale is usually arranged by producers individually; rarely do they deal with traders collectively, which would give them greater bargaining power. In Ghana, growers' earnings are often low "because they are disorganized and have limited capacity to negotiate prices". Traders in Bangui have big profit margins because they keep "tight control over market price information".

Vegetable growers are likely to receive only a small share of the retail price where they have taken production loans from intermediaries, who descend on gardens at harvest time to collect crops and consign them to city markets. A common complaint among Kinshasa gardeners is that intermediaries pay less than the agreed price, and sometimes do not pay at all. In Nigeria, many growers' incomes are "minimal" after they have paid back debts incurred before planting. In Burundi, losses along the marketing chain are deducted from prices promised to producers.

Those losses are often substantial owing to poor harvesting, handling and packaging practices. In Lusaka, produce arrives in markets already damaged after being crammed into poorly constructed wooden boxes. Post-harvest losses continue to mount in markets themselves. Lusaka's main market, Soweto, is in a "deplorable condition", with very limited storage capacity and no cold storage of any kind. In Nigeria, markets are "badly located, heavily congested, unsanitary, and lacking the physical facilities to handle large volumes of produce".

And low returns to growers do not necessarily mean low prices for consumers. In Kumasi, traders demand high prices at wholesale markets to cover service and transport costs. In Cotonou, locally grown produce is often too expensive for the average Beninese, and vegetables sold in Bangui are beyond the pockets of anyone but higher-income households.

In most African cities, then, market gardening is an informal sector activity, which has developed with little regulation or support from governments or city authorities. There is also alarming evidence of unsustainable intensification: the increasing use by vegetable growers of ever larger quantities of synthetic pesticide and polluted water.

Over-use of pesticides aggravates pest problems. A recent study in West Africa found that vegetable growers sprayed pesticide excessively for fear of losing crops and

It is time for governments to adopt firm measures to regulate market gardening. But punitive approaches are unlikely to discourage an activity that provides livelihoods for thousands of urban residents and fresh food for millions more.

the income needed to pay off high-interest informal loans used – to buy pesticide. In Cotonou, gardeners seeking to maximize output from very small plots have been spraying vegetables with chemicals that are banned or severely restricted. In Yaoundé, growers "test on their vegetables products registered for pests of cotton, coffee, cocoa and bananas".

Unsustainable intensification in Accra is blamed on urban development, which has reduced the average size of urban plots to around 200 sq m, and on continuous cultivation, which has depleted soil nutrients. To maintain yields, gardeners make massive use of chicken manure and wastewater from open drains and polluted streams. As a result, one study found that 70 percent of samples of cabbages bought in Accran supermarkets and grocery stores carried parasitic worm eggs.

In Senegal, gardeners have raised production by over-pumping groundwater for irrigation; to dilute the increasingly saline water, they mix it with untreated wastewater, a practise that has left most of them infected with intestinal parasites and "living in constant fear of health inspectors". In Nairobi, where the city council's objections to horticulture are based largely on health grounds, the use of raw sewage for irrigation has caused cases of faecal coliform contamination of leafy vegetables, which made them unfit for human consumption.

Vegetable traders in Yaoundé have delivered a verdict that will probably be seconded by health inspectors from Nairobi to Dakar: owing to the impoverishment of garden soils and the overuse of pesticides and untreated wastewater, the quality of vegetables grown in the city's market gardens was inferior to that of produce from rural areas.

The way forward

Unsustainable intensification is both a response to rapidly expanding urban demand for fresh produce, and a strategy adopted by market gardeners to maximize returns from insecure livelihoods. It can only be exacerbated in the years ahead: urbanization will continue to eat up land needed for horticulture; improvements in living standards generally lead to a decline in home gardening, as busy households purchase more of their fruit and vegetables.

It is time for governments to adopt firm measures to regulate market gardening. But punitive approaches, and all the health inspectors in Africa, are unlikely to discourage an activity that provides livelihoods for thousands of urban residents and fresh food for millions more. Policymakers should consider, instead, how support for market gardening could serve their broader policy goals, such as poverty

alleviation, food and nutrition security, job creation, economic development, urban environmental management and climate change mitigation.

FAO has four recommendations for the sustainable development of market gardening, which can assist in the design of policies for the sector. We review here the extent to which those recommendations have been implemented in Africa, highlighting progress, lessons learned, and areas where useful improvement could be made.

1. Provide political and institutional support

In most countries, the ministry of agriculture is best placed to foster the development of market gardening. It can provide extension advice, fund research on improved varieties, regulate the quality of inputs, and request support from international development partners. It can help to place UPH on the agendas of the ministries of planning, health and environment, and push for the removal of restrictive legislation. A key question in FAO's survey, therefore, was whether support for urban and peri-urban horticulture was included in national ministries' policies for agricultural development.

Of the 27 countries that provided an answer, 21 said "Yes". In a few countries, such as the Democratic Republic of the Congo, Gabon and Mozambique, market gardening has been officially encouraged for decades (Zimbabwe has regulated urban market gardens since 1912). However, UPH and the need to support it have been acknowledged by many governments only in the past 10 years.

"Urban and peri-urban horticulture" now appears in policy and planning documents of agriculture ministries in the Central African Republic, Chad, The Gambia, Guinea, Guinea-Bissau and Malawi. Burundi has a programme for market gardening and Cameroon has adopted a national strategy for UPH development. In East Africa, vegetable growers stand to benefit from a general trend in favour of urban agriculture. Kenya's Ministry of Agriculture has drafted a policy for the full integration of crop production and livestock keeping in urban areas. The final draft of Uganda's National Land Policy pledges the government to legitimizing "the land use activities of the urban poor, especially in relation to agriculture".

How policies are implemented depends on the depth of official commitment and on the amount of funding provided by governments and donors. In Burundi, the Ministry of Agriculture and Livestock has followed up on its commitment with a four-year project to develop market gardens in Bujumbura and provincial capitals. Cameroon is negotiating with the European Union (EU) funding for a national horticulture development programme that will also support horticulture in urban and peri-urban areas. Sometimes, however, plans are overtaken by other priorities. While Côte d'Ivoire's Horticultural Master Plan calls for securing market gardeners' title to land, there has been little follow-up.

Support "from the top" is crucial. In Kinshasa, the National Urban and Peri-urban Horticulture Support Service lacks the clout needed to defend the city's market gardens from illegal construction. In Nigeria, the absence of policy support has left vegetable growers with limited access to land, water, credit, inputs and extension advice. Production technologies developed at Ibadan's National Horticultural Research

Institute are practically unknown to the city's vegetable growers.

Many African cities are adopting their own measures to support market gardening, often following "multi-stakeholder consultations" organized under the Cities Farming for the Future initiative of the Resource Centres on Urban Agriculture and Food Security (RUAF). In Accra that process led to its Department of Agriculture's being mandated to support farming in the metropolitan area. It also helped persuade the national Ministry of Agriculture to improve urban vegetable growers' access to extension, inputs and good quality water. Kampala City Council adopted in 2005 ordinances authorizing horticulture, livestock keeping and aquaculture, and now provides food producers with extension services.

Similar initiatives are reported in other countries, despite – or perhaps because of – the lack of a national policy or programme for urban and peri-urban horticulture. In Burkina Faso, the city council of Bobo Dioulasso is integrating urban agriculture into its development policy, and the city of Ndola, in Zambia, recognizes crop and livestock production as legitimate land uses in its strategic plan.

2. Integrate market gardening into urban planning

Following the 2007-08 global food crisis, a United Nations high-level task force called for a "paradigm shift" in urban planning, to one that encourages urban and peri-urban food production. But the transformation of market gardening's current "squatter" status to that of a planned economic activity is yet to happen in most African countries.

Throughout urban Africa, millions of low-income residents have no legal title to the homes they live in, let alone to the plots many of them use to grow fruit and vegetables. Often, the problem is urban development plans, many of them decades-old, that take no account of population growth and the proliferation of slums and the informal economy.

Reforming national land tenure systems and reviving urban planning is now a priority in most countries. An important contribution to that process is FAO's globally-endorsed guidelines on the responsible governance of land tenure, published in 2012. While voluntary, the guidelines represent a consensus among states that spatial planning should help poor and vulnerable people to realize their right to adequate food and sustainable livelihoods.

To do that in African cities, planning departments need to map the land that is used for market gardening, and research its ownership status and production potential. Suitable areas should be zoned for horticulture (or combined with compatible uses, such as green belts) and protected from construction. Land-use titles – whether temporary permits or long-term leases, in the names of individual growers or their associations – should be registered in the city cadastre.

While most African cities have not yet done that, a few have, and very successfully. The best example is Mozambique, which created "green zones" for horticulture in Maputo and other major cities in the 1980s. Although Maputo has grown exponentially since then, most of its green zones are intact, protected by Maputo City Council. More recently, Kigali has zoned for urban development 40 percent of the city area, leaving 15 000 ha for agriculture and for

Most cities have not integrated market gardening into their urban planning. But some have, and very successfully. The best example comes from Mozambique.

safeguarding its wetlands. Antananarivo's master plan protects vegetable growing areas, and Cape Town, South Africa, includes horticulture in land use plans. In Mali, the government has reserved 100 ha of land 20 km southwest of the capital, Bamako, for market gardens. Near Algiers, the province of Blida, an important centre of irrigated fruit production, has inventoried prime farming land and set procedures to prevent its being taken for housing.

A surprising amount of land could be zoned for horticulture in cities that, so far, have seen no need for it. An inventory of unused land within metropolitan Lagos identified 4 400 ha suitable for market gardening. Although Lusaka City Council sees "little scope for long-term growth" of urban agriculture, some 4 000 ha in and around the city are suitable for "cultivation and plantation".

Water resource managers need to integrate market gardening in water planning. In Gabon, for example, designated market gardens are located near permanent sources of water and equipped with irrigation systems. In Benin, the cities of Cotonou and Sèmè-Kpodji have allocated to growers some 400 ha of peri-urban land with safer groundwater.

There needs to be a shift from a "linear" to a "circular" approach in urban water management. Appropriately treated, wastewater from domestic sources is safe and can supply most of the nutrients needed for horticulture. Near Dakar, an FAO-assisted project is installing a treated wastewater irrigation system for 50 ha of flower, fruit and vegetable plots. Bulawayo provides treated wastewater to peri-urban vegetable growers. Algeria's national water authority has plans to upgrade the quality of wastewater from the Oran treatment plant and use it to irrigate vineyards, orchards and vegetable gardens.

3. Increase production and improve the quality of produce

If horticulture is to become part of greener African cities, it must learn to grow more, and better quality, produce while optimizing its use of water and reducing its reliance on agro-chemicals. That concept is at the heart of "Save and Grow", FAO's new model for the sustainable intensification of crop production, which brings together farming practices and technologies that boost yields while nurturing the agro-ecosystem.

One recommendation is to feed the soil plenty of compost. While it cannot replace mineral fertilizer, even compost that is low in nutrients has important benefits: it improves soil structure and organic matter content, which slows the loss of moisture and nutrients, improves root penetration and suppresses plant diseases. With compost, soil produces more using less water, less fertilizer and less pesticide. Each year, African cities generate around

50 million tonnes of garbage that could be composted. However, country case studies reported few examples of the composting of urban organic waste.

If it were recycled, biodegradable solid waste could yield 35 000 tonnes of compost a year in Accra and 2 000 tonnes of nitrogen in Nairobi. City administrations in Africa need to upgrade their solid waste management systems and start separating organic material. They should also encourage small-scale composting enterprises located close to market gardens. That would help to keep streets clean, create jobs and improve the productivity of horticulture.

"Save and Grow" technologies that reduce demand on urban water supplies include drip irrigation, which also reduces loss of soil nutrients, and rainwater harvesting. In Tunis, tomatoes are grown in greenhouses with gutters that channel to storage tanks enough rainwater to meet 60 percent of irrigation requirements. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is promoting an inexpensive low-pressure drip irrigation system that distributes water evenly over a 500 sq m garden and produces big yield increases.

A low-tech alternative is a traditional African system consisting of clay pots filled with water and buried neck-deep next to crops. Since water seeps out to plant roots as needed, the system consumes 10 times less water than that normally delivered through watering cans. Options for safe re-use of wastewater include small stabilization ponds, which use algae, bacteria and sunlight to eliminate pathogens while retaining nutrients.

Another technology with huge potential is biopesticide, which is generally less toxic and less likely to provoke pest resistance than synthetic products. Oil extracted from neem tree seeds contains azadirachtin, which disrupts the life cycle of many insect pests. Another biopesticide, based on the fungus *Beauveria bassiana*, is highly effective against diamondback moths, a cabbage pest that is resistant to pyrethroid insecticides.

Market gardeners also need good quality seed of vegetable varieties that are better adapted to ecological production practices: the result will be plants that are more vigorous, use nutrients and water more efficiently, and have greater tolerance of pests and diseases. Great scope exists for African indigenous vegetables. Many have more nutrients than exotic vegetables, require lower levels of inputs and, thanks to their rich diversity, will adapt better to climate change.

Those and other good practices could help African cities grow more fruit and vegetables while lowering contamination risks, cutting production costs and increasing growers' profit margins.

"Save and Grow" is, however, knowledge-intensive, and requires well-trained farmers. A proven means of training rural farmers in crop production intensification is farmer field schools, where small groups of producers meet regularly with extensionists to analyse problems and test sustainable solutions. Such schools are rare in urban Africa, but experiences are encouraging. After two years of field schools, the proportion of market gardeners using synthetic pesticides near Dakar dropped from 97 percent to 12 percent, while their incomes rose by 60 percent. Growers said the main benefit of their training was learning to prepare seed beds, compost and biopesticide. In Nairobi, women's groups have learned

Great scope exists for African indigenous vegetables. Many have more nutrients than exotic vegetables, require lower levels of inputs and, thanks to their rich diversity, will adapt better to climate change.

to grow amaranth in raised beds rich in organic matter, which need 50 percent less fertilizer and 30 percent less pesticide than conventional beds, and produce eight harvests a year.

Introducing "Save and Grow" to other African cities will require much tighter regulation of pesticides, better organization of input supply, and the strengthening and reorientation of extension services. Field schools will need to be adapted to busy urban lifestyles: an extended "pre-school" phase may be necessary to identify gardeners with enough spare time to attend regular sessions throughout the growing season.

4. Build an efficient horticulture supply system

Political commitment, land zoned for horticulture, and sustainable production systems are essential for the development of market gardening in Africa. But building, on that foundation, an efficient urban fruit and vegetable supply system requires a far greater level of cooperation than currently exists among the sector's stakeholders. Governments, city authorities, gardeners, input suppliers, processors, wholesalers and retailers – all need to work together to optimize the flow of produce from grower to consumer.

The starting point should be the strengthening of market gardeners' organizations. Throughout Africa, growers' informal associations are virtually invisible to official sources of credit and development services, and have weak bargaining power with other links in the supply chain, such as traders. If they were better organized in legally recognized cooperatives or professional associations, growers could offer economies of scale that reduce the costs of service delivery. They could plan more diversified production to avoid seasonal over-supply, negotiate better prices, and enter new markets for higher-value produce.

A group of 20 growers near Nairobi has done just that with indigenous leafy vegetables. They buy seed in bulk from a local shopping centre, pool produce and sell up to 1.2 tonnes a week directly to supermarkets in the capital. Profit margins are twice those of unorganized producers. In Maputo, market gardeners use land granted to their cooperative union, with tenure guaranteed by titles issued to their associations. Through the union, 150 growers were trained recently in greenhouse production of vegetables for sale to hotels and supermarkets.

Cooperatives can help break the grip of intermediaries on production loans. In Lubumbashi, 130 market gardeners' associations formed a credit cooperative which, over the past 10 years, has provided loans – averaging US$60 each – to 6 000 women,

mainly for investment in the production of higher-value vegetables. In Bujumbura, 25 gardening associations have agreements with banks for production loans, and with input stores for the supply of seed, fertilizer and approved pesticides at a discount.

Governments should encourage vegetable growers' cooperatives by reducing fees for their registration. Building viable cooperatives also requires the development of members' organizational and business skills. In the Democratic Republic of the Congo, the solution to initially high rates of loan defaults was training in financial planning. Sometimes, growers' needs are very basic: a project launched recently in Guinea-Bissau includes literacy classes for 700 female gardeners.

Other stakeholders also need institutional credit. A study in Ibadan found that the biggest obstacle facing the city's market gardening sector was the lack of capital to finance production, input supply, processing and marketing. To encourage banks to finance horticulture, city authorities should consider creating guarantee funds to cover loan defaults. Creative policies may also be needed to provide "Save and Grow" input packages. Well-designed "smart subsidy" schemes, which issue vouchers that growers use to purchase inputs at below-market prices, could promote sustainable production and the emergence of small-scale, private suppliers.

In their plans for upgrading infrastructure, city administrations should give priority to their fruit and vegetable markets. Chaotic, unhygienic central markets built decades ago add to the cost of produce and increase food contamination risks. Clean, modern, decentralized markets that offer cold storage and transparent information on prices will attract more customers. Cities should also recognize informal food marketing. "Spontaneous" local markets and stalls provide much needed outlets for fruit and vegetable growers; they save urban households time and transport costs, and they provide an alternative to unhealthy street foods.

And, at the end of the day, that is the overarching objective of urban and peri-urban horticulture: to ensure a year-round supply of fresh produce that meets the dietary needs of urban populations, at a price all residents can afford. By supporting the development of market gardens that supply their cities with fresh produce, policymakers will be making a long-term investment in the nutrition and health of their citizens.

Country profiles

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Sources of key country data

Population
Reference year: 2011
Source: United Nations. 2012. *World urbanization prospects, the 2011 revision population database* (http://esa.un.org/unpd/wup/unup/).

Poverty rate (poverty headcount ratio at US$2 a day)
Reference year: Latest year available, 2002-2011
Source: World Bank. 2012. World development indicators online database (http://data.worldbank.org/indicator/SI.POV.2DAY).

Urban poverty rate (population below national poverty line)
Reference year: Latest year available, 2002-2009
Source: Millennium Development Goals Indicators (http://mdgs.un.org/unsd/mdg/Data.aspx).

Proportion undernourished
Reference year: Latest year available, 2006-2008
Source: FAO. 2011. *The state of food insecurity in the world: How does international price volatility affect domestic economies and food security?* Rome.

Gross domestic product (GDP) per capita
Reference year: 2010
Source: World Bank. 2012. World development indicators online database (http://data.worldbank.org/indicator/NY.GDP.PCAP.CD).

Child mortality rate
Reference year: 2010
Source: UNICEF. 2011. *Levels and trends in child mortality: Report 2011.* New York, USA, UNICEF, WHO, World Bank and UNDP.

Life expectancy at birth
Reference year: 2009
Source: WHO. 2011. *World Health Statistics 2011.* Geneva, Switzerland.

Human Development Index country ranking
Reference year: 2011
UNDP. 2011. *Human development report 2011. Sustainability and equity: A better future for all.* New York, USA.

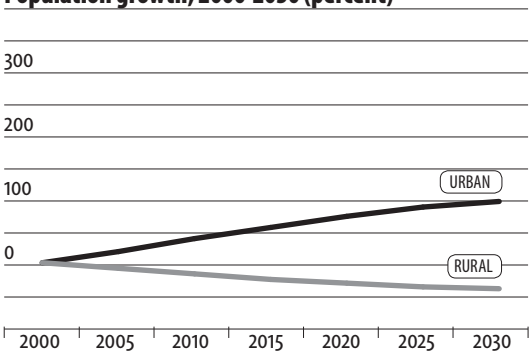
Algeria

Growing awareness of the need to conserve the country's agricultural heritage

Key data

Area	2 381 470 sq km
Population	35 980 000
Urban population	26 250 000 (73%)
Poverty rate	n.a.
Urban poverty rate	n.a.
GDP per capita	US$4 567
Proportion undernourished	n.a.
Child mortality rate	36/1000
Life expectancy at birth	72 years
Human Development Index ranking	96/187

Population growth, 2000-2030 (percent)



On Algeria's independence in 1962, around 70 percent of the population lived in rural areas. Milestones on the path to an urbanized society passed quickly. Within 10 years, an exodus of rural people to the capital, Algiers, and other cities and towns on the country's coast boosted the urban population to 40 percent, a proportion similar to that of most African countries today. By 1990, the majority of Algerians were urban, and since 1995 the rural population has been shrinking.

The urban population currently numbers more than 26 million and is projected to grow by more than half a million a year over the current decade. While Algiers and the city of Oran are home to 14 percent of the urban population, demographic growth is more rapid in a dense network of smaller towns and cities, most of them concentrated along the Mediterranean seaboard.

Algeria's transformation from a traditional rural to an urban mass society has been described as "deeply traumatic", particularly in Algiers, which has seen an increase in the number of young, poor and unemployed slum dwellers. Nationally, the urban slum population was estimated in 2005 at 12 percent, or 2.4 million people.

As in other North African countries (see *Tunisia*, page 83), urban growth in Algeria has often been at the expense of

Contributing to uncontrolled urban sprawl has been the failure of public authorities, and farmers themselves, to respect laws aimed at protecting urban and peri-urban agricultural land from transfer to other uses.

agriculture. The government estimates that more than 250 000 ha of agricultural land have been lost to construction since 1962. The loss of valuable food-producing areas has been most serious on *el-Mitidja,* a fertile alluvial plain that stretches for 100 km from Algiers along the Tell Atlas mountain range and includes some of the country's most heavily populated provinces. Much of the plain was a malarial swamp before being drained during the French colonial period. Today, Mitidja's 70 000 farmers produce annually some 1.5 million tonnes of vegetables, 560 000 tonnes of potatoes and 300 000 tonnes of citrus.

Conflict between Mitidja and expanding Algiers dates from the 1950s, when French planners – anxious to contain social unrest – targeted the plain for new industries and for the construction of 50 000 dwellings. Following independence, migrants from rural areas moved to Mitidja to occupy newly vacated colonial villages or settle in shanty towns that proliferated on the city's outskirts.

Urban development plans of the 1970s continued to promote large-scale industrial plant on the east of the plain and encouraged the construction there of public housing, both to attract workers to the area and to reduce demographic pressure on Algiers. Growing alarm over the loss of farmland prompted a policy reversal in the 1980s, when planners sought to divert the relentless flow of migrants to new hill towns on the Algiers Sahel, southwest of the city. However, a decade of intense civil conflict beginning in 1992 provoked a fresh influx of people from rural areas and the emergence of new squatter settlements.

Planned or unplanned, urban development over the past 50 years has removed from production some of Mitidja's most productive land, including 8 800 ha of vineyards. Sidi Moussa, at the heart of the plain, is now an industrial centre, and colonial villages across the region have grown into small cities. The total urban population of Mitidja's five provinces increased from 2.1 million in 1977 to more than 3.7 million in 2008. A study using satellite imagery found that, in the province of Algiers alone, the urban area had increased by 50 percent between 1987 and 2003, claiming more than 5 000 ha – equal to 15 percent – of the province's farmland.

Urban growth threatens food production around other Algerian cities. In Oran, where the remains of colonial farms testify to the existence of arable land beneath housing estates, the construction of new homes, industries and infrastructure is encroaching on 4 000 ha of prime peri-urban farmland, much of which is used for market gardening and fruit crops. In Sétif, a city of 250 000 east of Algiers, agriculture occupied 75 percent of the municipal area in 2002. Today cultivated land is disappearing under housing and workshops, and planners expect that the city's expansion

will require, by 2020, at least 960 ha now used for production of cereals, livestock and vegetables.

All of which is land that Algeria can ill-afford to lose. Through population growth and urbanization, the area of agricultural land per capita has fallen since 1960 from 1 ha to less than 0.25 ha, while the country's food import bill in 2009 amounted to US$5.4 billion, including US$550 million for fruit and vegetables.

Contributing to uncontrolled urban sprawl has been the failure of public authorities, and farmers themselves, to respect laws aimed at protecting urban and peri-urban agricultural land from transfer to other uses. A study in Sétif found that local government officials had the major say in urban planning and that, while existing regulations could be invoked to safeguard the city's farming heritage, "they are not implemented". In Oran, the Ministry of Agriculture and Rural Development's provincial office was formally consulted on proposed land use changes, but its opinion was not taken into account in urban planning decisions.

The root of the problem, underscored in the Oran study, is the absence in Algeria of a national policy for the development of urban and peri-urban agriculture, including horticulture. Farming within city boundaries is often seen as an extension of rural agriculture. In many urban plans, the term "agricultural land" indicates simply those open spaces that are not built-up or forested. Requirements that planners identify high quality farmland are ignored, and no provisions are made for development of the urban agricultural zone.

Not surprisingly, peri-urban farmers in Oran were reluctant to invest in production, knowing that eventually their land would be built over. The study said the city should recognize peri-urban agriculture's contribution to its economy, food supply and the urban landscape, and clearly express a preference: whether farming should be integrated into urban development or not. At national level, the study concluded, "incentive policies that encourage high-yield agriculture around large cities" were needed to slow the rate of agricultural land losses.

Such policies are not yet in place, and the Ministry of Agriculture has no specific programme for urban and peri-urban horticulture. However, the Algerian government has recently strengthened legislation to protect farmland with new provisions to ensure that "no transaction involving agricultural land will lead to a change in its agricultural use". It also approved, in 2010, a new master development plan to 2025 for the country's regions and major cities which seeks to slow the growth of coastal urban agglomerations and relieve pressure on agriculture by revitalizing rural areas, developing the country's underpopulated southern regions and building well-organized new towns.

Nevertheless, a government decree of July 2011, which re-zoned more than 760 ha of farmland in Algiers and neighbouring Blida province for the construction of public housing, indicates that meeting the immediate needs of low-income urban residents for decent shelter remains a top priority. In fact, a recent review of urban agriculture in the Mediterranean region warned that expansion of Algeria's coastal cities would continue in the medium term and that urban and peri-urban farming areas had entered "a cycle of accelerated depletion".

In the province of Blida, authorities have made an inventory of prime farming land included in urban development plans, and established new procedures to prevent its being used for housing.

The study raised another concern: that the loss of open spaces that could be used for urban food production had left cities entirely dependent for their fruit and vegetable supply on rural areas, and highly vulnerable to supply chain disruptions and additional costs. It estimated that transport charges and taxes doubled the price of horticultural produce in city markets – for example, a kilogram of tomatoes sells for up to US$1.30 in Algiers, compared to less than US$0.65 outside the city. Food price inflation was one factor behind widespread civil unrest in Algerian cities in January 2011, which forced the government to intervene with direct subsidies of US$3.8 billion to hold down the prices of essential foodstuffs.

For now, recognition of urban and peri-urban horticulture in Algeria is proceeding in small but significant steps. On *el-Mitidja,* the Ministry of Agriculture has launched a programme to rehabilitate agricultural production, including the construction by 2014 of 500 ha of greenhouses to permit three successive crops of vegetables, potatoes and melons a year. In the province of Blida, an important centre of irrigated horticulture, authorities have made an inventory of prime farming land included in urban development plans, and established new procedures to prevent its being used for housing. In Sétif, the municipality has granted land for flower and horticultural nurseries, while the national water authority has plans to upgrade the quality of wastewater from Oran's treatment plant and use it to irrigate 9 000 ha of food crops.

There is also growing national awareness of the need to conserve the country's agricultural heritage for future generations. A recent report on tourism and urban renewal pointed out that horticulture was an important asset that could contribute to sustainable urban development, employment and the conservation of local ecosystems.

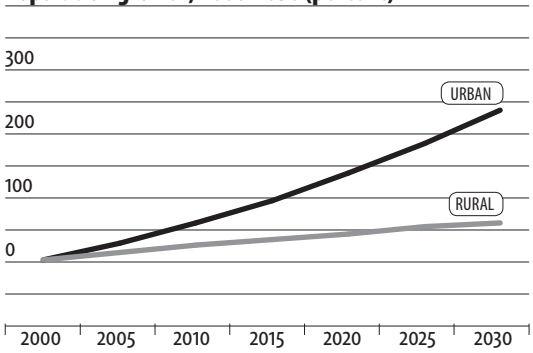
Benin

Locally grown vegetables are often too costly for most urban residents

Key data

Area	112 620 sq km
Population	9 100 000
Urban population	4 087 000 (44.9%)
Poverty rate	75.3%
Urban poverty rate	29.0%
GDP per capita	US$749
Proportion undernourished	12%
Child mortality rate	115/1000
Life expectancy at birth	57 years
Human Development Index ranking	167/187

Population growth, 2000-2030 (percent)



Low productivity in agriculture is blamed for Benin's high rates of rural poverty and rural-urban migration. The urban population, which stood at 4 million in 2011, is growing by 4 percent a year, and is projected to reach almost 7 million in 2025. Unable to meet their needs for fresh produce, Benin's cities are forced to import increasing amounts of fruit and vegetables, worth almost US$50 million in 2009.

To boost food production, save foreign exchange and diversify the export crop base, Benin's government finalized in 2010 a Strategic Plan for Agricultural Recovery that gives high priority to horticulture. While it makes no specific provisions for UPH, the plan at least acknowledges its contribution to urban nutrition. The plan aims at ensuring that by 2015 the national vegetable sector is able to satisfy domestic demand for peppers, tomatoes, onions and carrots.

The government's commitment to horticulture could be good news for the thousands of small-scale market gardeners operating in and around Benin's principal cities, where one-third of the population lives in poverty. A study conducted in 2003 identified three major UPH systems serving the cities of southern Benin: very extensive production on the floodplains north of Cotonou; moderately extensive systems in the coastal areas of Grand-Popo and Agoué;

and fully urban, very intensive gardening on plots of less than 0.3 ha. The more intensive the system, the higher the returns – while river valley growers had incomes below the national minimum wage, those in urban areas earned up to 2.5 times as much.

The gross profit of commercial horticulture has been estimated at US$32 000 per hectare in Cotonou, where 12 large market gardens provide permanent jobs for 1 400 garden managers and labourers. UPH generates income for thousands of indirect beneficiaries, such as input dealers and vegetable retailers, and also contributes to waste management: on a 15 ha market garden in Cotonou, a growers' cooperative composts vegetable waste collected from markets, restaurants and hotels, and uses it as a soil amendment and fertilizer.

Benin's plans for the development of its national horticulture sector should address the urgent need to protect land used for UPH. The sector has grown in the almost total absence of a legal framework, with no mechanisms for its incorporation into urban planning. A survey found that two-thirds of growers were occupying land without legal title and operated under the constant threat of eviction.

Since insecure land tenure discourages growers from investing in irrigation and drainage works, dry season water shortages and rainy season flooding often interrupt production, reducing the supply and increasing the cost of produce in urban markets. In fact, locally grown vegetables are too expensive for most urban residents, and cannot compete with produce imported from Burkina Faso and Nigeria.

Although farmer field schools have been used in agricultural development projects in Benin for more than a decade, only in recent years has the approach been applied to UPH. Outside project areas, however, growers have little contact with agricultural extension services and limited skills in nursery management, fertilizer application and phytosanitary treatment. Another constraint to UPH development is the high cost of inputs and the lack of a specific input supply chain for market gardening. Growers complain about the irregular supply of seed, and often have no choice but to use mineral fertilizer formulated for cotton, which causes acidification of garden soils.

While government policy seeks to improve food producers' access to credit, the rate of disbursements to urban vegetable growers is low, mainly because they lack the skills needed to make loan applications. Increasing the flow of credit to horticulture requires measures that reduce transaction costs by creating legally recognized vegetable growers' organizations, and adapt lending procedures to the particular characteristics of horticulture (for example, by delaying repayments until growers begin to market their produce).

Food safety regulations are almost non-existent for horticultural produce, and vegetables are processed in unhygienic conditions. The development of the processing sector is hampered by the lack of processing technologies and locally available storage.

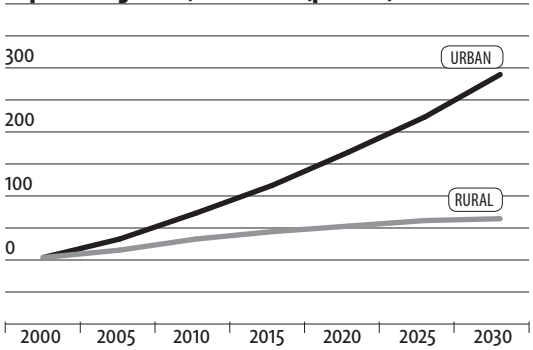
Burundi

Action to ensure that horticulture is included in the capital's urban master plan

Key data

Total area	27 830 sq km
Total population	8 575 000
Urban population	936 000 (10.9%)
Poverty rate	93.5%
Urban poverty rate	34%
GDP per capita	US$192
Proportion undernourished	62%
Child mortality rate	142/1000
Life expectancy at birth	50 years
Human Development Index ranking	185/187

Population growth, 2000-2030 (percent)



On 10 November 2011, some 3 000 people gathered in the central park of Burundi's capital, Bujumbura, to celebrate the country's first National Horticulture Day. Special guests included the Minister of Agriculture and Livestock, the mayor, government and municipal officials and many of the city's fruit, vegetable and flower growers.

The event was a clear signal that Burundi is preparing for an urban future with horticulture. Although its population is still overwhelmingly rural, Burundi's recent rate of urbanization has averaged 5.4 percent a year, the second fastest in Africa after neighbouring Rwanda. The urban population, now 950 000, is projected to reach 2 million by 2030.

The growth of Bujumbura (estimated population: 650 000) is driven by the return of refugees from a decade of civil conflict, and an influx of rural people seeking to escape endemic poverty. However, lack of employment opportunities has led to a rapid increase in the number of urban poor. Around one third of the capital's residents live in poverty and spend two-thirds of their income on food. In 2008, an estimated 118 000 of them were "chronically food insecure" owing to the soaring cost of food, transport and health care.

To boost the urban food supply and provide livelihoods for low-income households, Burundi's National Food Security

Programme allocates US$10.8 million to promote urban and peri-urban horticulture. In support of that programme, the Ministry of Agriculture and Livestock launched in December 2010 a four-year FAO-assisted project, funded by Belgium, to develop UPH in Bujumbura and provincial capitals.

Drawing on the strategy that has been applied successfully in the Democratic Republic of the Congo (see page 57), the project aims at securing fruit and vegetable growers' rights to land and access to irrigation, training them in good cultivation practices and promoting increased consumption of fresh produce. As a first step, the project opened a municipal horticultural office in Bujumbura staffed by specialists in horticulture, agricultural economics, agricultural engineering and property law. It also helped to create a municipal consultation committee, chaired by the city mayor, to oversee the zoning of land for horticulture.

With institutional support in place, the project conducted an inventory of market gardening areas in and around the capital. It mapped 150 ha of land, including 12 ha beside the international airport, cultivated by 71 informal associations with a total of 3 328 members, 70 percent of them women. From individual plots averaging 450 sq m, growers produce mainly cabbages, tomatoes, amaranth, peppers, zucchini, celery, spinach, lettuce and cucumbers. While lack of irrigation restricts most production to the September-May rainy season, some growers cultivate plots along watercourses during the dry season, irrigating them with treadle pumps.

The Bujumbura Horticulture Office encouraged growers who occupy state-owned land to seek provisional titles now being offered under a government scheme for low-income areas. It also began consultations with city planners aimed at ensuring that market gardening is incorporated in the Bujumbura Urban Master Plan, which is now being formulated with World Bank funding.

To introduce more productive cultivation techniques, the project trained 140 agronomists and association leaders to serve as facilitators in a campaign of farmer field schools in 2012. It selected promising local varieties of amaranth, tomato, eggplant and onion for introduction to the city's market gardens, and is testing improved vegetable varieties from Europe and other African countries. Agreements have been reached with credit institutions to provide production loans to 25 gardening associations, and six input supply stores are gearing up to provide seed, fertilizer and approved pesticides.

The project has also introduced vegetable gardening to 14 primary schools in Bujumbura. It supplied gardening tools, seed, nutrition education materials, and 7 000 papaya seedlings for planting in school grounds. The project's 2011 programme of preparatory work ended with an inventory of horticulture in the provincial capitals of Cibitoke and Muramvya, and a major step forward: the celebration of Burundi's first National Horticulture Day.

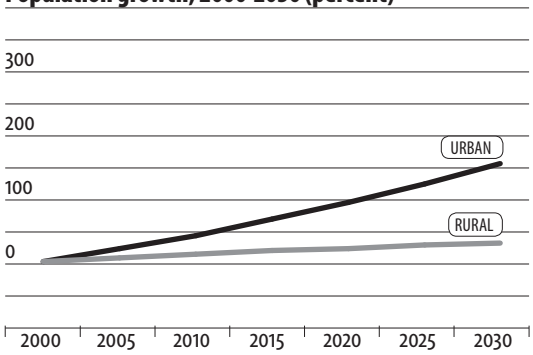
Cameroon

Ensuring the safety of horticultural produce is the most serious challenge facing the sector

Key data

Total area	475 440 sq km
Total population	20 030 000
Urban population	10 435 000 (52.1%)
Poverty rate	30.4%
Urban poverty rate	12.2%
GDP per capita	US$1 147
Proportion undernourished	22%
Child mortality rate	136/1000
Life expectancy at birth	51 years
Human Development Index ranking	150/187

Population growth, 2000-2030 (percent)



In July 2011, Cameroon joined the small group of African countries that have adopted a national strategy for the development of urban and peri-urban horticulture. The strategy outlines a comprehensive programme for cities in the country's five agro-ecological zones, aimed at boosting fruit and vegetable production, enhancing the horticultural value chain and developing markets for produce.

For now, the 70-page document is a statement of good intentions that awaits a plan of action for implementation, and funding from the government and from donors. What becomes of the strategy is being seen as a crucial test of national and international commitment to sustainable UPH development in Africa.

For Cameroon's capital, Yaoundé, is a prime example of the challenges facing rapidly urbanizing African cities, of the importance of urban and peri-urban horticulture, and of the health and environmental risks posed by unregulated farming in urban areas.

Cameroon made the transition to a majority urban society in the decade 2000/10, when its urban population increased by almost 50 percent, from 7.9 million to 11.6 million. Towns and cities are currently growing by 3.3 percent a year and their total population is projected to reach 16 million by 2020.

Traders in Yaoundé say the quality of vegetables grown in urban areas is inferior to that of produce from rural farms, owing to the impoverishment of valley soils, the use of untreated wastewater and the overuse of pesticides.

Growth is strongest in Yaoundé and the coastal city of Douala, which together account for 33 percent of all urban residents. Official estimates put the rate of income poverty in both cities at just 5 percent. However, urban poverty has other dimensions: in Douala's slums, drinking water is heavily polluted by untreated domestic and industrial effluent. In Yaoundé, torrential rains during the wet season lead to floods and outbreaks of diarrhoeal diseases in low-income communities.

Yaoundé's tropical highland climate is also a blessing: it allows year-round production of flowers, medicinal plants, fruit and leafy vegetables. Agriculture is practised in every part of the capital, from intensive market gardening in swampy valleys that run through the inner city, to rainfed farming of maize and cassava in peri-urban uplands. The pig population is estimated at 50 000, while annual production of broilers and laying hens is close to 1 million birds. According to recent data, 1 445 ha of land are used for agriculture, including 94 ha under vegetables and 120 ha under fruit trees, within Yaoundé's urban area.

Some 35 percent of households in the capital grow fruit and vegetables. Research supported by the Urban Harvest initiative of the Consultative Group on International Agricultural Research (CGIAR) in 2002-2004 found that the majority of producers were women, who cultivated maize and traditional leafy vegetables on plots in upland areas. Their households consumed more than 80 percent of the crops grown, and sold or gave away the rest.

Commercial vegetable production is concentrated in the city's swampy valley bottoms. The typical grower is a married woman with very limited education and most likely to be from Cameroon's impoverished western highlands. While plots are small, commercial growers cultivate on average four plots each. They produce mainly lettuce during the rainy season, and traditional vegetables – amaranth, African nightshades and jute mallow – during the November-February dry season, when competition from rural areas declines and market prices double.

With irrigation and high levels of inputs, including chicken waste and insecticides, an urban garden can produce 1.5 tonnes of lettuce a year, equal to 38 tonnes per hectare. Most growers cite poverty and unemployment as their main motives for taking up market gardening and report average monthly incomes of around US$70, or 50 percent more than the minimum wage.

While valley bottom market gardening accounts for most of the city's vegetable supply, it is also illegal since all riverine land belongs to the state. Surveys have found a wide range of informal tenure arrangements: two-thirds of growers paid rent to customary landowners, some

had "borrowed" the land, and less than 10 percent considered themselves to be squatters. Although urban agriculture is officially tolerated, more than half the growers interviewed for one study said they had been forced to move to other areas.

Both household vegetable production and market gardening make a significant contribution to the nutrition of Yaoundé residents, with cassava leaves, bitterleaf and amaranth providing about 8 percent of their protein and 40 percent of their calcium intake.

Floriculture and fungiculture are also important sources of income for Yaoundé's poor. Flower production occupies an area of around 10 ha, mainly in the city's urban core, and provides a livelihood for 500 women. Recent reports indicate rapid growth of mushroom production, which generates monthly incomes of US$250.

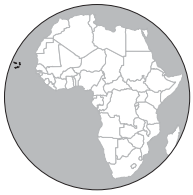
But Cameroon's capital is no garden of Eden. The productivity of its market gardens is due in large part to the use of urban wastewater for irrigation. The water is polluted by human waste that flows from pit latrines and open sewers into the city's inland valleys, and also by livestock waste: while most pig and poultry waste is recycled as manure on maize and vegetable plots, it has been estimated that 6 350 tonnes are "lost to the environment" every year.

Analysis of irrigation water used in Yaoundé revealed levels of faecal bacteria and parasites that were a health risk to both growers and consumers. The cost to growers of diseases such as bilharzia, typhoid fever and diarrhoea was estimated at US$70 a year in health expenses. Recent studies found that city residents contracted diarrhoeal diseases by walking in irrigated fields or eating contaminated fruit and vegetables. Moreover, research suggests that the prime source of contamination could be livestock and domestic animals.

Many growers have little knowledge of pest management, and use highly toxic, obsolete pesticide without protection. Overuse of insecticide has also been linked to increasing resistance in vectors of diseases such as malaria. A study found that resistance was particularly prevalent in mosquitoes in areas used for urban agriculture.

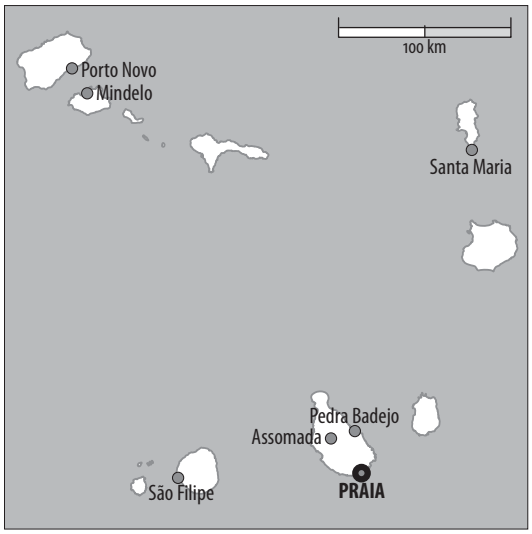
Vegetable traders in Yaoundé say the quality of vegetables grown in urban areas is inferior to that of produce from rural farms, owing to the impoverishment of valley soils, the use of untreated wastewater and the overuse of pesticides.

Cameroon's new national strategy for UPH development recognizes that ensuring the safety of horticultural produce is the most serious challenge facing the sector. So, while calling for action to increase the volume of production and expand markets for fruit and vegetables, it stresses the need to educate market gardeners to the health risks posed by wastewater irrigation, to regulate the use of pesticides and to provide training in integrated pest management. But, for now, the strategy is a statement of good intentions, and a crucial test of national and international commitment to the sustainable development of urban and peri-urban horticulture in Africa.



Cape Verde

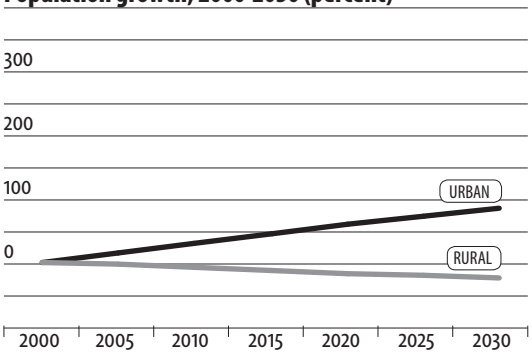
The key to productivity increases: higher-yielding and water-saving technologies



Key data

Total area	4 030 sq km
Total population	501 000
Urban population	314 000 (62.6%)
Poverty rate	40.9%
Urban poverty rate	13.2%
GDP per capita	US$3 323
Proportion undernourished	n.a.
Child mortality rate	36/1000
Life expectancy at birth	71 years
Human Development Index ranking	133/187

Population growth, 2000-2030 (percent)



Africa's arid Sahelian climatic zone extends 850 km across the Atlantic Ocean to embrace 10 islands that make up the Republic of Cape Verde. With just 11 percent of its land surface cultivable, no permanent surface waters and average rainfall of less than 300 mm a year, agriculture meets barely one-tenth of the country's cereal needs.

Cape Verde's farmers began abandoning the countryside *en masse* for urban areas, or emigration abroad, in the early 1980s. The urban population, which is concentrated on the islands of Santiago, São Vicente and Sal, grew from 70 000 to more than 300 000 between 1980 and 2010. Surveys put the urban poverty rate at 13 percent and unemployment at 23 percent. Once completely dependent on emigrant remittances and foreign aid, Cape Verde now sees the development of tourism as its main source of economic growth.

Horticulture will also play an important role in Cape Verde's future. The government's Agricultural Development Strategy to 2015 aims at modernizing the country's farming sector, primarily by optimizing the use of irrigation water, particularly for the intensive production of fresh produce destined for both urban and tourist markets.

During the decade 2000/10, government and private investment in horticulture helped boost local production of vegetables

– mainly tomatoes and cabbages, but also green beans, onions and cucumbers – from 15 000 tonnes to 20 600 tonnes. Average yields increased by 20 percent. The key to productivity increases was the introduction of higher-yielding and water-saving technologies, such as greenhouse cultivation and drip irrigation systems.

The challenge is to extend those technologies to the islands' estimated 4 000 ha of irrigable land. The main source of irrigation water in Cape Verde is groundwater, which is recharged each year during the brief August-October rainy season and extracted from springs and wells. Available data indicate that more than 2 000 ha are currently irrigated, mainly on the islands of São Antão and Santiago. The most common practice is surface irrigation and the main irrigated crop is sugar cane, used to make the national alcoholic beverage, *grogue*. The irrigated vegetable growing area has been estimated at 1 000 ha, of which about 600 ha are under drip irrigation.

The advantages of irrigation emerged clearly in a recent survey of fruit and vegetable growers near São Filipe, on the island of Fogo. Most of Fogo's growers have adopted drip irrigation, use locally designed greenhouses and harvest rainwater from their rooftops. Produce is marketed in São Filipe, 7 km distant. The study found that full-time irrigated horticulture was the island's most profitable farm sector, providing average household incomes of US$5 800 a year, 2.5 times more than the earnings of farmers without irrigation.

The study also identified constraints to increased production. They included the high cost of irrigation water from the government distribution network, the fuel costs of pumping water from boreholes, the lack of agricultural credit, shortages of inputs and irrigation equipment, and seasonal gluts that depressed producer prices.

Cape Verde's National Agricultural Investment Programme allocates US$46 million for water management and a further US$9.5 million mainly for horticultural development in the period 2010-2015. The aim is to extend drip irrigation to 600 ha of land to allow fruit and vegetable production by 1 500 low-income farming households. The programme includes the construction of 12 dams, the installation of 80 km of irrigation canals, and training for agricultural extensionists and farmers. With crop cycles averaging 1.5 per year, the newly irrigated area is expected to produce 18 000 tonnes of fruit and vegetables annually. The programme will also help to improve the marketing of fresh, quality produce.

Meanwhile, FAO is assisting a three-year project that will introduce hydroponic greenhouse production of vegetables to farmers on eight Cape Verdean islands. The project is installing 16 demonstration greenhouses and nurseries, and disseminating the technology through local horticultural entrepreneurs and extension staff. It will also provide training at Cape Verde's National School of Hydroponics, under construction in the capital, Praia.

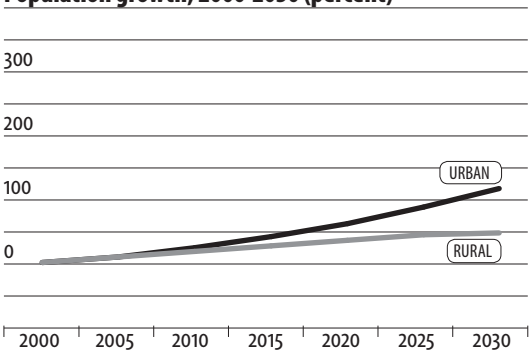
Central African Republic

Shifting cultivation of vegetables is blamed for the devastation of urban green belts

Key data

Total area	622 980 sq km
Total population	4 487 000
Urban population	1 753 000 (39%)
Poverty rate	81.9%
Urban poverty rate	49.6%
GDP per capita	US$457
Proportion undernourished	40%
Child mortality rate	159/1000
Life expectancy at birth	48 years
Human Development Index ranking	179/187

Population growth, 2000-2030 (percent)



Though richly endowed with natural resources, the Central African Republic ranks as one of the world's least developed countries, the consequence of three decades of political crises and armed conflict. Per capita GDP stands at around US$450 and two-thirds of its 4.5 million people live in poverty.

Trends in urbanization mirror the country's turbulent past and ongoing violence: while the population of many provincial towns has declined, that of the capital, Bangui, has tripled since 1980. Bangui and its neighbouring town of Bimbo are now home to some 900 000 people, or half the country's urban population, and 75 percent of its urban poor. According to recent reports, the state of the city's infrastructure is "appalling", youth unemployment is "rampant", and most of its elderly "have insufficient savings to guarantee their survival".

Many of Bangui's residents have taken up home gardening to meet household food needs. However, the bulk of the city's supply of fresh produce – tomatoes, onions, cabbages and local vegetables – is grown on eight market gardens in and around the city. A study in 2005 found that market gardens produced about 1 000 tonnes of vegetables annually.

Most of Bangui's 2 125 gardeners are organized in informal groups that operate, often without secure title, on

state-, community- and privately-owned land along tributaries of the Ubangi river. Many of them are women, who participate through women's groups or in mixed groups. Female gardeners are usually illiterate, use rudimentary tools, spend more time than men on watering crops, and use most of their income to meet family basic needs. The strong presence of women is attributed to the responsibility placed on them for household well-being and to their lower educational status, which forces them to seek informal employment.

Many growers practise shifting cultivation, which is blamed for depleting soils and devastating green areas around the city. Gardeners generally have limited knowledge of good cultivation practices, such as crop rotation and correct planting density. They use untreated wastewater for irrigation, and sow either whatever seed is available on the market or their own saved seed.

Despite high demand for vegetables, growers' profits are low. A study found that traders kept tight control over the flow of market information, which allowed them to pay low prices and maximize their own returns. In fact, the price of vegetables in the city's markets is beyond the reach of the city's poor: a kilogram of tomatoes can cost up to US$1.50, which is 50¢ more than the daily expenditure of an average resident. The main buyers of vegetables are higher-income households.

The Central African government's strategy for rural development recognizes horticulture as a means of diversifying peri-urban agriculture and improving farmers' incomes. Over the past decade, the Ministry of Rural Development and Agriculture, along with national and external partners, has promoted market gardening in Bangui and the western town of Bouar. Those initiatives have helped some growers to secure title to plots in both cities, and one French-funded project is credited with having helped set up in Bangui a gardeners' federation with 2 550 members. However, the end of external assistance has often spelt the termination of state support.

Sustainable development of UPH in the Central African Republic should begin with the establishment of a formal framework for consultation among all stakeholders, including city and provincial administrations, Ministry of Agriculture technical services, urban planners, growers' groups, traders and input suppliers. A complete inventory needs to be made of gardening sites as a first step towards zoning areas for horticulture, securing growers' title to the land, and organizing them into professional associations. The associations need to be supported with training, especially for women, in good horticultural practices and financial management, and with access to input supply services, micro-credit and market information.

At national level, the government can assist the sector by facilitating the import of improved seed, small-scale irrigation equipment and fertilizer, and investing in the breeding of improved vegetable varieties from local and exotic genetic resources.

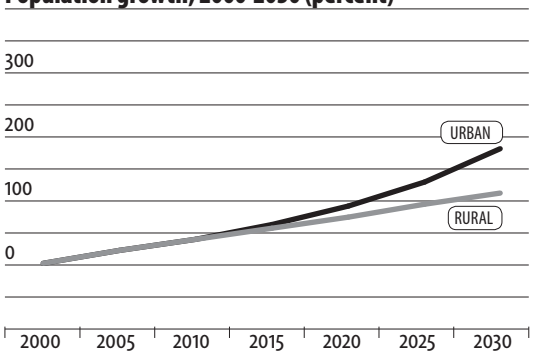
Chad

Recognition of horticulture is emerging in the country's development planning

Key data

Total area	1 284 000 sq km
Total population	11 525 000
Urban population	2 512 000 (21.8%)
Poverty rate	83.3%
Urban poverty rate	24.6%
GDP per capita	US$676
Proportion undernourished	39%
Child mortality rate	173/1000
Life expectancy at birth	48 years
Human Development Index ranking	183/187

Population growth, 2000-2030 (percent)



Although 78 percent of Chadians live in rural areas, the country's rate of urbanization, currently 3 percent annually, is accelerating and is expected to reach 4 percent by 2025. Between 2010 and 2025, Chad's urban population is projected to grow by two-thirds, to 4 million, while that of the capital, N'Djamena, will increase from 1 million to 1.9 million.

Despite an oil-based economic boom that tripled per capita GDP in the period 2002-2010, poverty in Chad is described as "massive and deep", especially in rural areas. The incidence of urban poverty ranges from 20 percent in N'Djamena to 33 percent in the cities of Moundou and Sarh. Around one quarter of children in urban areas are malnourished, and in 2005 more than 90 percent of the urban population lived in slums. While urban development is essential for the country's economic growth, inadequate town planning has led to a chaotic expansion of settlements, the confiscation of peri-urban farmland and the loss of urban green spaces.

Studies have described a thriving pig production sector in peri-urban areas of N'Djamena (855 production units and 11 728 pigs in 2005). However, no data is available on the extent of urban and peri-urban horticulture at city or national level. FAO's survey of UPH in Chad indicates that along with urbanization, there has been strong growth in consumption of vegetables,

estimated at around 30-45 kg per person per year in N'Djamena. The area under vegetables has expanded considerably around Moundou, where the removal of cotton subsidies has prompted many farmers to diversify production.

Around 40 percent of UPH output in Chad is from backyard and community gardens, while around a third is grown in market gardens. The main vegetables produced are tomatoes, onions, garlic, okra, peppers, lettuce, melons, cucumbers and cabbages. In the Sudanese climate zone in the south, market gardening is generally a dry season activity, with the peak of production in January and February. However, traditional tomato varieties grow well in the southern rainy season, and vegetables are produced throughout the year around oases in the country's northern Saharan zone.

Many urban and peri-urban growers have organized themselves in groups that cultivate collective plots. Others have established individual businesses on private land and employ labourers, or run family operations on plots no larger than 2 000 sq m. A survey of five market gardening associations in N'Djamena found that most growers are small-scale and take up horticulture as a source of food security and income. The associations were cultivating plots of tomatoes and lettuce, mainly on land along the Chari River that separates N'Djamena and Cameroon. Only 20 percent owned the land they farmed. More than 40 percent of growers said their production was limited by the lack of access to irrigation, quality seed, fertilizer and herbicide.

The use by gardeners of organophosphate pesticides formulated for cotton is a major concern. A study of pesticide use found that growers applied cotton pesticide throughout the year on other crops, particularly cowpea and tomatoes, and had little knowledge of application rates or the risks posed by pesticides to health and the environment.

Government support to UPH development has been limited. While one of the tasks of the National Office for Horticultural Development, created in 1985, is to support market gardening, its impact has been weak owing to the lack of a coherent strategy for the sector. The national agricultural extension service is oriented towards rural producers and has no specific programme for urban gardeners.

However, recognition of UPH is emerging in the country's development planning. The Chadian Institute of Agronomic Research for Development has included urban and peri-urban production in its research programme for improving the productivity of vegetable crops, while the National Poverty Reduction Strategy, 2008-2011, calls for revitalization of horticultural production and measures to stimulate urban demand for fruit and vegetables. The draft National Food Security Programme, 2011-2015, targets investment of more than US$9 million in rural and peri-urban market gardening. Planned activities include the modernization of gardening sites, the creation of input supply centres and crop management training for 10 000 vegetable growers.

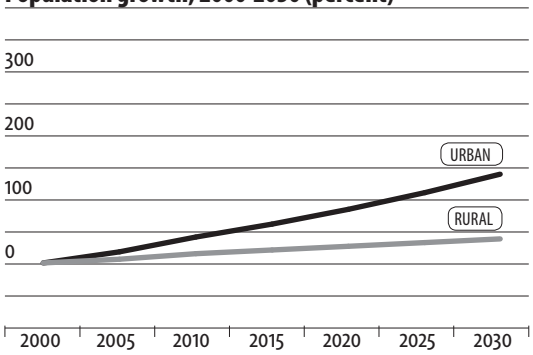
Republic of the Congo

Market gardens have largely withstood the impact of urbanization

Key data

Total area	342 000 sq km
Total population	4 140 000
Urban population	2 635 000 (63.7%)
Poverty rate	74.4%
Urban poverty rate	n.a.
GDP per capita	US$2 970
Proportion undernourished	13%
Child mortality rate	93/1000
Life expectancy at birth	55 years
Human Development Index ranking	137/187

Population growth, 2000-2030 (percent)



In 1960, Brazzaville had a population of 124 000, a peri-urban belt of prosperous market gardens, and a municipal *jardin d'essai* that was used for trials of European fruit and vegetable varieties. Over the following five decades, a massive movement of rural people to the city saw its population grow at an average annual rate of 5.2 percent, to reach 1.6 million in 2010.

That exponential growth has made the Republic of the Congo one of the most urbanized countries in Africa, and Brazzaville and the coastal city of Pointe-Noire home to more than half of the total population. Although its oil-based economy recorded strong growth in 2010, Congo remains heavily indebted and its cities lack basic services and proper housing. The urban poverty rate has been estimated at 40 percent, less than half of urban residents have access to electricity, and 60 percent are employed in the informal sector.

Although most of Brazzaville's municipal garden has been taken for housing, its market gardens have largely withstood the impact of urbanization. Horticulture is practised by some 10 000 growers on 500 ha of land and provides 80 percent of the leafy vegetables and 20 percent of the tomatoes marketed in Brazzaville. Nationally, the total area dedicated to urban and peri-urban horticulture is about 1 450 ha, engaging more than 30 000 producers, about 70 percent of whom are women.

Annual production is estimated at 10 000 tonnes in Brazzaville, 7 000 tonnes in Pointe-Noire and 4 000 tonnes in Dolisie.

Very distinct wet and dry seasons in Brazzaville allow the year-round production of a variety of local and exotic vegetables, including amaranth, lettuce, endives, cassava leaves, nightshade, tomatoes, cabbages and cucumbers. Market gardening is concentrated in unplanned suburbs and peripheral areas, such as Mikalu, Mfilou and Talangayi, where the majority of the poor live. In Mfilou, many young people without high school diplomas take up horticulture to help support their families. Growing vegetables is often a profitable part-time activity – along the banks of the Djoué river, many gardeners are university students whose monthly incomes are four times the minimum wage.

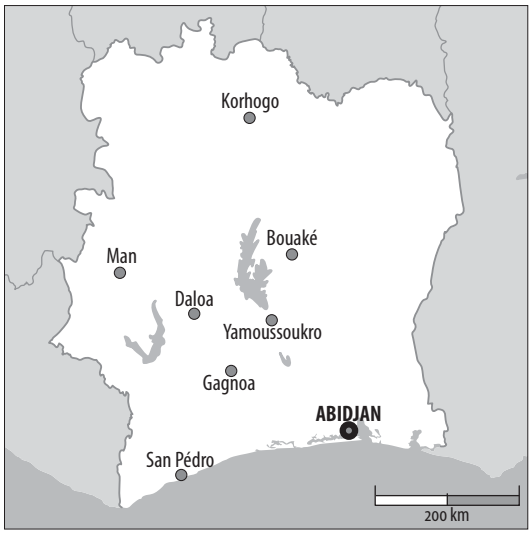
The resilience of UPH in the Republic of the Congo is partly due to the support to the sector that began in the mid-1980s, when the parastatal Agricongo Centre launched a programme that installed irrigation on 50 ha of market gardens in Brazzaville and opened resource centres to supply growers with training and inputs. Though much of the infrastructure was destroyed during civil strife in the 1990s, Agricongo has continued to provide training in fertilizer management, composting and greenhouse production. The Ministry of Agriculture and Livestock has established technical support centres in some gardening areas to provide on-site training.

Nevertheless, the productivity of market gardeners is limited by their low levels of technical skills, inadequate tools, lack of irrigation, the high cost of quality seed and the erratic supply of organic fertilizer. An even more pressing constraint is urban encroachment on land used for horticulture. Growers in Talangayi protest illegal housing construction on their land, which continues despite legal action against speculators. While a law of 2008 seeks to safeguard peri-urban zones used for horticulture, there is a lack of procedures for legal and administrative scrutiny that would halt illegal sales of public land.

The Republic of the Congo is one of the few African countries to have given priority to UPH in its current planning for agriculture, food security and poverty reduction. The National Food Security Programme, 2008-2012, recognizes horticulture's contribution to urban livelihoods and nutrition security and provides for construction of irrigation works serving 240 ha of market gardens. It allocates funding of US$800 000 for organizing growers' associations, training growers in good production practices, improving storage and processing facilities and developing input supply and marketing channels. Another positive development: in 2011, the Mayor of Brazzaville announced plans to restore what remains of the *jardin d'essai,* which will be used as a nursery for ornamental plants destined for the city's public parks.

Côte d'Ivoire

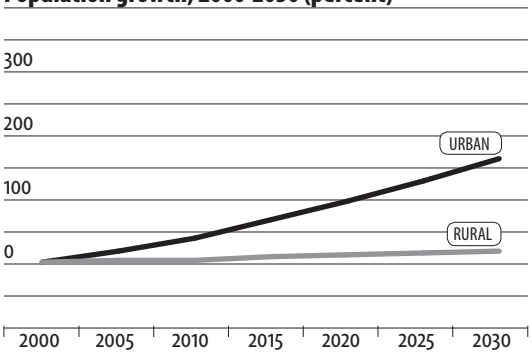
Loss of land to real estate development is a major threat to gardeners' livelihoods



Key data

Total area	322 460 sq km
Total population	20 153 000
Urban population	10 339 000 (51.3%)
Poverty rate	46.8%
Urban poverty rate	29.4%
GDP per capita	US$1 154
Proportion undernourished	14%
Child mortality rate	123/1000
Life expectancy at birth	50 years
Human Development Index ranking	170/187

Population growth, 2000-2030 (percent)



Côte d'Ivoire was once considered a "model African nation", thanks to a boom in coffee and cocoa exports that fuelled spectacular economic growth in the 1960s and 1970s. That period saw the urban population expand by an average of 8 percent a year, as people from rural areas and neighbouring countries flocked to its principal cities, Abidjan, Bouaké and Yamoussoukro. By 2002, Abidjan's population stood at more than 3 million – a 450 percent increase in the space of 30 years – and four out of every 10 residents were migrants.

Since then, civil strife, a slump in agricultural exports and the deterioration of basic infrastructure have pushed an estimated 2 million people into poverty. In 2008, almost half the total population, and one-third of those in urban areas, lived below the poverty line of US$1.32 a day. While high levels of unemployment have discouraged the flow of migrants, many remain, concentrated increasingly in urban slums. In Abidjan, at least 600 000 people live in *bidonvilles*, where population density reaches 340 inhabitants per hectare and the majority of residents hail from Benin, Burkina Faso, Ghana and Mali.

Urban and peri-urban horticulture is regarded as an informal economic activity in Côte d'Ivoire, and few reliable statistics are available on the scale of production, whether by city or nationwide. However,

FAO's survey of UPH indicates that around 650 full-time market gardeners operate in Abidjan, 200 in Bouaké, and 320 in Yamoussoukro. The area under horticulture ranges from more than 190 ha in Abidjan and Yamoussoukro to less than 10 ha in the towns of Daloa, Korhogo and San Pedro.

In larger cities, low-income immigrants are the backbone of the sector. A recent survey found that more than 80 percent of market gardeners in Abidjan and 75 percent in Yamoussoukro came from other countries, usually Burkina Faso. Most growers are males, aged under 40 years and illiterate, with families of from five to 15 people to support. A typical grower cultivates a small, individual plot – averaging less than 1 500 sq m in Abidjan and 600 sq m in Yamoussoukro – mainly on vacant land beside lagoons, rivers and streams, but also along drains and sewage canals.

Market gardeners produce crops such as lettuce, cabbages, peppers, sweet potatoes, onions and traditional leafy vegetables all year round. Researchers have inventoried 26 plant species grown in urban and peri-urban gardens. Intercropping of indigenous vegetables – such as okra, amaranth, jute and African eggplant – is widely practised, especially in Abidjan, where they fetch good prices. Pesticides are used by about half of Abidjan's urban growers, compared to more than 70 percent of those operating on the city's outskirts, where poor cultivation practices, such as high cropping densities and the lack of crop rotation, cause a higher incidence of pests.

Horticulture is most growers' main source of income. Per month, full-time market gardeners earn from US$120 in Abidjan to little more than US$40, equal to the national poverty line, in Yamoussoukro. The marketing chain for fresh produce is well organized. In Abidjan, vegetables are sold directly at gardening sites or through markets, while much of the production in Yamoussoukro is bought by traders for sale in Abidjan. In both cities, wholesale and retail marketing is the domain of women, usually young and illiterate, whose incomes range from US$0.40 to US$3.50 a day.

As in other countries of West Africa, urban planning in Côte d'Ivoire makes little allowance for market gardening. Master development plans prepared during the 1980s and 1990s have not been updated to cope with the proliferation of makeshift dwellings, and growers must constantly move to new areas as urbanization advances. In Abidjan, less than 2 percent of market gardeners own the land they cultivate, and loss of land to real estate development is cited as one of the main threats to their livelihoods.

The sector receives little support from the agricultural extension service, which is directed mainly at rural producers. Control of produce quality is also inadequate: a survey of pesticide used in Abidjan's vegetable gardens identified more than 40 different products, many of them formulated for cotton, and dangerously high application rates. UPH development is also handicapped by the lack of a national seed system for improved vegetable varieties and the high cost of seed from commercial outlets. A shortage of post-harvest and processing facilities prevents growers from accessing value-added markets.

The government's Horticultural Master Plan, 2006-2025, sees UPH as an integral part of its strategy for increasing vegetable production. It recognizes that urban and peri-urban market gardeners are excluded from extension and other services, and that

A survey of pesticide used in Abidjan's vegetable gardens identified more than 40 different products, many of them formulated for cotton, and dangerously high application rates.

the failure to incorporate horticulture into urban planning has rendered their livelihoods "permanently insecure". However, while the plan gives priority to securing growers' titles to land, and supporting them with training, there has been little follow-up.

In the absence of a national action plan for UPH development, initiatives supported mainly by FAO and the National Centre for Agronomic Research (CNRA) continue to demonstrate to policymakers the sector's potential to boost the supply of fruit and vegetables and create employment. The CNRA has started a programme for improving the quality of vegetable production in urban and peri-urban areas, and in 2011 FAO and the Ministry of Agriculture launched in Abidjan's Treichville district a two-year project that will train 200 low-income households in hydroponic production of vegetables.

Meanwhile, the challenges facing Côte d'Ivoire continue to mount. The urban population is growing by 3.6 percent a year, one of the highest rates in Africa and faster than current economic growth. Between 2010 and 2020, Abidjan's population is projected to increase by 40 percent, from 4.2 million to 5.9 million. Urban unemployment is estimated at 27 percent and two-thirds of the jobless are under the age of 30. In a country where 40 percent of the population is younger than 15, iron-deficiency anaemia is reported to affect half of pre-school children and more than half of pregnant women in peri-urban areas.

Properly organized and supported, UPH could make an important contribution to economic development, employment and nutrition in urban areas. The starting point should be firm government commitment through institutional and legal provisions that fully recognize the activity, involve the Ministry of Agriculture in urban planning decisions, and reserve land for market gardening. A national action plan for sustainable development of UPH would help target investment to building irrigation infrastructure, promoting seed production, providing growers with micro-credit, extension advice, inputs and processing technologies, and linking them to marketing chains.

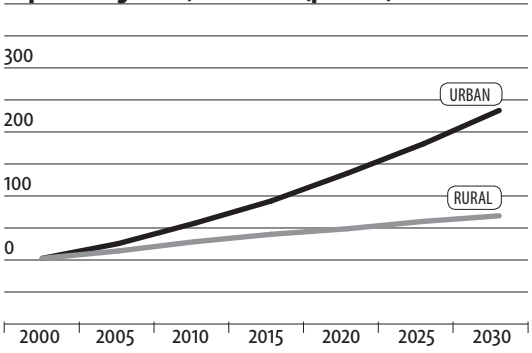
Democratic Republic of the Congo

Market gardens decades-old are at risk in Kinshasa's "fuzzy" legal environment

Key data

Total area	2 344 860 sq km
Total population	67 758 000
Urban population	23 221 000 (34.3%)
Poverty rate	95.2%
Urban poverty rate	61.5%
GDP per capita	US$199
Proportion undernourished	n.a.
Child mortality rate	170/1000
Life expectancy at birth	49 years
Human Development Index ranking	187/187

Population growth, 2000-2030 (percent)



Market gardeners in the N'djili valley, 15 km southeast of the city centre, have witnessed Kinshasa's transformation from a well-planned colonial capital of 300 000 into a chaotic megacity with a population projected to reach 10 million in 2013.

Women and jobless youths were granted the first plots in the 1950s, when the government designated 75 ha of land for horticulture in N'djili and the neighbouring rural area of Kimbanseke. Within 15 years of national independence in 1960, a still buoyant economy had boosted the city's population to 1.5 million. To provide Kinshasans with fresh produce, the government opened 430 ha of new market gardens around the city, and installed irrigation, access roads and on-site centres to support 4 300 full-time producers organized in a cooperative union. Kinshasa's most recent development plan, of 1975, proposed building satellite towns and creating green belts of forests and farmland.

But plans for the orderly growth of Kinshasa were shattered during the 1980s as structural adjustment and economic "stabilization" programmes led to mass unemployment and poverty. Between 1980 and 1990, the city grew from 2 million to 3.5 million inhabitants, the vast majority of them impoverished rural migrants crowded into unplanned settlements on the city's rapidly expanding periphery. When popular discontent exploded in the early

A recent study at the Mokali garden in Kimbanseke described a fierce struggle between 760 vegetable growers and a local leader, who was selling 200 sq m plots (for around US$500 each) on weekends, when gardeners were absent.

1990s, much of Kinshasa's infrastructure, including the N'djili market garden, was devastated.

By 1997, the country then known as Zaire had collapsed and its people had entered a period of traumatic change: the end of almost three decades of one-man rule, a violent civil conflict, and a five-year regional war. Between 1995 and 2011, Kinshasa's population almost doubled, from 4.5 million to 8.8 million, owing to both natural increase and the continuing influx of people from neighbouring rural areas and the war-torn eastern provinces.

Today, N'djili and Kimbanseke make up the city's most populated area, with more than 1.5 million inhabitants. State support to market gardening has withered, the cooperative union has yet to recover from the looting of the 1990s, and many of the city's green belts have been plundered for fuelwood and lost to housing, roads and industry.

Yet market gardens in N'djili, Kimbanseke and other areas have survived three decades of anarchic urbanization. The area under commercial horticulture has actually expanded, to more than 1 000 ha, while annual production has risen from 30 000 tonnes in 1996 to more than 80 000 tonnes, or 65 percent of the city's supply. The number of market gardeners, estimated in 1996 at 7 250, is now put at 15 000.

The persistence of market gardening is due to several factors: highly favourable conditions for horticulture along rivers and streams that flow through the city, the huge urban market for fresh produce, and the tenacity of Kinshasa's vegetable growers. The sector has also benefited from a Ministry of Rural Development programme, launched in 2000 with FAO assistance and Belgian funding, aimed at supporting UPH in Kinshasa and four other Congolese cities.

Since even members of cooperatives had no legal title to their plots, one of the programme's first initiatives was to create municipal consultation committees, chaired by local mayors, to demarcate market garden areas. Through negotiations with the state and with private and customary owners, the committees arranged use permits for 600 ha of land.

The Ministry also revived its National Urban and Peri-urban Horticulture Support Service (SENAHUP), created in 1996, and set up municipal horticulture offices to promote improved water management, intensification of production, and cultivation of a wider range of vegetables. Irrigation and flood control works helped to expand the cultivated area by some 250 ha, and to extend production throughout the year. Farmer field schools introduced 1 600 gardeners to improved cultivation practices – including the use of biopesticides and organic fertilizer – and helped them to

diversify from traditional vegetables, such as amaranth and sorrel, to more profitable crops, such as eggplants, cabbages and tomatoes. The programme contracted development NGOs to provide loans for the purchase of inputs, especially seed.

An FAO evaluation in 2010 reported that most of the growers reached by the programme were using improved seed and crop management practices. It estimated that their monthly incomes had increased fourfold since 2000.

Other research, however, has underscored continuing constraints to the development of Kinshasa's horticulture sector. Studies in the N'djili valley found that the collapse of the cooperatives and of government support had left growers with very limited access to training, credit and inputs.

A shortage of certified vegetable seed forced most to rely on their own saved seed, and production was hampered by the dilapidated state of irrigation canals and access roads. Many gardeners preferred to grow less profitable short-cycle crops, which required fewer resources and provided a regular, if minimal, cash flow. They sold their crops to traders who often paid less than the contracted price and sometimes not at all.

But the biggest problem facing Kinshasa's market gardeners is the threat of losing their livelihoods to land speculation. Soaring rents in Kinshasa are driving more and more residents to new settlements on the urban fringe, in areas used for horticulture. While most of the city's long-established market gardening sites were appropriated or purchased from traditional land owners decades ago, weak governance in recent years has encouraged many traditional leaders to seek to reclaim the land and sell it for housing construction.

A recent study at the Mokali garden in Kimbanseke described a fierce struggle between 760 vegetable growers and a local leader, who was selling 200 sq m plots (for around US$500 each) on weekends, when gardeners were absent. Similar confrontations have been reported in N'djili and neighbouring Kisenso municipality, where land use permits that growers had obtained through the municipal consultation committees were being disregarded. In Kinshasa's "fuzzy" legal environment, SENAHUP and its horticulture offices clearly lacked the clout needed to defend the city's market gardens.

The Ministry of Rural Development's UPH support programme has been more effective in the smaller cities of Lubumbashi, Kisangani, Likasi and Mbanza-Ngungu. In Lubumbashi (population: 1.5 million), the programme has guided the expansion of the area under commercial horticulture from less than 100 ha a decade ago to 720 ha. Production has grown from 2 250 tonnes to some 60 000 tonnes a year.

Through the municipal consultation committee, SENAHUP helped 85 growers at Naviundu, the city's oldest market garden, to secure land titles that now protect their plots from suburban sprawl. It installed irrigation canals to provide water to a 55 ha garden at Kilobelobe, east of the city, which has become Lubumbashi's main supplier of leafy vegetables. The programme also helped to establish a gardeners' cooperative with more than 8 000 members, of whom around 6 000 are women, and provided them with training and US$200 000 in loans (averaging US$60 each) for the purchase of farm tools and inputs. Market

In Lubumbashi, one hectare of market gardens provides livelihoods for 20 producers, 70 labourers and 150 small-scale vegetable traders who, in turn, supply 10 000 consumers.

gardens ringing Lubumbashi now account for half of the city's vegetable supply.

Similar improvements are reported in Likasi, largely thanks to the introduction of drip irrigation, and in Mbanza-Ngungu, near Kinshasa, where growers have achieved potato yields of 30 tonnes per hectare. All nine of Kisangani's market gardens have been secured through leases, and growers there have adopted more lucrative crops, such as green beans, carrots and lettuce.

Some 23 million Congolese now live in 100 cities and towns stretching from Africa's Great Lakes to the mouth of the Congo River, and their number is projected to reach 40 million by 2025. Most of the urban population depends on informal employment, lives below the poverty line, and is highly vulnerable to food price inflation. Even before the cost of staple foods rose by 50 percent in 2008/09, the "best-off" category of urban poor ate one meal a day.

Urban and peri-urban horticulture could make a big contribution to the country's urban nutrition, employment and economic development. The FAO survey of UPH reported that market gardening is practised by some 30 000 people in 13 major cities, on an aggregate area of more than 6 000 ha. The largely untapped potential of the sector emerged from a recent report on UPH in Lubumbashi, which found that one hectare of market gardens provided livelihoods for 20 producers, 70 labourers and 150 small-scale vegetable traders who, in turn, supplied 10 000 consumers. Market gardeners' average annual income, earned mainly during the five-month dry season, was around US$2 000, or three times the country's minimum wage, while vendors at a market pavilion built by the programme were earning up to US$600 a month.

The Ministry of Rural Development has plans to extend its programme nationwide, and SENAHUP now has offices in 13 provincial capitals. However, SENAHUP lacks funding and staff adequate to its mandate, and almost all of the investment in the country's urban and peri-urban horticulture development has come from external donors. Building a sustainable UPH sector requires firmer national commitment, enforcement of regulations that protect areas zoned for horticulture, and major investment in capacity-building, irrigation, production of quality seed, and produce handling and processing.

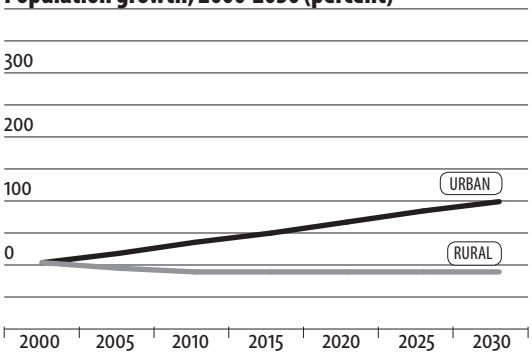
Gabon

Two decades of state support have integrated horticulture into the urban economy

Key data

Total area	267 670 sq km
Total population	1 534 000
Urban population	1 323 000 (86.2%)
Poverty rate	19.6%
Urban poverty rate	29.8%
GDP per capita	US$8 729
Proportion undernourished	n.a.
Child mortality rate	74/1000
Life expectancy at birth	62 years
Human Development Index ranking	106/187

Population growth, 2000-2030 (percent)



Gabon is the most urbanized country in sub-Saharan Africa. Urban residents number around 1.3 million, or 86 percent of the total population, and most live in the capital, Libreville, and the city of Port-Gentil. Although GDP per capita exceeds US$8 700, thanks mainly to oil and mineral exports, the prevalence of urban poverty has been estimated at 30 percent. As a result, 75 percent of Gabon's poor are urban.

Gabon has another distinction: to feed its cities and provide livelihoods for low-income residents, it has actively encouraged peri-urban horticulture for two decades. Starting in 1992, the parastatal Gabonese Development Support Institute (IGAD), in partnership with France and the NGO Agrisud, helped establish in Libreville three market gardens covering 10 ha. Interventions were later extended to all nine of Gabon's provinces under a US$10 million programme for peri-urban agriculture.

A typical market gardening area consists of individual holdings of 500 to 1 000 sq m, established near permanent sources of water, with covered nurseries and a gravity irrigation system. Training focuses on the use of good management practices, such as crop rotation, use of organic fertilizers and integrated pest management. Around 30 percent of the gardeners are women. By 2009, IGAD had helped to develop 10 market gardens and 1 200 small-scale

gardening enterprises, which generated 2 000 jobs in the horticulture value chain.

Including both planned market gardens supported by IGAD and other "spontaneous" operations, some 200 ha of land in and around Libreville, Port-Gentil and half a dozen other cities are currently under horticulture. UPH accounts for as much as 50 percent of the vegetables sold in urban markets, and has completely replaced lettuce imported from Cameroon. Market gardeners can earn up to US$650 a month, well above the average civil servant salary.

Nationally, an estimated 11 000 people are engaged in UPH, mainly irrigated and rainfed vegetable gardening but also fruit production and floriculture. In Libreville, market gardeners include itinerant operators who slash-and-burn unused peripheral land to create temporary plots, and entrepreneurs specialized in irrigated production of lettuce, tomatoes, European eggplants and cucumbers. During the dry season, growers in more remote wetland areas produce African eggplants, okra, maize, chilli peppers and Guinea sorrel.

The government has taken steps to protect IGAD-supported market gardens, but the tenure security of many other growers – who rent their plots, practise sharecropping or occupy vacant land – is becoming precarious in the face of urban expansion and land speculation. Since most vegetable growers water their crops manually from rivers and creeks, water shortages during the dry season reduce their production and incomes. Fluctuations in supply are also caused by poor production planning and a lack of marketing information.

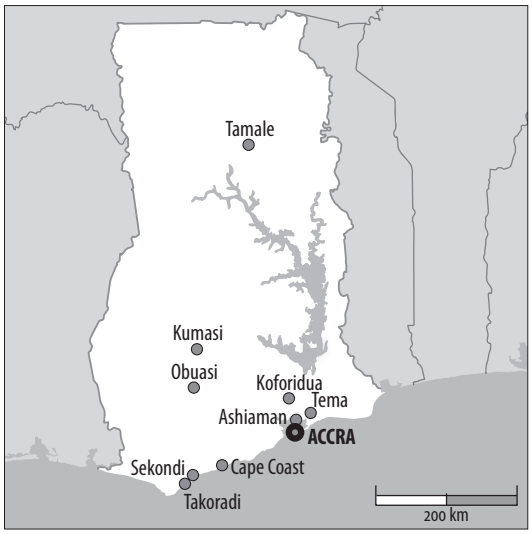
Although horticulture is firmly integrated into Gabon's urban economy, sustainable growth and the development of new production areas will require leadership and support in the years ahead. The lessons learned from IGAD's two decades of experience have not been widely disseminated. Agricultural extension services are inadequate, and there is a lack of technology packages specifically for horticulture. The poor performance of Gabonese agriculture, in general, underlines the urgent need for a strong national system of agricultural research and extension and for sustained investment in agriculture.

Development of market gardening should capitalize on IGAD's experience in professionalizing the sector. If they were better organized in professional associations, gardeners could take advantage of economies of scale in marketing, improve their access to inputs and micro-credit, and press for government action to address competition from imported produce.

As a starting point, support for UPH needs to be incorporated explicitly in Gabon's new US$26 million Agricultural Investment and Development Programme, 2011-2015, which seeks to strengthen national food security, reduce poverty and improve agriculture's share of GDP. Since IGAD has been chosen to lead the new programme, it is well positioned to ensure that urban and peri-urban horticulture will play a key role in achieving those objectives.

Ghana

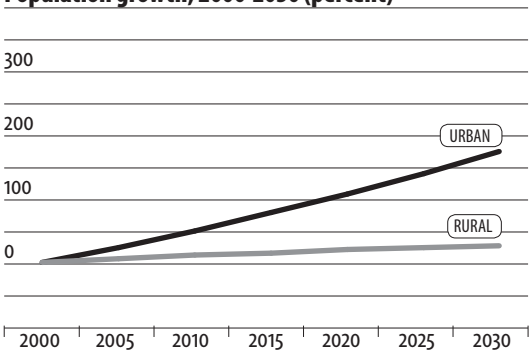
The challenge: translating policies that favour horticulture into "facts on the ground"



Key data

Total area	238 540 sq km
Total population	24 966 000
Urban population	12 955 000 (51.9%)
Poverty rate	51.8%
Urban poverty rate	10.8%
GDP per capita	US$1 325
Proportion undernourished	5%
Child mortality rate	74/1000
Life expectancy at birth	60 years
Human Development Index ranking	135/187

Population growth, 2000-2030 (percent)



The rapid growth of Accra provides a striking example of the "urbanization of poverty". Between 1998 and 2005, an influx of rural migrants helped boost the city's population from 1.6 million to 2 million. In the same period, and even as the rate of rural poverty was falling, the proportion of poor in Accra's population grew from 4.4 percent to more than 10 percent.

Today, Accra has some 2.5 million residents and continues to attract low-income settlers from rural Ghana and neighbouring countries, most of whom make their homes in peripheral slums and around its port. In 2007, some five million Ghanaians, or 43 percent of the urban population, lived in informal settlements, where malnutrition is described as a "serious problem" among children, adolescents and women.

Two out of every three households in Accra engage in food production. They grow mango trees around their homes for fruit and shade, graze goats along roadsides, and keep mudfish in backyard ponds. But the dominant agricultural system is irrigated market gardening, which supplies most of Accra's leafy vegetables and provides livelihoods for about 1 000 growers, most of them settlers from rural areas.

About 50 ha of land in and around the capital are used for market gardening, while another 250 ha are under mixed cereal-vegetable cropping. During the dry

In a year, one hectare of land can yield 180 tonnes of lettuce. The downside is that urban market gardening relies heavily on wastewater from open drains and polluted streams.

season, irrigation expands the vegetable-growing area to around 100 ha. Gardeners produce lettuce, cabbages, spring onions and cauliflower, and traditional vegetables such as okra, eggplants and chili peppers, on plots ranging in size from 100 sq m in the city to 2 ha in peri-urban areas. Typical earnings are around US$50 a month, well above the national average income.

In Kumasi, 200 urban market gardeners earn up to US$800 a year growing mainly lettuce, cabbages and spring onions. During the dry season, thousands of farmers in peri-urban Kumasi switch from staple crops to irrigated production of local leafy vegetables, such as jute and amaranth. In and around Tamale, Ghana's third largest city, about 110 ha of land are used for mainly dry season horticulture.

Although most gardeners use simple watering cans to irrigate crops, irrigated UPH is highly productive. In a year, one hectare of land can yield five crops of lettuce, amounting to 180 tonnes. The downside is that urban market gardening relies heavily on wastewater from open drains and polluted streams. In Accra, 1.6 billion litres of wastewater are used for agriculture annually. Most gardeners there understand the dangers of using untreated wastewater and some have adopted risk-reduction strategies, such as mixing it with groundwater. However, since Accra can count on only 80 days of rain during the year, irrigation – from whatever water source is available – is critical to gardeners' livelihoods.

The use of polluted water, and of chicken wastes as manure, is blamed for high levels of microbiological contamination of vegetables. Samples of fresh produce purchased in Accra, Kumasi and Tamale for one study had faecal coliform levels that exceeded international recommended limits, and 70 percent carried parasitic worm eggs.

Not surprisingly, most municipal authorities associate urban farming with health risks. By-laws on UPH focus mainly on controlling wastewater use and provide little support to growers in accessing land, agricultural extension, inputs or training. Since horticulture is ignored in urban planning, most urban gardeners cultivate land under customary arrangements, without title, until owners need it for development. As land is lost to urbanization, many growers are intensifying production with higher rates of fertilizer and pesticide applications. In Kumasi, some vegetable growers were found using 26 different pesticides, including banned chemicals, and spraying during the harvest period.

Although the Ministry of Food and Agriculture assigns extension officers to pay regular visits to market gardens, half of the growers surveyed recently in Accra had not seen an extensionist during the year. Another major limitation on

UPH development is the lack of access to credit. A study at three market gardening sites in Accra found that growers funded production entirely from their own savings. Other constraints include organizational weaknesses in farmers' associations, the lack of market information and cold storage, and poor hygiene in markets.

With better organization and support, gardeners could tap into markets for higher value produce. That was demonstrated by a RUAF-sponsored programme in Accra that helped register three informal gardening groups with the city's Department of Cooperatives, and provided members with training in business planning and record-keeping. The growers selected lettuce as the most promising crop for value chain development, and adopted improved practices such as seed drilling, organic composting and integrated pest management. With greater awareness of a market-oriented approach to production, the groups have begun using piped water for irrigation, and they sell their vegetables through branded kiosks in Accra.

According to FAO's survey of UPH in Ghana, government support for the sector is "minimal". However, there are signs of progress. In Accra, representatives of the Ministry of Food and Agriculture, the city's departments for agriculture, planning, health and environmental protection, farmers' associations, universities and NGOs cooperated in the preparation of a city strategic agenda on urban and peri-urban agriculture and guidelines for a review of the city's by-laws.

That process helped persuade the ministry to include in its Food and Agriculture Sector Development Policy strategies to promote urban agriculture as a sustainable livelihood, and to improve producers' access to extension, inputs, technology and good quality irrigation water. Ghana's new National Irrigation Policy says the lack of land tenure security and safe water is a major constraint to urban farming, and calls for research into safe irrigation practices in urban environments.

The challenge is to translate those policies into facts on the ground. Ghana's urban population is expected to increase by 80 percent, to 23 million, by 2030. To ensure that market gardeners are able to provide safe, high quality produce to urban consumers, the government and city authorities need to collaborate in a national programme for sustainable UPH development. Along with regulations to protect market gardening areas, major investments are needed to expand irrigation and drainage infrastructure, boost urban wastewater treatment capacity, and increase the supply of credit and the production of inputs.

Vegetable growers need safer sources of irrigation water, such as tube-wells and shallow groundwater, and training in the use of water-saving technologies, such as drip irrigation. Support should also focus on enhancing the horticulture value chain, involving producers, traders and processors in identifying bottlenecks and taking opportunities to increase the volume, quality and safety of fresh produce.

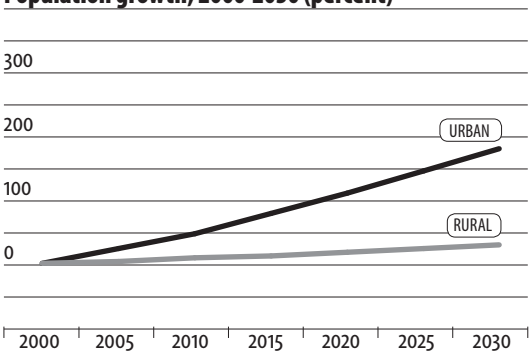
Guinea-Bissau

Female gardeners need literacy training and title to the land they cultivate

Key data

Total area	36 130 sq km
Total population	1 547 000
Urban population	680 000 (43.9%)
Poverty rate	78.0%
Urban poverty rate	51.6%
GDP per capita	US$580
Proportion undernourished	n.a.
Child mortality rate	150/1000
Life expectancy at birth	49 years
Human Development Index ranking	176/187

Population growth, 2000-2030 (percent)



Military conflict in the late 1990s destroyed much of Guinea-Bissau's social and economic infrastructure and has had a lasting negative impact on the country's development. Today, Guinea-Bissau ranks as one of the world's poorest countries, with an estimated 78 percent of its 1.5 million inhabitants living below the poverty line. Between 2002 and 2010, the number of extremely poor, who survive on less than US$1 a day, more than doubled, to half a million.

An estimated 44 percent of the population lives in urban areas, the vast majority in the capital, Bissau, where more than half of all residents are poor. The incidence of poverty is highest in female-headed households, reflecting deep gender disparities. Females in Guinea-Bissau have very low levels of school enrolment, are more vulnerable to malnutrition, and are severely disadvantaged in rights to land ownership.

Among the major aims of Guinea-Bissau's Poverty Reduction Strategy, 2011–2015, is to reduce the national poverty rate to below 60 percent and to minimize gender inequalities. To help achieve that, it calls for priority investments in urban and peri-urban horticulture, given its potential for reducing poverty and generating women's employment.

In fact, in Guinea-Bissau soil and climatic conditions are highly favourable to

horticulture, and UPH is a predominantly female activity. A recent study found that out of more than 11 300 members of market gardening associations nationwide, 9 000 are women; in Bissau, 90 percent of the city's 4 200 vegetable growers are women.

Most production takes place in the September-May dry season, when gardeners obtain temporary rights to land that is used to grow rice during the rainy season. Market gardening is also practised on areas reserved for future urban development and on vacant state-owned land. The crops most commonly grown are tomatoes, Guinea sorrel, okra, lettuce, bitter eggplants, chili peppers, cabbages and onions. More than 2 000 vegetable varieties have been identified in the green belt of Bissau alone. In the dry season, market gardening covers up to 80 percent of urban demand for fresh vegetables. Nationally, annual UPH production is estimated at 60 000 tonnes.

Urban expansion in Bissau and the towns of Gabú and Bafatá has been largely unregulated, and peri-urban agricultural land is being lost to the construction of housing and small businesses. Since female gardeners do not have title to the land they cultivate, they are frequently forced to shift to new areas. Many female gardeners have moved out of Bissau to start new plots 3.5 km to the north, while urban growth around Gabú is rapidly consuming low-lying farming areas which are used to grow both rice and vegetables.

Although many of Guinea-Bissau's gardeners are organized in informal associations, and created a national union, *Mon na Terra*, in 2005, this grassroots movement remains fragile. Only four of the 70 groups affiliated to the national union are legally recognized, owing to the high cost of registration. While members collaborate in production, they seldom work together in post-harvest storage, processing and marketing. Illiteracy impedes the development of management skills among female members.

Gardeners receive little support from extension workers, who have limited expertise in horticultural production. There is no national seed legislation for vegetable varieties and no input supply chain for market gardening. The agricultural sector, in general, has very limited access to bank loans, and financial services are not tailored to the needs of small-scale producers. Marketing is also poorly organized, depending on a network of female vendors who purchase produce directly from growers' fields.

A US$2.1 million project of FAO and Guinea-Bissau's Ministry of Agriculture and Rural Development, to begin in 2012, aims at overcoming many of those constraints. It will assist associations of female vegetable producers in developing 18 ha of existing and new market gardens in Bissau, Gabú and Bafatá, and improving their skills in both production and marketing. Interventions include training in improved cultivation and post-harvest practices, a literacy programme for 700 women, nutrition education, and collaboration with local government authorities in securing growers' legal title to land.

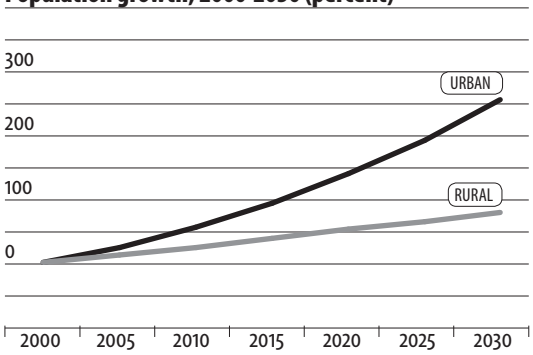
Kenya

Recent policy initiatives could lay foundations for sustainable urban horticulture

Key data

Total area	580 370 sq km
Total population	41 610 000
Urban population	9 973 000 (24%)
Poverty rate	67.2%
Urban poverty rate	33.7%
GDP per capita	US$795
Proportion undernourished	33%
Child mortality rate	85/1000
Life expectancy at birth	60 years
Human Development Index ranking	143/187

Population growth, 2000-2030 (percent)



Four decades of galloping urban growth, in the absence of effective urban planning, have created in Kenya what its government describes as "a potential disaster". Since 1970, the country's population has almost quadrupled, from 11.3 million to 41.6 million, an average annual increase of 3.3 percent. In the same period, urban population growth averaged 5.4 percent. Nairobi's population grew from 530 000 to 3.3 million, and is projected to reach 5 million by the end of this decade.

Although 70 overlapping and often conflicting statutes and acts of parliament have governed urban development in Kenya, less than one-third of its 108 urban centres have development plans, and those plans were formulated by central government, often without considering local needs. Nairobi's growth was guided by a master plan approved in 1948, and "planning" there sometimes took the form of denying services to ever-growing squatter and slum areas, demolishing illegal settlements and repatriating their residents to rural areas.

In the process, Kenyan cities have become emblematic of African urban poverty. More than 60 percent of Nairobi's population lives in unplanned and poorly serviced slums. In one of them, Kibera, up to a million people are packed into corrugated iron and mud shanties covering an area of less than 3 sq km. Recent studies have estimated that one-third of the population of Kenya's second city, Mombasa, lives in poverty while in

Kisumu 30 percent of the adult population is unemployed and half of those with jobs earn less than US$1.60 a day.

Natural increase of city populations, as well as rural-urban migration, is now driving Kenya's urban growth. Income inequality in urban areas is described as "staggering", and rising, and infant and child mortality rates are worse in Nairobi slums than in rural areas. A 2008 study in Kibera found that almost half of children aged under five years showed signs of chronic malnutrition, and 23 percent were severely stunted.

Urban agriculture has grown along with Kenyan cities. According to the Ministry of Agriculture, 36 percent of the urban population practises crop and livestock production, in household yards, on vacant land and in protected natural areas. Agriculture, including free-range livestock keeping, aquaculture, and intensive peri-urban production of maize, groundnuts, beans and sorghum, is the dominant activity on 80 percent of Kisumu's land area. In Nakuru, an estimated 7 000 families earn their living from farming. Within the Nairobi city boundaries, from 30 to 40 percent of households are engaged in agriculture, as producers, processors or traders. The capital has an active movement of urban farmers, the Nairobi and Environs Food Security, Agriculture and Livestock Forum, founded in 2004.

While most urban residents produce food for their own consumption, FAO's survey of UPH in Kenya indicates that more than 70 percent of horticultural produce is sold. In urban Nairobi, market gardening is practised in the usual places: along riverbanks, roads and railway lines, under power lines and on private plots and public land. The majority of producers are low-income, female slum dwellers, who grow crops such as kales, tomatoes, beans, cabbages and spinach, often using untreated wastewater for irrigation. Many fertilize their gardens with wastes produced by the city's estimated 140 000 head of livestock. In peri-urban areas of Nairobi, farmers are switching to intensive horticulture on small plots as land is taken for housing.

In Kisumu, residents have progressively reclaimed wetlands for the cultivation of cabbages, kales, yams and traditional vegetables. In Mombasa, production of fruit and vegetables is widely practised on balconies, in home gardens and in peri-urban open fields, both for domestic consumption and for sale in local markets and to tourist hotels.

Commercial production of traditional leafy vegetables, such as amaranth, is reported to be booming in Kenya's urban areas, with monthly sales in informal markets and, increasingly, supermarkets estimated in 2007 at more than 600 tonnes, worth US$100 000. Strong demand has prompted many entrepreneurs, particularly women, to take up small-scale production. Even in crowded Kibera, vegetables grown in home gardens provide some 11 000 households with a nutritious meal two to three times a week and generate total income of more than US$50 000 a week from sales.

Despite horticulture's contribution to the urban food supply and livelihoods, it has been excluded, along with agriculture generally, as a land use in Kenya's cities and towns. During the colonial period, agriculture was officially designated as a rural land use and independent Kenya perpetuated that policy.

While most local authorities tacitly accept the existence of urban agriculture, many – including Nairobi City Council – have enacted by-laws that ban the cultivation of crops on public streets and unoccupied land,

and the Ministry of Health is empowered to prohibit irrigation within and around townships. Even by-laws that authorize urban agriculture are so stringent that most farmers could not meet their requirements if they were fully enforced.

Councils' objections to horticulture are based largely on health grounds. Tests have found high concentrations of heavy metals in vegetables irrigated with polluted well water in Kisumu and of lead in kales grown along roadsides in Nairobi. Low-income growers in the capital regularly block sewers to extract irrigation water; one test on leafy vegetables sold in informal markets revealed parasitic larval and faecal coliform contamination that made them unfit for human consumption.

Over the past decade, however, other influential voices – including the CGIAR's Urban Harvest initiative, the Kenya Agricultural Research Institute, the Nairobi urban farmers' forum and the environmental NGO Mazingira Institute – have argued that urban agriculture is an essential survival strategy for Kenya's urban poor which, if properly promoted and regulated, could make a great contribution to the country's economic development.

That view is shared by Kenya's Ministry of Agriculture. The Ministry's extension service provides training for urban farmers, and recently launched a US$2.3 million project to promote urban and peri-urban agricultural cooperatives in Nairobi, Mombasa and five other cities. Late in 2011, the Ministry was reported to be finalizing a national Urban and Peri-urban Agriculture and Livestock Policy to guide the full integration of agricultural activities in urban areas. It calls for reform of legislation affecting the sector, and measures aimed at developing appropriate production technologies, and improving waste management and product marketing.

That draft policy joins an array of recent policy and planning initiatives which, if effectively implemented, would lay the foundations for rational urban development and, along with it, sustainable urban and peri-urban horticulture in Kenya.

The National Land Policy, approved in 2009, recognizes the importance of urban agriculture, and the need for the zoning of land in ways that allow it. The 2011 Urban Areas and Cities Act, aimed at establishing a nationwide legal framework for urban governance and management, requires that every city and municipality prepare an integrated development plan that should "provide a framework for regulated urban agriculture".

The government's strategy for the growth and development of the Nairobi metropolitan region to the year 2030 also calls for "active measures" to prevent urban sprawl on prime peri-urban agricultural land, and proposes – at long last – to include agriculture among metropolitan land uses.

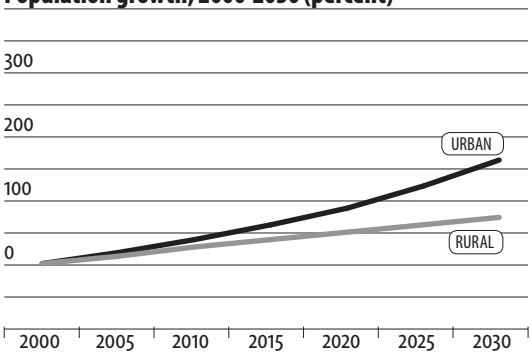
Mozambique

Maputo's green zones provide livelihoods for 13 000 market gardeners

Key data

Total area	799 380 sq km
Total population	23 930 000
Urban population	7 463 000 (31.2%)
Poverty rate	90.0%
Urban poverty rate	49.6%
GDP per capita	US$410
Proportion undernourished	38%
Child mortality rate	135/1000
Life expectancy at birth	49 years
Human Development Index ranking	184/187

Population growth, 2000-2030 (percent)



The bloody civil war that raged in Mozambique's countryside throughout the 1980s forced five million rural people to abandon their land and seek refuge in urban areas and neighbouring countries. Faced with massive urban unemployment and the disruption of food supply lines, the government responded by organizing cooperatives to farm areas designated as "green zones" in and around Maputo and other major cities. Since crop production is considered a female activity in much of Mozambique, the vast majority of cooperative producers were low-income rural women.

By 1990, Mozambique's urban population had grown from 1.6 million to 2.9 million. Almost a quarter of the Maputo city area was under agriculture, and 12 000 of its green zone female farmers had joined a General Union of Cooperatives (UGC) that was producing some 200 000 chickens and 5 000 tonnes of vegetables annually.

Structural adjustment and a 1992 peace agreement ushered in a period of market-led economic development. Between 1996 and 2008, Mozambique's economy grew by 8 percent a year, one of the highest rates in Africa. Urbanization has also been spectacular: between 1990 and 2010, the population of Maputo and its nearby "twin city" of Matola grew from 1 million to 2 million.

The benefits of strong economic growth have not trickled down to much of the

urban population. Half of the country's 9 million urban residents live in poverty, 36 percent of urban children under five years are malnourished, and two-thirds of Maputo's population are slum dwellers. Over the past decade, income inequality has widened more in urban than in rural areas.

Food price inflation and unemployment have made food production a common practice in urban Mozambique, particularly in smaller cities and towns in the north and centre of the country. In backyards and on vacant lots, residents grow vegetables, fruit, maize, cassava and beans on small plots, known as *machambas*, mainly for home consumption.

Commercial horticulture is concentrated in the green zones of Maputo and the cities of Beira, Chimoio and Nampula. In Maputo, as many as 13 000 market gardeners operate on 2 300 ha of land in the Infulene and Mahotas valleys. They include some 5 000 women belonging to UGC member associations who farm land, mainly in the Mahotas area, granted to the cooperative union in the 1990s. Commercial horticulture is also practised on 2 600 ha of land near Matola, on 2 000 ha in Chokwé, on 7 000 ha around Beira, and on 460 ha near the town of Inhambane.

Maputo's green zones were created on high quality agricultural land, with soil and water resources that make them particularly suitable for intensive vegetable production. On individual plots of around 300 sq m, gardeners produce a variety of vegetables, including cabbages, lettuce, tomatoes, onions, eggplants, beans and pumpkins. As many as eight cycles of lettuce can be grown in a year.

As well as being the capital's main supplier of fresh produce, its green zones are an important source of self-employment for poor urban households, particularly those headed by women. Maputo and Matola market gardens provide employment for an estimated 40 000 people, including thousands of female traders, known as *maguevas*, who buy crops directly from growers' fields.

The daily income of a commercial vegetable grower in Maputo is around US$4, well above the national poverty line of US$0.50. Since less than 20 percent of growers' households have a member in formal employment, market gardening is critically important to family survival, representing almost half of average household earnings.

Government commitment to UPH dates back to the 1980s and the designation of the green zones. Although Maputo has grown exponentially since then, with virtually no planning or administrative control, the land under horticulture has largely escaped urban sprawl. Most of the original 5 700 ha of green zones – including a 500 metre-wide strip of gardens running for 15 km through the city – are intact, and areas for urban agriculture are formally demarcated and protected by the Maputo City Council.

A bigger problem for small-scale vegetable growers has been attempts by better-off private farmers to take control of their land. However, the growers' membership of associations has helped most of them to defend their plots. A recent survey found that the majority of market gardeners had either occupied the land or had received it free as part of post-independence land redistributions. Encouraged by the agricultural extension service and NGOs, they had joined associations, which played an important role in the allocation of plots and actually held the land use titles. In

general, producers were "not afraid that someone might take their land".

Some 200 Maputo-based cooperatives and farmers' associations are affiliated to the General Union of Cooperatives which, with support from the government and external donors, has grown into one of Mozambique's biggest farmer organizations, one of its top 10 business enterprises, and one of the most successful examples in Africa of organized women's empowerment. The UGC is a major supplier of poultry, fruit, flowers and vegetables. It runs a savings-and-loans cooperative, a training centre, a poultry hatchery, a fruit tree nursery, four health clinics, two schools and a community radio station.

The union was chosen recently as the main partner of an International Trade Centre programme aimed at improving the skills of market gardeners in the Mahotas valley and linking them to more lucrative markets, such as tourist hotels, restaurants and supermarkets. As part of that programme, 150 growers were trained in advanced horticultural techniques, including greenhouse production. Improvements in the quality of produce are expected to increase their incomes tenfold.

The Government of Mozambique's strategy for an agricultural "Green Revolution" includes a specific programme for UPH development aimed at satisfying urban demand for fresh produce all year round and creating employment, especially for women. To achieve those objectives, the government should capitalize on the UGC's experience and increase its support to the sector considerably.

A 2010 study in the Infulene and Mahotas valleys highlighted constraints to higher productivity and profitability. While most growers grew cabbages and lettuce, far fewer cultivated higher-value crops, such as onions, carrots, beets and peppers. Producers who had diversified their crops reported average daily incomes twice as high as those who grew fewer than three crops. The reluctance of growers to diversify was explained by their fear of losing crops to thieves and wet season flooding, and the lack of reliable markets.

Growers' associations were handicapped by the low education levels of both members and leaders, the failure of members to pay their dues and – as a consequence – a lack of financial resources. Although credit was available from local microfinance institutions, less than 40 percent of gardeners had taken out production loans. Credit made a big difference to average incomes: those who obtained loans earned twice as much as those who did not.

Other constraints included inadequate technical assistance, the salinization of soils, limited knowledge of pest and disease control, and the concentration of production in the April-September dry season, which led to overproduction and depressed prices. In Matola, vegetable growers say they need better technical support, particularly in fertilizer use, while those in Nampula have requested the installation of irrigation systems to overcome dry season water shortages.

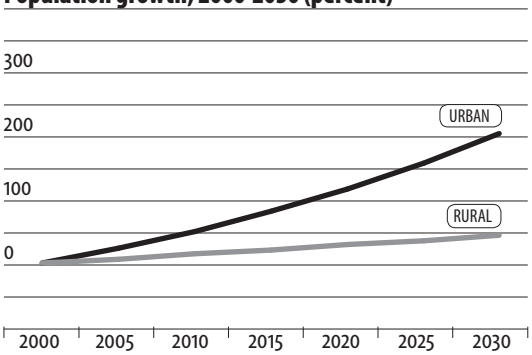
Nigeria

Horticulture has survived, and even thrived, in a challenging urban environment

Key data

Total area	923 770 sq km
Total population	162 471 000
Urban population	80 635 000 (49.6%)
Poverty rate	84.5%
Urban poverty rate	43.1%
GDP per capita	US$1 278
Proportion undernourished	6%
Child mortality rate	143/1000
Life expectancy at birth	54 years
Human Development Index ranking	156/187

Population growth, 2000-2030 (percent)



Urban and peri-urban horticulture was officially launched in Nigeria under the federal government's Operation Feed the Nation of 1976–80, which encouraged urban residents to grow crops around their homes and on vacant land as a source of food and income. At the time, the urban population stood at 16.6 million, and more than 48 million Nigerians lived in rural areas.

Much has changed since then. Over the past three decades, the total population has more than doubled, to 162 million, and is projected to reach 258 million by 2030. Nigeria's rate of urbanization is even higher: since 1980, the urban population has grown by 270 percent, to 80 million. Today, half of all Nigerians live in towns and cities and by 2030 they will number 156 million.

Urbanization is most intense in the economic capital, Lagos, and its hinterland, which are growing by 600 000 new inhabitants a year. Lagos ranks as sub-Saharan Africa's biggest city and one of the world's poorest. Seventy percent of the population – or more than 7 million people – live in shantytowns, where average densities exceed 12 000 people per sq km. Half of all slum dwellers are unemployed or self-employed, and households spend up to 80 percent of their incomes on food. Nationally, 40 percent of the urban population lives below the poverty line, and there is evidence that the severity of poverty has increased more in urban than in rural areas.

A study in Ibadan found that vegetable production generated individual incomes of up to US$3 000 a year for a network of producers, input suppliers and vegetable traders.

While urban growth has covered over most of the gardens that sprouted under Operation Feed the Nation, horticulture has survived, and even thrived, in Nigeria's challenging urban environment. One household in 10 in Lagos grows vegetables in micro-gardens and backyards. Commercial horticulture is also well established in urban and peri-urban areas, generating employment and income for thousands of people and supplying city markets with a wide range of fruit, vegetables and ornamental plants.

In the Ojo area, on Lagos's western edge, market gardeners grow amaranth, lettuce, cabbages, cucumbers, eggplants and spring onions, mainly during the November to March dry season, when urban demand is highest. Many of Ojo's market gardeners are rural people for whom horticulture is a profitable, temporary occupation. They use locally purchased inputs, such as poultry manure, and simple farm tools, and hire local labourers to assist in planting, watering and harvesting. During the wet season, when production is limited by pests, floods and competition from rural areas, growers return to their home states to cultivate staple crops.

In the neighbouring city of Ibadan, UPH provides as much as 80 percent of the vegetable supply. Produce is grown on some 320 ha of plots and sold at the farm gate or through intermediaries, usually women, in city markets. A study of the horticultural value chain in Ibadan found that vegetable production generated individual incomes ranging from US$330 to more than US$3 000 a year for a network of producers, input suppliers and vegetable traders.

Floriculture is a long-standing local industry in the southern city of Port Harcourt. Flower growers are usually well-educated males who operate on rented land along major roads and employ permanent labour. Along with the rapid growth of Port Harcourt over the past 20 years, the area under vegetables has also expanded, with low-income growers cultivating roadsides, open spaces and large tracts of public land.

In Kano, northern Nigeria, fruit and vegetables are grown on plots within the walls of the old city, while river flats around the capital of Niger State, Minna, produce year-round fruit, vegetables, rice and sugarcane. In urban and peri-urban areas of Jos, capital of Plateau State, farmers practise rainfed production of staple crops during the wet season and irrigated vegetable production in the dry season. Horticulture is important also in smaller cities, such as Lokoja, capital of Kogi State: along with a 124 percent increase in population since 1987, the area under vegetables and maize has doubled.

Although horticulture in Nigeria is described as a mainly male occupation, increasing numbers of women work in market gardens. In Port Harcourt, women make up the majority of low-income

Since urban planners do not consider horticulture's water needs, most production is rainfed or depends on wells, boreholes, streams and – increasingly – urban wastewater.

vegetable growers. In Lagos, one study noted a gender division in crop selection and access to resources – men tended to grow vegetables that sold for higher prices, and women's plots were smaller and on less fertile land.

Some market gardeners in Lagos and floriculturists in Port Harcourt export produce to Europe. However, for most small-scale growers, horticulture guarantees little more than a subsistence income. In Minna, average annual income was reported as US$425, equal to the state's minimum wage. A survey in Lokoja found that most growers lived below the state's poverty line.

Despite its contribution to nutrition, food security and livelihoods, UPH is largely ignored in Nigeria's development planning and investment. A search of the National Economic Empowerment and Development Strategy found no mention of horticulture, let alone urban and peri-urban horticulture, while the word appears in only three of 37 state strategies.

The absence of policy and institutional support means that UPH development is held back by a lack of land, water, credit, inputs, agricultural extension advice, improved technologies and marketing infrastructure. In Ibadan, a survey found "abysmally low" levels of linkage between growers and extension services. Improved vegetable production technologies developed at the city's National Horticultural Research Institute were virtually unknown to most growers. In Enugu, southeastern Nigeria, only 20 percent of vegetable growers were aware of extension services, and extensionists said serving urban growers was "not our job".

Most small-scale gardeners continue to rely on their own saved seed or other local sources, such as neighbours and markets. At harvest time, profits are reduced considerably by the need to repay production loans supplied at high interest rates by intermediaries. While central wholesale markets offer fixed prices, most markets in Nigeria are congested, unhygienic and unable to handle large volumes of fresh produce.

The main obstacle to UPH development in Nigeria, identified in numerous studies, is current urban land use policies that make no provision for horticulture. In fact, one study observed, many of the urban residents who heeded Operation Feed the Nation's call to take up horticulture effectively became squatters on public land.

Competition for urban open space is intense, and in many cities UPH is being pushed into environmentally fragile areas. As an economic activity, vegetable growing simply cannot compete with other land uses. For example, between 2001 and 2006, the built-up area of Nigeria's federal capital, Abuja, grew from 155 sq km to 235 sq km,

claiming more than 9 000 ha of cultivated land. In Lagos, many growers use vacant land earmarked for industrial development. Since they could be evicted without notice, the growers are reluctant to invest in permanent structures, such as fencing, and do not qualify for bank loans. In Port Harcourt, vegetable growers have been fined for cultivating public land, and even successful floriculturists operate on land owned by investors with an eye to future development.

Kano State's Land Use Act of 1979 makes no provision for urban crop production, considering agriculture a rural land use. As a result, over the past decade, two extensive sites used for horticulture at the edge of the city of Kano have been reduced by half, owing to evictions or compulsory acquisitions of land for construction. In Minna, too, most growers have no secure title to their plots, and urban development is described as "a major threat" to their livelihoods.

Since urban planners do not consider UPH's water needs, most production is rainfed or depends on wells, boreholes, streams and – increasingly – urban wastewater. In Kano, most water is sourced from drainage channels, which are often highly polluted with household and industrial effluent. A study of heavy metal loads in amaranth, lettuce, carrots and parsley found that while contamination was within international recommended limits for vegetables, increasing use of wastewater posed a health risk to consumers. In Jos, peri-urban lettuce crops contained "very large concentrations" of heavy metals.

A study of Nigeria's urban agriculture pointed out 10 years ago the urgent need to integrate the sector into town planning, and to introduce leasing agreements to secure growers' access to land and water. Even in Lagos, there is no shortage of natural resources for horticulture. A 2010 inventory of areas within Lagos metropolis suitable for market gardening identified 675 ha of prime arable land along natural drainage channels, 3 300 ha of highway, railway and power line corridors, 250 ha on military estates, 100 ha in residential buffer zones, and 75 ha of vacant residential lots. However, many prime sites were threatened by land speculation, illegal settlements and garbage dumping.

The study called on the Lagos State ministries of justice, agriculture, environment, planning and urban development to collaborate in drawing up guidelines and legislation for an effective urban agriculture policy for the state and the metropolis. Other Nigerian states are urged to take similar action.

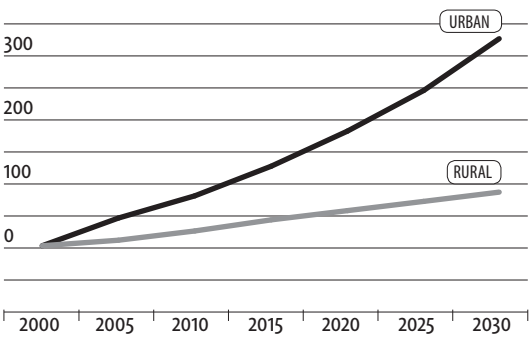
Rwanda

The Kigali master plan envisions a city set amid farmland and community gardens

Key data

Total area	24 670 sq km
Total population	10 943 000
Urban population	2 090 000 (19.1%)
Poverty rate	82.4%
Urban poverty rate	23.2%
GDP per capita	US$530
Proportion undernourished	32%
Child mortality rate	91/1000
Life expectancy at birth	59 years
Human Development Index ranking	166/187

Population growth, 2000-2030 (percent)



Over the past two decades, Rwanda's urban areas have been among the world's fastest growing. Swollen by rural migration and the return of refugees from the 1994 genocide and civil war, the population of Kigali and 13 smaller cities grew from 390 000 to 1.9 million between 1990 and 2010. The number of Kigali residents increased from 220 000 to 960 000, and is projected to almost double by 2025.

Among African capitals, Kigali has been the most successful in meeting the challenge of rapid urbanization by fostering food security, decent work, a clean environment and good governance for its citizens. It has recently upgraded its transport and sewage systems, launched a programme of slum resettlement and improvement, lined its streets with trees, organized an efficient garbage collection service, and banned plastic bags and public smoking.

Kigali has also given urban agriculture a privileged place in its development planning. About one-tenth of the 730 sq km city area is urbanized and home to half of its population. The rest consists of sparsely inhabited rural and natural areas, including river valleys that drain into the extensive Nyabugogo marsh northwest of the city centre. Both valley lowlands and upstream sections of the marsh are used for crop and livestock production, which provides an estimated 25 percent of the city's food supply.

A planning report to the Kigali City Council in 2001 estimated that 37 percent of the city's workforce was employed in small-scale agriculture. The total area under food crops – mainly sweet potatoes and beans, but also potatoes, soya beans, maize and cassava – was around 3 500 ha. While farmers in rural areas consumed 80 percent of the food they produced, those in Kigali were selling almost 40 percent of their crops in local markets.

Recognizing agriculture's contribution to Kigali's food supply and livelihoods, the council requested assistance from the Ministry of Agriculture and FAO in promoting a shift from subsistence to commercial food production in the city. Between 2004 and 2009, through a project funded by Italy and the city of Rome, FAO helped to develop horticulture and livestock production, and to improve soil and water management. The project's horticulture component established fruit-tree nurseries, trained vegetable growers in improved cultivation practices, introduced rainwater harvesting systems and treadle pumps for irrigation, and transferred urban micro-garden technology to slum areas and new housing estates.

In 2008, Kigali City Council took another major step forward with the approval of its Kigali Conceptual Master Plan, which envisions a city set amid farmland, green belts and open spaces with community gardens. The plan zones for urban development 40 percent of the city area, sufficient to accommodate a future population of two million, while leaving some 15 000 ha for agricultural activities and protecting the city's wetlands.

To provide a framework for the development of Kigali's agricultural sector, FAO assisted in drafting a strategic plan for urban and peri-urban agriculture which has been adopted by the City Council and the Ministry of Local Government. The plan outlines measures to increase production and add value to Kigali's farm produce for both urban and export markets.

Sustainable development of horticulture in Kigali faces familiar constraints: growers' limited access to inputs, insecurity of land tenure, rudimentary farming methods and low producer prices. The 2001 planning study noted that since half of the city's farmers had no title to their land, they preferred crops, such as sweet potatoes, which require only small investments of time and money. To diversify production away from traditional staples to higher value vegetables, growers will need secure title to land and access to production loans.

There are also concerns about the quality of produce. The Nyabugogo marsh is increasingly polluted with untreated wastewater, particularly industrial effluent, and concentrations of lead and cadmium in samples of amaranth grown near the marshes exceeded EU limits for food crops.

Finally, Rwanda depends heavily on external aid, which accounts for more than 40 percent of the government budget. Continued investment will be needed to realize the vision of Kigali as a model for Africa of environmental, social and economic sustainability.

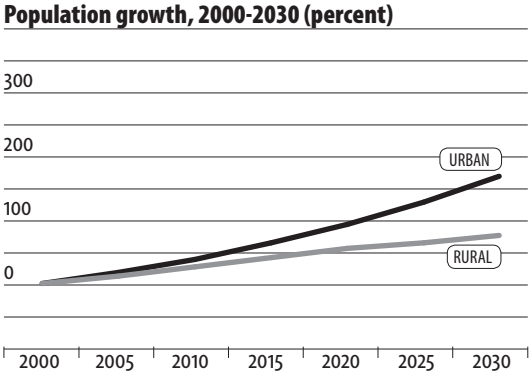
Senegal

Insecurity of land tenure makes investment highly risky for most market gardeners

Key data

Total area	196 720 sq km
Total population	12 768 000
Urban population	5 430 000 (42.5%)
Poverty rate	60.4%
Urban poverty rate	35.1%
GDP per capita	US$1 034
Proportion undernourished	19%
Child mortality rate	75/1000
Life expectancy at birth	62 years
Human Development Index ranking	155/187

Population growth, 2000-2030 (percent)



Over the past 40 years, recurring drought and declining income from agriculture have driven an exodus of rural people to Senegal's coast and its capital, Dakar. The population of Dakar has grown since 1970 at an annual rate of almost 4 percent and reached 3 million in 2011. In the period 2010-2025, it is expected to grow by a further 2.1 million people, only slightly less than total rural population growth.

Nearly 80 percent of urban residents live in the coastal regions of Dakar, Louga, Saint-Louis and Thiès, where the population swells during the December-April dry season with rural migrants seeking jobs. Many remain, and join the ranks of the urban poor in sprawling informal settlements, such as those stretching between Dakar and the neighbouring city of Pikine. By 2015, most Senegalese will be living in urban and peri-urban areas.

Although Senegal managed to reduce the proportion of slum dwellers by more than 20 percent in the decade 2000-2010, much of urban housing is in areas unfit for habitation, and water sources are increasingly polluted by untreated sewage and industrial waste. About one-third of urban households lives in poverty, and in 2006 one in 10 urban children was malnourished.

Urbanization has stimulated rapid expansion of horticulture in the Niayes zone, a 180 km-long strip of rainfed wetlands

between Dakar and the northern region of Saint-Louis. Favoured by a long dry season, ample groundwater and good roads, the area accounts for about 80 percent of Senegal's horticultural output, which amounted in 2010 to 710 000 tonnes of vegetables and 200 000 tonnes of fruit. Most fresh produce is destined for urban markets and neighbouring countries, while some 20 000 tonnes are exported annually to Europe.

Horticulture is practised on 3 600 ha of land on Dakar's Cap-Vert peninsula and a similar area in Thiès, on 1 360 ha in Louga, and on 4 450 ha in Saint-Louis. Production is most intensive in a series of fertile shallow basins, known as *niayes*, which give the coastal zone its name.

Studies over the past decade have documented distinct horticultural production systems in and around Dakar. One study found that 70 percent of the horticultural area was occupied by 200 enterprises producing French beans, cherry tomatoes and mangoes, mainly for export. Alongside those capital-intensive ventures were more than 2 700 holdings, generally of less than 0.5 ha, cultivated mainly by migrants from rural areas. The principal crops – tomatoes, onions, cabbages, potatoes and watermelons – were sold through local markets and provided growers with their main source of income. Unlike export-oriented producers, these growers were highly vulnerable to land use changes: only 3 percent had title deeds.

Horticulture extends deeply into urban Dakar, where gardeners produce lettuce and tomatoes on plots of 500 sq m. On patios and in backyards, 7 500 Dakar city residents have taken up home production in micro-gardens – plastic-lined wooden crates, custom-built tables and old car tyres in which vegetables are grown on gravel, peanut shells and coconut fibre. In less than two months, 3 sq m of micro-gardens yield 11 kg of lettuce or 4.5 kg of carrots, providing food for the household and a surplus for sale.

Horticulture in the Niayes zone generates livelihoods for more than 400 000 people. In Dakar, they include local youths hired as day labourers, seasonal workers from Burkina Faso, and a multitude of intermediaries, called *banabanas*, who provide production loans and have first rights to the harvests of most small-scale growers.

Sustainable development of UPH faces several challenges. First among them is urbanization itself, which competes intensely for increasingly scarce land and water. In Senegal, almost all land is legally part of the state's patrimony. Land use is granted free of charge, but the user receives no permanent title, and cannot pledge the land as collateral for loans. In the rapidly changing urban environment, that pervasive insecurity of tenure makes medium-term planning highly risky for most market gardeners.

At the same time, strong demand for peri-urban land has led to widespread "illegal" transfers, usually to well-off beneficiaries. As municipal authorities expropriate land for sale to developers, gardening basins have been filled in and local farmers driven out. The price of peri-urban land in the Niayes zone has quadrupled in 10 years, and expropriations in Thiès have caused conflict with the rural community. Not all land is taken for construction. One study noted the emergence of horticultural entrepreneurs who enjoyed "privileged entry points" to land and credit.

Small-scale growers have responded to tenure insecurity by abandoning fallow periods and intensifying production. Many have increased the pumping of groundwater for irrigation, which is lowering water levels in the Niayes aquifer, the source of most of Dakar's drinking water. Another effect of excessive pumping is seawater intrusion into wells. Growers have resorted to diluting saline groundwater by mixing it with untreated wastewater, which has left an estimated 60 percent of them infected with intestinal parasites.

Recognizing horticulture's economic importance, Senegal has created a national directorate for the sector, has increased funding for research, storage and transport infrastructure, and has encouraged private investment in the supply of inputs. Two national programmes provide assistance to small-scale growers, while a master plan for the Niayes zone aims at protecting horticultural areas and Dakar's peri-urban green belt.

Senegal is also helping to pioneer in sub-Saharan Africa efforts to reduce pressure on water resources by providing market gardeners with treated urban wastewater. Since 2008, a sewage treatment plant has supplied wastewater free of charge to a limited number of Pikine growers. An FAO-assisted project is installing a wastewater irrigation system for 50 ha of flower and vegetable plots; it includes measures to secure growers' title to land and to provide training in good horticultural practices. Other FAO projects have promoted integrated pest management and the diffusion of micro-gardening in Dakar, Pikine and Thiès.

Meanwhile, the government's Accelerated Growth Strategy has identified horticultural exports as a key sector for wealth creation, and seeks to boost annual exports of fruit and vegetables to Europe to 55 000 tonnes. There is concern, however, that a priority focus on exports would marginalize small-scale growers. A recent study said production and marketing assets were "unevenly distributed", favouring a few large companies over thousands of growers with limited skills and financial capacity.

To compete in domestic and emerging export markets, small-scale growers will need support in intensifying production sustainably and improving the quality of produce. Investment in water control is urgently needed in the Niayes zone, where growers lack simple technologies, such as drip irrigation, that would save water and raise productivity. Measures are also needed to reduce the high cost of fertilizer and to enforce pesticide regulations.

Current land tenure legislation effectively excludes urban and peri-urban growers from borrowing the investment capital they need to modernize production, increase profitability and resist the conversion of their land to urban real estate. A recent study warns that without a genuine land reform in both rural and urban areas, Senegal will see further increases in rural poverty and accelerated migration to its already overcrowded coastal cities.

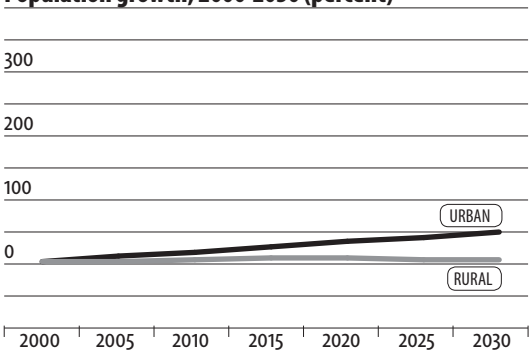
Tunisia

The plains of Greater Tunis produce 10 percent of the country's fruit and vegetables

Key data

Total area	163 610 sq km
Total population	10 594 000
Urban population	7 024 000 (66.3%)
Poverty rate	8.1%
Urban poverty rate	n.a.
GDP per capita	US$4 199
Proportion undernourished	n.a.
Child mortality rate	16/1000
Life expectancy at birth	75 years
Human Development Index ranking	94/187

Population growth, 2000-2030 (percent)



In 1970, most of the plains around the medina of Tunis were countryside – in Arabic, *rif* – dedicated to the production of cereals, fruit, vegetables and livestock. Today, Greater Tunis covers an area of more than 260 sq km, with a total population of 2.4 million, and Ariana and Ben Arous, once satellite farming villages, are municipalities of more than 100 000 inhabitants.

Rapid urban growth for the past 40 years has caused the loss of large areas of prime agricultural land that were once Tunis's primary source of food. A green belt of small-scale farms, known as *swani*, has disappeared beneath roads, residential quarters and industries. Little remains of the once thriving market gardens of the Zahrouni neighbourhood. In La Soukra, 6 km from the city centre, water shortages, soil salinization and the fragmentation of holdings are slowly strangling orange production. On the fertile Sijoumi plain, southwest of Tunis, suburban sprawl threatens some 3 000 ha of farmland, provoking tensions between the farming community and new residents.

Elsewhere, urbanization has claimed orchards of almonds and apricots in the city of Sfax, citrus groves around Hammamet, half the arable land in the coastal oasis of Gabes and, along the tourist coast near Sousse, market gardens cultivated for centuries within metres of the Mediterranean.

Nationwide, some 4 000 ha of agricultural land are lost each year to urban growth. Yet Tunisia was one of the first African countries to recognize the threat posed by urbanization to its food production. In 1983 it enacted a law that no farmland could be converted to other uses without a permit from the Ministry of Agriculture, and quickly mapped and zoned farmland across the country. A 1996 amendment recognized agriculture as an important component of urban planning.

That legal framework provides effective tools for protecting urban and peri-urban agriculture. However, the ministry lacked the resources necessary for implementation and monitoring, and urban plans have failed to keep pace with urban growth. In Tunis, a shortage of public housing and zones for industries has led to the construction of factories and the proliferation of low-density workers' settlements on swathes of supposedly protected farmland. With a hectare of peri-urban land selling for up to US$70 000, many farmers became real estate developers.

Loss of farmland is also put down to the fact that regulations are interpreted in different ways by institutions involved in urban development, including the ministries of tourism and housing. A study of the impact of tourism infrastructure on Tunisia's east coast found that while most resorts had been built on salt flats and consolidated sand dunes, they had created a "diversity of guardianship" over adjoining agricultural land that encouraged land speculation.

Tunisia's *rif* may have retreated from its expanding cities, but food production continues in some urban areas or has relocated to peri-urban zones. Urbanization itself has prompted many farmers to switch to market gardening. Since orange cultivation is barely profitable on less than 3 ha, more than half of the plots in La Soukra now produce vegetables. On the outskirts of Tunis, intensive production of fruit and vegetables destined for the city's central market has become a profitable investment. As a result, Greater Tunis and its surrounding plains constitute one of the country's most productive horticultural regions, supplying the metropolis with some 380 000 tonnes of fruit and vegetables a year (equivalent to 10 percent of national production).

In fully urban areas and on the immediate periphery of Tunis, UPH is practised on family holdings that rarely exceed 3 ha and produce mainly fruit, such as peaches and apricots, and vegetables, such as lettuce, parsley, radishes, celery and okra. Compared to their rural counterparts, urban growers have easier access to inputs and market information, which allows them to adapt quickly to consumer demand.

As Tunis grows, and access to the central market becomes more difficult, more produce is being sold through neighbourhood markets, small shops and street vendors. Short distribution chains help growers cut transport costs and avoid wholesale market levies. Locally marketed fruit and vegetables are, therefore, cheaper than those sold in supermarkets, an advantage for low-income residents who spend up to 40 percent of their budgets on food.

While traditional horticulture has adapted to urbanization, sustainable development of UPH is constrained by the high cost of production inputs and equipment, the fragmentation of land holdings, labour shortages and water scarcity. A study in

Tunis found that 80 percent of urban growers could not make a living from horticulture alone, and supplemented their earnings with income from informal employment, such as taxi driving. Increasingly, young family members seek other occupations.

More intensive production technologies would make horticulture much more profitable. In La Soukra, a recent project funded by Canada's International Development Research Centre developed a greenhouse with gutters that channel rainwater into storage tanks, capturing enough to meet 60 percent of irrigation requirements. Each greenhouse produces up to 6 tonnes of tomatoes per year, much of it in the off-season, when prices are higher. Growers market produce directly to consumers, which increases their profit margins, and many invest their earnings in more greenhouses.

Beyond Tunis, urban horticulture resists in a variety of forms. Near Sousse, small-scale growers have moved to intensive irrigated production of higher-value crops. For a radius of 7 km from the centre of Sfax, fruit trees are still planted around suburban homes, a style of housing that has been adopted in Tunis as well. An emerging trend is "farming for pleasure": families tend their *swani* on weekends, both to produce food for the household and to guard their land from illegal construction.

Tunisians' attachment to their gardens and orchards could play a key role in efforts to defend them from urban sprawl. The past decade has seen growing recognition of horticulture's "intangible benefits", such as the preservation of farming traditions and the greening of urban landscapes.

In Gafsa, an oasis 370 km south of Tunis, agro-tourism is being promoted to protect surrounding farmland. Sfax has set aside land to conserve its fruit genetic resources, and Hammamet recently hosted a festival to celebrate traditional techniques of citrus culture. In urban planning to the year 2050, the government has given priority to relieving pressure on farmland by increasing the density of housing and creating urban green belts.

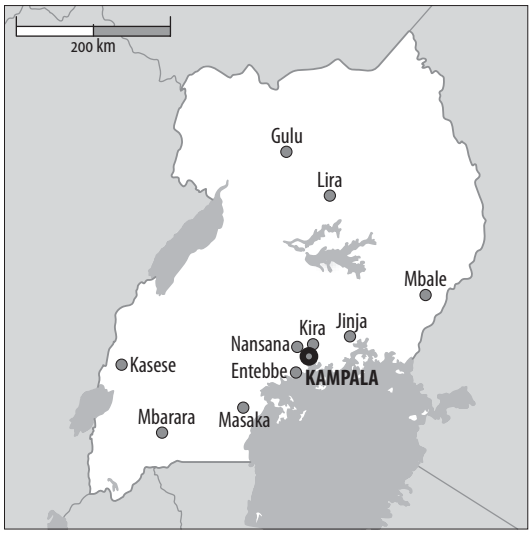
At Sousse University, the Chott Meriem Higher Institute of Agronomy has launched a research programme on horticulture, landscape and the environment, and collaborates with Euro-Mediterranean universities to promote an "*urbanisme vert*" with horticulture as one of its core features.

There are encouraging signs that ordinary Tunisians see urban agriculture in that new light. In 1985, a study found widespread adversity to the rural environment and aspirations focused on urban life. Surveyed 15 years later, 40 percent of city dwellers saw the *rif* instead as a place of "calm, beauty, nature, freedom and traditional values".

A more recent survey of suburbanites on Tunis's troubled Sijoumi plain found that almost half had moved to the area in order to pursue an urban lifestyle in a pleasant rural setting. Recognizing the multifunctional character of UPH, and its advantages for all of the community, will help to ensure that, in Tunisia, urban development and horticulture are compatible.

Uganda

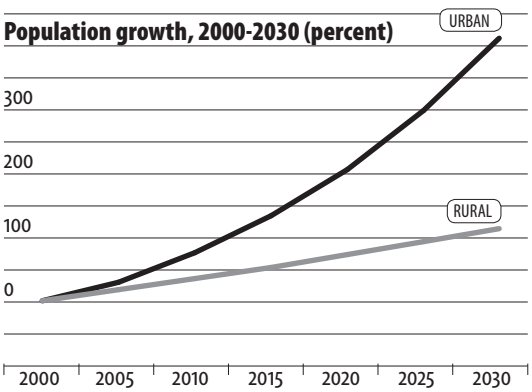
Urban growers needed support particularly in marketing and enterprise development



Key data

Total area	241 550 sq km
Total population	34 509 000
Urban population	5 371 000 (15.6%)
Poverty rate	64.7%
Urban poverty rate	9.1%
GDP per capita	US$509
Proportion undernourished	22%
Child mortality rate	99/1000
Life expectancy at birth	52 years
Human Development Index ranking	161/187

Population growth, 2000-2030 (percent)



Excellent conditions for agriculture – fertile soil, a mild climate and ample rainfall – help explain why Uganda remains one of the world's least urbanized societies. More than eight out of 10 Ugandans live in rural areas, and farming provides 48 percent of the country's exports, 73 percent of employment and the bulk of raw materials for industry. While the rate of urban population growth is accelerating, and will average 5 percent a year between 2010 and 2030, Uganda is expected to be a predominantly rural society even in the year 2050.

Agriculture is a conspicuous fact of life in the capital, Kampala, where farming systems inherited from the Buganda kingdom are still practised on hill slopes and in wetland valleys. It has been estimated that half the city's households produce food. They cultivate small plots of plantains and graze goats in the densely populated inner city, squeeze vegetable gardens and cattle into tight spaces between suburban slum dwellings, and produce poultry, pigs, maize, cassava, fruit and vegetables on larger, peri-urban holdings.

Studies conducted over the past decade indicate that urban agriculture in Kampala is practised by all socio-economic groups and provides up to 60 percent of the capital's food. What's more, as Kampala expands, the proportion of the population engaged in food production appears to be growing. But the sector's dynamism is

due not only to favourable agro-climatic conditions; equally significant are the city's high levels of unemployment and poverty.

Kampala's population doubled, from 755 000 to around 1.6 million, between 1990 and 2010, and is projected to double again by 2025. The city's growth is driven by migration from rural areas, where more than one-third of the population lived in poverty in 2006. Lack of overall planning and the prevalence of customary land tenure have led to unregulated expansion of the urban area. Today, about 85 percent of Kampalans live in poorly serviced settlements, and most households are without stable sources of income.

While strong economic growth helped reduce levels of urban income poverty between 1993 and 2006 – from 27 percent to 14 percent – severe food price inflation in 2007/08 exposed the vulnerability of urban dwellers' purchasing power. The soaring cost of food drove an additional 3.6 percent of the urban population – or 150 000 people – below the poverty line, compared to an increase of 2.4 percent among the rural population.

A series of studies coordinated by the CGIAR's Urban Harvest Initiative in 2002-2004 found that the majority of people in Kampala grew crops or kept animals either to reduce spending on food or simply "to prevent starvation". They typically cultivated more than one plot, usually near their homes, and grew mainly staple foods, such as plantains, beans, cassava, sweet potatoes, maize and cocoyam. Many kept animals, such as poultry, and planted fruit trees in and around household compounds.

For most farmers, the main benefit of urban agriculture was "having enough to eat". The majority were women, who took up farming as a source of food that did not depend on the availability of cash. Almost none of the farmers who grew *only* crops did so for commercial purposes. In fact, across all sites, the main products sold were poultry, milk and pigs. While many households grew amaranth, eggplants and spinach for home consumption, market gardening was practically invisible in Kampala.

As a result, most of the fresh produce sold in the city's markets was being supplied from rural areas. An Urban Harvest survey of marketing opportunities found that, while Kampala was becoming a major market for fruit and vegetables, few farmers in the capital were growing leafy vegetables for sale, even though they were ideally suited to urban and peri-urban production. Some households sold avocados, mangoes, papayas and jackfruit, but the volume of marketed fruit was also low.

Vegetable growers cited various obstacles to increased production and to more commercial operations: their lack of agronomic skills and investment capital, dry season water shortages, pests and diseases, and limited access to fertilizer. While there was an abundance of fruit during the harvest season, there were also high levels of losses owing to a lack of storage facilities. The study concluded that urban growers needed extension support and assistance particularly in marketing and enterprise development.

At the time, however, urban food production in Kampala was actually illegal. It was not until 2005 that, after a decade of lobbying by an alliance of Ugandan public, research and civil society organizations, Kampala City Council finally adopted a set of five ordinances that recognize the right

of residents to raise crops, livestock and fish.

Thanks to that legal framework, the council's Department of Production, Marketing and Environment has a mandate to support urban food producers in order to improve the nutrition and welfare of Kampala residents. The department provides crop, animal and fisheries extension services, formulates agricultural development projects within the city boundaries, and facilitates farmers' access to credit and central government development programmes.

Five years later, the impact of the ordinances had not been evaluated and reports suggest discontent among some urban farmers over the cost of permits. It is also unclear how the ordinances are meant to complement more development-oriented measures, such as training and marketing. A report by the Department of Production, Marketing and Environment in 2008 noted a "lack of full recognition of the sector by decision-makers" and – echoing the findings of Urban Harvest's market survey four years earlier – found that "much of urban agriculture remains on a subsistence level due to lack of resources needed to practice commercial agriculture".

Kampala's local laws on urban food production have been developed in the absence of a national policy on urban agriculture. A 2007 study in Kampala and seven Ugandan towns found that local government perceptions of the practice varied considerably. While the municipality of Entebbe regarded it as a legitimate land use, by-laws in Mbale and Mbarara were still largely prohibitive. The country's five-year Agriculture Development Strategy and Investment Plan, approved in 2010, provides little guidance, citing peri-urban agriculture only once (as an area where "policies are urgently needed").

At the same time, however, support for urban and peri-urban agriculture has emerged strongly in Uganda's plans to correct decades of unregulated urban growth. Its new National Development Plan stresses the need to raise the country's level of urbanization, seeing it as the key to achieving more rapid socio-economic transformation. To guide the review of existing laws on land administration and management, it calls for the finalization and implementation of the country's National Land Policy, which has been in development since 2001.

The final draft of that policy recognizes explicitly urban and peri-urban agriculture. It pledges the government to regularizing land tenure for residents of informal settlements and slums, and to legitimizing the urban poor's land use activities, "especially in relation to agriculture and silviculture". It calls for the development of a legal framework to facilitate and regulate urban agriculture, and for the integration of the sector into overall urban development planning. Those provisions, once implemented, offer a solid basis for the sustainable development of horticulture in Kampala and Uganda's other urban centres.

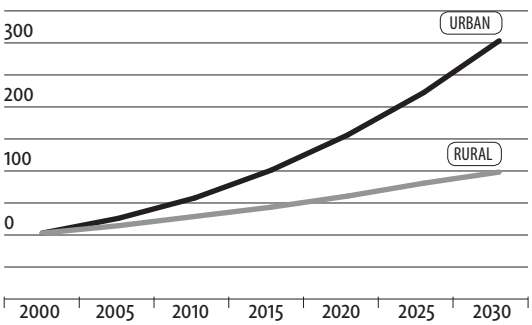
United Republic of Tanzania

An integral part of the urban food system, horticulture is expanding as cities grow

Key data

Total area	947 300 sq km
Total population	46 218 000
Urban population	12 351 000 (26.7%)
Poverty rate	87.9%
Urban poverty rate	n.a.
GDP per capita	US$524
Proportion undernourished	34%
Child mortality rate	76/1000
Life expectancy at birth	55 years
Human Development Index ranking	152/187

Population growth, 2000-2030 (percent)



The population of the United Republic of Tanzania stood at 46.2 million in 2011 and is growing at an annual rate of 3 percent. While almost three out of every four Tanzanians live in rural areas, current urban growth is close to 5 percent a year. At that rate, the population of cities and towns, now numbering more than 12 million, is expected to reach 30.2 million in 2030.

The country's urban areas face enormous problems of unemployment, poverty, lack of basic services and environmental degradation. In the largest city, Dar es Salaam, an estimated 16 percent of residents live below the poverty line, while the poverty rate in other urban areas is put at around 24 percent. In Zanzibar, urban poverty has increased owing mainly to steep increases in the cost of food.

While no systematic survey of UPH, at city or national levels, has been made over the past decade, it is believed that urban agriculture employs more urban residents than any other sector of the informal economy. A study of horticulture in Dar es Salaam, conducted in 2000, found it being practised throughout the city, over an area estimated then at 650 ha. As the city has grown, from 2.1 million inhabitants in 2000 to 3.6 million in 2011, UPH has also expanded. Even in densely populated areas, horticulture is a common land use, while in lower density areas, residents keep

Technical support for fruit and vegetable growers is inadequate. While the agricultural extension system uses farmer field schools, the main beneficiaries are rural producers.

livestock and grow fruit and vegetables around their homes. School and factory grounds are used for market gardening. The same scale and intensity of UPH is found in other cities, such as Arusha, Mbeya and Morogoro, and food production is widespread in Stone Town, the historic core of Zanzibar City.

On the mainland, urban dwellers practise short-cycle production of highly perishable leafy vegetables, including amaranth, Chinese cabbage, African kale, Swiss chard and the leaves of sweet potatoes, pumpkins, cassava and cowpea. Production is very low-tech, requiring little more than a hoe and a watering can. A promising new trend among inner city residents is fungiculture, which is practised indoors and uses locally available crop residues as growing substrates.

Non-leafy vegetables, such as tomatoes, eggplants and okra, are grown mainly on larger peri-urban plots, along with fruit trees, maize, cassava and rice. While some growers water their crops through hoses or pipes, they rarely have access to advanced irrigation systems. Soil fertilization depends heavily on poultry manure, and there are well-established bartering arrangements among poultry keepers and vegetable growers.

The majority of urban horticulturalists are women, who are most active in home gardening, while males are more often engaged in open-space and peri-urban commercial production. Produce is grown for both household consumption and sale. It was estimated in 1997 that urban and peri-urban gardens in Dar es Salaam supplied the city with about 60 000 tonnes of leafy vegetables and 25 000 tonnes of non-leafy vegetables per year.

Urban agriculture is a profitable enterprise for both low-income residents and large agribusinesses, and generates income for an estimated 30 percent of Dar es Salaam's households. It has diversified the city's economic base, provides informal employment for settlers from rural areas, and is a reliable source of income during economic downturns. It has also stimulated the development of micro-enterprises that supply agricultural inputs. In the United Republic of Tanzania, therefore, urban food production is not a relic of the past; it is an integral part of the urban food system and is expanding as cities themselves grow.

Urban agriculture has long been recognized in national legislation and development strategies. The Town and Planning Ordinance of 1992 defines "urban farming" as plant and animal husbandry within statutory township boundaries and sets a limit of 1.2 ha of land per urban farmer. The Agricultural and Livestock Policy of 1997 states that urban agriculture "has the potential to provide employment and income and is a supplementary source of food supply". Political and institutional

support to UPH is, however, still very limited. Chief among the constraints to its development is the lack of clear policies and guidelines for the sector, particularly on the zoning of land for vegetable growing. In and around Dar es Salaam, an estimated 900 sq km are suitable for agriculture, but urban planners tend to favour allocation of land to housing rather than to vegetable growing or other agricultural activities.

UPH is, therefore, often practised illegally on government- and privately owned land, especially in inner city areas (in peri-urban areas, informal agreements with land owners usually provide growers with greater security of tenure). Since the town water supply is often unreliable and too costly to use for irrigation, many urban gardeners resort to untreated wastewater from streams and drains. Urban pollution, excessive use of pesticides, and reliance on unsafe water pose increasing risks to consumer health. Quality and safety standards for fresh fruit and vegetables exist, but enforcement is weak.

Technical support for fruit and vegetable growers is also inadequate. While the agricultural extension system uses farmer field schools and farmer-to-farmers extension methods, the main beneficiaries are rural producers. Owing to a lack of storage and processing facilities, growers suffer high post-harvest losses, and are usually forced to sell produce immediately after the harvest, when prices are falling.

There is a growing awareness of the important role that UPH could play in the United Republic of Tanzania's urban development. In order to realize the sector's potential, however, it must be fully recognized as a legitimate land use in all cities, and supported by policies that promote environmentally sound horticultural practices.

That will require the integration of horticulture into urban planning and stricter regulation of the sector. Specific zones need to be allocated for UPH, and by-laws and regulations should be clearly documented and explained to stakeholders. Extension services should work with peri-urban commercial growers to increase productivity and ensure produce safety. Training should focus on good agricultural and post-harvest practices, including mixed cropping systems and crop rotation, the use of organic fertilizer, and integrated pest management. Improving peri-urban market gardeners' access to credit is essential for increasing production.

Urban and peri-urban growers already have a competitive advantage over rural producers in accessing city markets for fresh leafy vegetables, mushrooms, herbs and flowers. But public investment in logistics and quality control is needed to connect them to horticulture value chains and to new markets, such as supermarkets and hotels. Finally, there is a clear need to conduct a new, detailed survey of UPH in the country's towns and cities in order to inform policymaking and provide the sector with the adequate institutional and technical support.

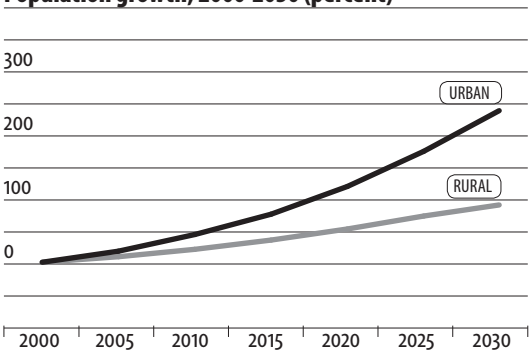
Zambia

Backyard vegetable gardens help low-income households to make ends meet

Key data

Total area	752 610 sq km
Total population	13 475 000
Urban population	5 276 000 (39.2%)
Poverty rate	82.6%
Urban poverty rate	26.7%
GDP per capita	US$1 253
Proportion undernourished	44%
Child mortality rate	111/1000
Life expectancy at birth	48 years
Human Development Index ranking	164/187

Population growth, 2000-2030 (percent)



On the crest of a copper export boom, Zambian cities were among the world's fastest growing in the immediate post-colonial years. However, a protracted economic crisis beginning in the 1980s slowed the rate of urbanization significantly, from an annual increase of around 8 percent in 1965 to just 1.4 percent by 2000. In Lusaka, the peak of the crisis saw an explosion of food production, characterized by abundant fields of maize, to the point where the city was described as "the capital of urban agriculture in Africa". In the 1990s, subsistence agriculture accounted for about one-third of the food supply in its peripheral townships.

Following a period of stabilization and structural adjustment, urbanization is now accelerating and the country's urban population is projected to more than double, to 11.8 million people, between 2010 and 2030. In Lusaka, growth is driven by high rates of migration from other parts of the country and is accompanied by rising levels of poverty. Most Lusaka residents live in poorly serviced townships and, owing to the decline in wage employment, work in the informal sector.

A study in 2004 estimated that more than 25 percent of Zambia's urban households were engaged in food production of some kind. A survey in Lusaka in 2005 showed that 90 percent of urban residents practising agriculture were women and that, for

Lusaka lacks well managed marketing facilities for vegetable wholesaling. A study in 2010 found that the city's sprawling Soweto market had almost no infrastructure suitable for fresh produce.

the majority, the activity provided from one quarter to one half of household income. About 70 percent of growers were cultivating small fields of less than 0.5 ha, usually on land belonging to the city council or private individuals.

A more recent survey of 400 urban farming households in four cities – Lusaka, Kabwe, Kitwe and Ndola – found that the most common form of agriculture was backyard gardening and crop production on communal land. While the crop most frequently cultivated was maize, half the production consisted of horticultural crops, mainly pumpkins, beans, onions, rape, tomatoes, groundnuts, sweet potatoes and Chinese cabbage.

The households were typically large, with low levels of education, and more than half were cultivating at least some land they did not own. While many growers held other jobs in the formal or informal economy, their average monthly income was less than the US$400 required to meet the basic needs of a family of six. The survey showed how food production was an important household strategy for ensuring food security and saving money: 80 percent of families consumed from 80 to 100 percent of what they grew, allowing them to reduce significantly their spending on food for an average of 3.2 months each year. The high proportion of produce consumed in all four cities was ascribed to the fact that most households were poor and grew crops primarily for subsistence.

However, in many households, urban agriculture not only met family food and nutritional needs, but produced a surplus, which was sold on the open market. The volume of sales is unknown, but recent research indicates that it is "meaningful": 80 percent of Lusaka's supply of the green leafy vegetable rape is produced locally and marketed mainly through a network of small vendors operating along city streets and in residential neighbourhoods.

It is estimated that urban growers' annual profits range from US$67 in Lusaka to US$230 in Kabwe, where larger areas of land are available for cultivation. Revenue from sales accounts for 18 percent of annual household income in Lusaka and about 50 percent in Kabwe, Kitwe and Ndola. The survey concluded that, if properly integrated into urban development plans, agriculture could help significantly in alleviating income poverty.

Achieving that integration is a major challenge in Lusaka, where urbanization threatens most agricultural activities, including horticulture. Lack of land now prevents many residents of overcrowded townships from growing vegetables. The city's gardeners complain about the high cost of town water, and in some areas they are using untreated wastewater to irrigate crops. The city also lacks well managed marketing facilities for vegetable

wholesaling. A study in 2010 found that Lusaka's sprawling Soweto market had almost no infrastructure specifically suited to fresh produce. Nearly all wholesaling took place in an uncovered dirt field at one end of the market complex, with no dedicated entry and exit points, very limited storage capacity, and no cold storage of any kind.

The growing shortage of urban land and water for horticulture reflects the lack of clear national policies for the sector. The National Agricultural Policy, 2002-2010, makes little mention of horticulture in general and completely ignores urban and peri-urban horticulture.

Many city administrations are ambivalent about urban farming. While it is regarded as illegal under the Public Health Act, regulations are seldom enforced. At the same time, Lusaka has not integrated allotment gardens into its land use planning, although they are provided for by Local Government Acts. Planners in Lusaka say there is insufficient land for allotment gardening and that, in any case, it would not make a meaningful contribution to the city's food supply.

Although some 4 000 ha of land in and around Lusaka are suitable for "cultivation and plantation", a recent council planning report states that "there is little scope for long-term growth" of urban agriculture. A more optimistic view has been taken by the city council of Ndola, Zambia's third largest city, where food crops are widely cultivated in backyards and forest reserves, along roads and river banks, and on rented plots and small holdings.

Following multi-stakeholder consultations in 2008, the council has prepared an urban agriculture policy that will incorporate crop and livestock production as a legitimate land use into the city's strategic plan.

Bibliography

General

Abubakari, A.-H., Husseini, R. & Addi, P.E. 2011. Strategies for minimizing health risks of wastewater for poor farmers in the urban environment. *ISHS Acta Horticulturae,* 911: 123-132. ❧ African Progress Panel. 2012. *Jobs, justice and equity. Seizing opportunities in time of global change.* Africa Progress Report 2012. Lausanne, Switzerland. ❧ Agudo, A. 2005. *Measuring intake of fruit and vegetables.* Background paper for the Joint FAO/WHO workshop on Fruit and Vegetables for Health, 1-3 September 2004, Kobe, Japan. Geneva, Switzerland, WHO. ❧ Ayieko, M.W., Tschirley, D.L. & Mathenge, M.W. 2005. *Fresh fruit and vegetable consumption patterns and supply. Chain systems in urban Kenya: Implications for policy and investment priorities.* Tegemeo Institute of Agricultural Policy and Development Working Paper, 19. Nairobi, Egerton University. ❧ Baker, J.L. 2008. *Urban poverty: A global view.* Urban papers, 5. Washington DC, The World Bank Group. ❧ Baltzer, K.T. & Hansen, H. 2011. *Agricultural input subsidies in Sub-Saharan Africa*. Evaluation study 2011(2). Ministry of Foreign Affairs of Denmark. Copenhagen, Danida. ❧ Banerjee, S. Skilling, H., Foster, V., Briceño-Garmendia, C., Morella, E. & Chfadi, T. 2008. *Urban water supply in sub-Saharan Africa.* African Infrastructure Country Diagnostic Background paper 12. Washington, DC, International Bank for Reconstruction and Development and World Bank ❧ Cissé, O., Gueye, N.F.D. & Sy, M. 2005. Institutional and legal aspects of urban agriculture in French-speaking West Africa: From marginalization to legitimization. *Environment & Urbanization,* 17(1): 143-154. ❧ Couth, R. & Trois, C. 2011. Waste management activities and carbon emissions in Africa. *Waste management,* 31: 131-137. ❧ Crush, J., Frayne, B. & McLachlan, M. 2011. *Rapid urbanization and the nutrition transition in Southern Africa.* Urban Food Security Series No. 7. Kingston, Queen's University and Cape Town, South African, African Food Security Urban Network. ❧ Crush, J. 2010. The prevalence of urban and peri-urban cultivation in contemporary Southern Africa. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ de Bon, H., Parrot, L. & Moustier, P. 2009. Sustainable urban agriculture in developing countries. A review. *Agron. Sustain. Dev.,* 30(1): 21-32. ❧ de Zeeuw, H. & Dubbeling, M. 2010. *Cities, food and agriculture: Challenges and the way forward.* RUAF working paper, 3. Leusden, the Netherlands, RUAF. ❧ Douglas, I., Alam K., Maghenda, M., McDonnell, Y., Mclean, L. & Campbell, J. 2008. Unjust waters: climate change, flooding and the urban poor in Africa. *Environ Urban,* 20: 187-205. ❧ Drechsel, P. & Dongus, S. 2010. Dynamics and sustainability of urban agriculture: Examples from sub-Saharan Africa. *Sustain Sci.,* 5: 69-78. ❧ Drechsel, P., Cofie, O. & Niang, S. 2008. Sustainability and resilience of the urban agricultural phenomenon in Africa. *In* D. Bossio & K. Geheb, eds. *Conserving land, protecting water.* Oxfordshire, UK, CAB International. ❧ Dreschel, P., Graefe, S., Sonou, M. & Cofie, O.O. 2006. *Informal irrigation in urban West Africa: An overview.* IWMI research report 102. Colombo, Sri Lanka, International Water Management Institute. ❧ Dubbeling, M. & Pasquini, M. 2010. *The growth of cities in East-Africa: Consequences for urban food supply.* Paper developed by the RUAF Foundation for the World Bank. Leusden, the Netherlands, RUAF. ❧ Economic Commission for Africa. 2012. *Economic Report on Africa 2012. Unleashing Africa's potential as a pole of global growth.* Addis Ababa. ❧ Ekelund, L. & Nyström, K. 2007. *Composting of municipal waste in South Africa: Sustainability aspects*. Uppsala, Sweden, Uppsala University. ❧ Ellis-Jones, J., Stenhouse, J., Gridley, H., Hella, J. & Onim, M. 2008. *Vegetable breeding and seed systems for poverty reduction in Africa. Baseline study on vegetable production and marketing.* Cameroon. ❧ FAO. 2003. *Food security and nutrition trends in West Africa - Challenges and the way forward*, by C. Lopriore & E. Muehlhoff. Rome. ❧ FAO. 2007. *Profitability and sustainability of urban and peri-urban agriculture.* Agricultural management, marketing and finance occasional paper, 19. Rome. ❧ FAO. 2010. *Good agricultural practices (GAP) on horticultural production for extension staff in Tanzania: Training manual*, by W. Mushobozi. FAO GAP working paper series, 13. Rome. ❧ FAO. 2010. *Growing greener cities.* Rome. ❧ FAO. 2010. *The West African regional integrated production and pest management (IPPM) programme: A case study,* by W. Settle & M. Hama Garba. Rome. ❧ FAO. 2011. *Save and Grow. A policymaker's guide to the sustainable intensification of smallholder crop production.* Rome. ❧ FAO. 2011. *The place of urban and peri-urban agriculture (UPA) in National Food Security Programmes.* Rome. ❧ FAO. 2012. FAOSTAT statistical database (http://faostat.fao.org). ❧ FAO. 2012. *Voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security.* Rome. ❧ FAO & WHO. 2005. *Fruit and vegetables for health.* Report of a Joint FAO/WHO workshop on Fruit and Vegetables for Health, 1-3 September 2004, Kobe, Japan. Rome, FAO and Geneva, Switzerland, WHO. ❧ Fotso, J.C. 2006. *Urban-rural differentials in child malnutrition:*

Trends and socioeconomic correlates in sub-Saharan Africa. APHRC working paper No. 32. Nairobi, African Population & Health Research Center. ❧ Frayne, B., Battersby-Lennard, J., Fincham, R. & Haysom, G. 2009. *Urban food security in South Africa: Case study of Cape Town, Msunduzi and Johannesburg.* Development Planning Division Working Paper Series, 15. Midrand, South Africa, DBSA. ❧ Girardet, H. 2004. *Cities people planet: Livable planet for a sustainable world.* Hoboken, USA, Wiley Academy. ❧ GlobalHort. 2011. *Food city supply in East and Southern Africa.* Concept note. Arusha, Tanzania. ❧ IAASTD. 2009. *Sub-Saharan Africa Report. Agriculture at a crossroads.* Washington DC, International Assessment of Agricultural Knowledge, Science and Technology for Development. ❧ ICRISAT. 2008. *The African Market Garden: Advanced horticulture for the poor*. Patancheru, India, International Crops Research Institute for the Semi-Arid Tropics. ❧ IFPRI. 2009. *Fertilizer subsidies in Africa. Are vouchers the answer?*, by N. Minot & T. Benson. IFPRI issue brief, 60. Washington, DC. ❧ ILO. 2009. *The informal economy in Africa: Promoting transition to formality: Challenges and strategies*. Geneva, Switzerland, International Labour Office. ❧ IITA. 2010. *Bauveria bassiana: A golden opportunity for vegetable farmers*. IITA Annual Report (available at http://annualreport.iita.org/?p=340). ❧ Lund, T. & Rahman, H. 2011. Increasing IPM knowledge through FFS in Benin. *In* M. Stoytcheva, ed. *Pesticides in the modern world – Pesticides use and management*, pp. 345-368. Rijeka, Croatia, InTech. ❧ Mabogunje, A.L. 2005. *Global urban poverty research agenda: The African case.* Paper presented at seminar on "Global urban poverty: Setting the research agenda," 15 December, 2005, Washington DC. ❧ Macassa, G., Hallqvist, J. & Lynch, J.W. 2011. Inequalities in child mortality in sub-Saharan Africa: A social epidemiologic framework. *Afr. J. Health Sci.,* 18: 14-26. ❧ Mbiba, B. 2000. Urban agriculture in Harare: Between suspicion and repression. *In* N. Bakker, M. Dubbeling, S. Gundel, U. Sabel-Koschella & H. de Zeeuw, eds. *Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda,* pp. 285-301. Feldafing, Germany, Deutsche Stiftung fur Internationale Entwicklung (DSE). ❧ Morella, E., Foster, V. & Ghosh Banerjee, S. 2008. *Climbing the ladder: The state of sanitation in sub-Saharan Africa.* African Infrastructure Country Diagnostic Background paper 13. Washington, DC, International Bank for Reconstruction and Development and World Bank. ❧ Potts, D. 2012. *Whatever happened to Africa's rapid urbanisation.* London, Africa Research Institute. ❧ Pretty, J.N., Noble, A.D., Bossio, D., Dixon, J., Hine, R.E., Penning de Vries, F.W.T. & Morison, J.I.L. 2006. Resource-conserving agriculture increases yields in developing countries. *Environmental science & technology,* 40(4): 1114-1119. ❧ Pretty, J., Toulmin, C. & Williams, S. 2011. Sustainable intensification in African agriculture. *International Journal of Agricultural Sustainability,* 9(1): 5-24. ❧ Ravallion, M., Chen, S. & Sangraula, P. 2007. *New evidence on the urbanization of global poverty.* Policy Research Paper No. 4199. Washington, DC, World Bank. ❧ RUAF. 2010. From seed to table. Developing urban agriculture value chains. *UA Magazine,* 24. ❧ Ruel, M.T., Garrett, J.L., Hawkes, C. & Cohen, M.J. 2009. The food, fuel, and financial crises affect the urban and rural poor disproportionately: A review of the evidence. *J. Nutr., Supplement: The impact of climate change, the economic crisis, and the increase in food prices on malnutrition*. DOI: 10.3945/jn.109.110791 ❧ Ruel, M.T., Garrett, J.L., Morris, S.S., Maxwell, D., Oshaung, A., Engle, P., Menon, P., Slack, A. & Haddad, L. 1998. *Urban Challenges to Food and Nutrition Security: A Review of Food Security, Health, and Caregiving in the Cities*. FCND Discussion Paper No. 51. Washington, DC, IFPRI. ❧ Ruel, M.T., Minot, N. & Smith, L. 2005. *Patterns and determinants of fruit and vegetable consumption in sub-Saharan Africa: a multicountry comparison.* Background paper for the Joint FAO/WHO workshop on Fruit and Vegetables for Health, 1-3 September 2004, Kobe, Japan. Geneva, Switzerland, WHO. ❧ Sharholy, M., Ahmad, K., Mahmood, G. & Trivedi, R.C. 2008. Municipal solid waste management in Indian cities – A review. *Waste management*, 28: 459-467. ❧ Strauss, M. 2000. *Human waste (excreta and wastewater) reuse*. Contribution to ETC/SIDA Bibliography on Urban Agriculture. Suebendorf, Switzerland, EAWAG/SANDEC ❧ Tamò, M. 2012. Farmers in Africa should switch to biopesticides. *SciDevNet* (available at). ❧ UNEP. 2010. *Waste and climate change: Global trends and strategy framework.* Nairobi. ❧ UN-HABITAT. 2008. *The state of African cities 2008: A framework for addressing urban challenges in Africa.* Nairobi. ❧ UN-HABITAT. 2009. *Global report on human settlements 2009. Planning sustainable cities.* Nairobi. ❧ UN-HABITAT. 2010. *State of the world's cities 2010/2011. Bridging the urban divide.* Nairobi, UN-HABITAT and London, Earthscan. ❧ UN-HABITAT. 2010. *The state of African cities 2010. Governance, inequality and urban land markets.* Nairobi. ❧ UNIDO. 2004. *Small-scale fruit and vegetable processing and products. Production methods, equipment and quality assurance practices,* by P. Fellows. Vienna. ❧ UNICEF & WHO. 2012. *Progress on drinking water and sanitation. 2012 update.* New York, USA. ❧ United Nations. 2012. *World urbanization prospects, the 2011 revision population database* (http://esa.un.org/unpd/wup/unup/). ❧ United Nations System High Level Task Force on the Global Food Security Crisis. 2010. *Updated comprehensive framework for action.* New York, USA. ❧ Van Mele, P. Ugen, M.A., Wanyama, D., Anyang, R., Rubyogo, J.C. & Sperling, L. 2011. Uganda: Dreams of starting a company. *In* P. Van Mele, J.W. Bentley & R.G. Guéi. *African seed enterprises: Sowing the seeds of*

food security. Rome, FAO, Cotonou, AfricaRice and Oxfordshire, UK, CAB International. ❧ WHO. 2003. *Diet, nutrition and the prevention of chronic diseases: Report of a joint WHO/FAO expert consultation.* WHO Technical Report Series, 916. Geneva, Switzerland. ❧ WHO. 2009. *World Health Organization, Africa region.* Johannesburg, South Africa. ❧ WHO & FAO. 2003. *Diet, nutrition and the prevention of chronic diseases.* Report of a joint WHO/FAO expert consultation. WHO Technical report series, 916. Geneva, Switzerland. ❧ Wolfram, C., Shelef, O. & Gertler, P. 2012. How will energy demand develop in the developing world? *Journal of Economic Perspectives,* 26(1): 119–138. ❧ World Bank. 2008. *Africa infrastructure country diagnostic. Urban water supply in sub-Saharan Africa*, by S. Banerjee, H. Skilling, V. Foster, C. Briceño-Garmendia, E. Morella & T. Chfadi. Summary background paper. Washington, DC. ❧ World Bank. 2009. *Reshaping Economic Geography.* World development report. Washington DC, International Bank for Reconstruction and Development / World Bank. ❧ World Bank. 2010. *Improving wastewater use in agriculture: An emerging priority.* Energy Transport and Water Department Water Anchor (ETWWA). Washington, DC. ❧ World Bank. 2010. *World Development Indicators*. Washington DC. ❧ Ziraba, A.K., Fotso, J.C. & Ochako, R. 2009. Overweight and obesity in urban Africa: A problem of the rich or the poor? *BMC Public Health*, 9(465).

Algeria

Berezowska-Azzag, E. 2007. Alger, le territoire invente son avenir. *Planum – Eur. J. Plann.*, 2(2007). ❧ Boudjenouia, A., Fleury, A. & Tacherift, A. 2008. L'agriculture périurbaine à Sétif (Algérie): Quel avenir face à la croissance urbaine? *Biotechnol. Agron. Soc. Environ.,* 12(1): 23-30. ❧ Boumansour Djaafri, R. 2005. *L'impact des plans d'urbanismes élaborés pour l'extension de la ville d'Alger et la plaine de la Mitidja sur l'étalement urbain*. Paper presented at the International seminar «Les villes au défi du développement durable: Quelle maîtrise de l'étalement urbain et des ségrégations associées?» 24-25 November 2005, Sfax, Tunisia. Groupe de Recherche en Géographie Sociale de l'Université du Maine (Gregum). ❧ Chabbi-Chemrouk, N. 2004. The impact of the French colonial legacy on Algiers urban development. *GBER*, 4(1): 15-23. ❧ Diafat, A. 2010. *A strategy for tourism and urban regeneration in Algeria*. Paper presented at Conference "Edificación sostenible: Revitalización y rehabilitación de barrios", Madrid, 28-30 April 2010 (http://www.sb10mad.com). ❧ Guillermou, Y. 1993. Paysans et pasteurs en Algérie: Réponses aux contraintes écologiques et crise des systèmes de production "traditionnels". *Ecologie humaine*, XI(2): 21-35. ❧ Khalil, F. 2011. Urban sprawl vs urban renewal: What role for town and country planning instruments in ensuring sustainable cities? Case of Algeria. *Procedia Engineering*, 21(2011): 760-766. ❧ La Mitidja, une plaine en voie de disparition. 2010. *La Tribune* (Algiers), 27 April (www.latribune-online.com/). ❧ Lakrouf, R. 2010. *Situation et réhabilitation des systèmes de production dans la zone Mitidja-Algérie.* Case study prepared for the International symposium on Urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Maachou, H.M. 2012. Agriculture and periurban landscape: The case of Oran (Algeria). *Projet de Paysage* (http://www.projetsdepaysage.fr) ❧ Mona, A. & Hadjiedj, A. 2005. Quelle politique urbaine pour la capitale? *Courrier du Savoir*, 6(2005): 7-10. ❧ Naïli, M. 2011. Nourrir les villes en Algérie: Un enjeu multidimensionnel. *Watch letter*, 18: 11-13. ❧ Office National des Statistiques de l'Algérie. 2008. Algerie. *In:* Thomas Brinkhoff – City Population (http://www.citypopulation.de). ❧ People's Democratic Republic of Algeria. 2009. *Journal officiel de la République algérienne démocratique et populaire*, No. 61. Décret exécutif n° 09-339 (http://www.univ-alger.dz). ❧ People's Democratic Republic of Algeria. 2011. *Journal officiel de la République algérienne démocratique et populaire*, No. 39. Décret exécutif n° 11-23711 (http://www.univ-alger.dz). ❧ People's Democratic Republic of Algeria. Ministry of Physical Planning and Environment. 2011. *Schéma National d'Aménagement du Territoire: Le racines du futur.* Algiers. ❧ People's Democratic Republic of Algeria. Ministry of Physical Planning, Environment and Tourism. 2008. *La mise en œuvre du schéma national d'aménagement du territoire (SNAT) 2025*. Document de Synthèse, February 2008. Algiers. ❧ Saadi, S. 2011. *Développement de la zone périurbaine du Grand Alger.* Informal Settlement Issues, Spatial Development, Planning and Governance. FIG Working Week 2011 - Bridging the Gap between Cultures, Marrakech, Morocco, 18-22 May 2011. ❧ UNESCO. 1996. *Urbanization and urban research in the Arab world*, by M. Kharoufi. Management of Social Transformations (MOST) Discussion paper series, 11. Paris. ❧ United States Trade and Development Agency. 2010. *Algeria - Oran wastewater tertiary treatment facility feasibility study* (https://www.fbo.gov).

Benin

Adorgloh-Hessou, R. 2006. *Guide pour le développement de l'entreprise de production et de commercialisation de légumes de qualité dans les régions urbaines et périurbaines du Sud-Bénin*. Consultation report. Cotonou, IITA. ❧ Agossou, G., Ahouansou, T. & Assogba-Komlan, F. 2001. *Étude sur la promotion de la filière des cultures maraîchères au Bénin*. Final Report. Cotonou, PCM/INRAB/MAEP. ❧ Assogba Komlan, F. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) au Bénin.* Document prepared for the

International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Assogba Komlan, F., Azihou, F. & Johnson, J.-M. 2010. *La situation de l'horticulture urbaine et périurbaine au Bénin.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Assogba-Komlan, F., Anihouvi, P., Achigan, E., Sikirou, R., Boko, A., Vodouhe, R. & Assa, A. 2007. Pratiques culturales et teneur en éléments anti-nutritionnels (nitrates et pesticides) du *Solanum macrocarpum* au Sud du Bénin. *Afr. J. Food, Agric., Nutr. Dev.*, 7(4): 1-27. ❧ Déguenon, E. 2005. *Problématique foncière et développement de l'agriculture urbaine à Cotonou et environs: L'expérience de l'Union Communale des Producteurs de Cotonou en matière de recherche de solution, leçons à tirer et propositions d'actions pour développer une agriculture urbaine et périurbaine durable*. Cotonou, Chambre d'Agriculture. ❧ Drechsel, P., Graefe, S., Sonou, M. & Cofie, O.O. 2006. *Informal irrigation in urban West Africa: An overview.* IWMI research report 102. Colombo, Sri Lanka, IWMI. ❧ Hounkpodote, M. & Tossou, C. 2001. *Profil des interactions entre la problématique foncière et le développement de l'agriculture urbaine dans la ville de Cotonou et environs*. Final study report. Dakar, Institut Africain de Gestion Urbaine (IAGU) and Cotonou, Chambre nationale d'agriculture du Bénin. ❧ IMF. 2011. *Benin: Poverty reduction strategy paper.* IMF Country report No. 11/307. Washington, DC. ❧ Kakai, S.H., Kakai, S.A. & Tohouegnon, A.G. 2010. Agriculture urbaine et valorisation des déchets au Bénin: Une approche de développement durable. *VertigO*, 10(2). DOI: 10.4000/vertigo.9994 ❧ Lund, T. & Rahman, H. 2011. Increasing IPM knowledge through FFS in Benin. *In* M. Stoytcheva, ed. *Pesticides in the modern world – Pesticides use and management*, pp. 345-368. Rijeka, Croatia, InTech. ❧ Mensah, C. 1998. *Problèmes d'assainissement dans une ville moyenne du Bénin: Cas d'Abomey-Calavi*. Cotonou, Université d'Abomey-Calavi. (MA thesis) ❧ Republic of Benin. Ministry of agriculture, livestock and fisheries. 2010. *Plan stratégique de relance du secteur agricole (PSRSA)*. Cotonou. ❧ Republic of Benin. Ministry of agriculture, livestock and fisheries (MAEP)/ Programme d'Appui au Développement Agricole Périurbain au Sud-Bénin (PADAP). 2003. *Étude de faisabilité,* 2. Cotonou, MAEP/IIED. ❧ Saethre, M.-G., Svendsen, N.O., Holen, B., Assogba-Komlan, F. & Godonou, I. 2011. Pesticides residues analysis of three vegetable crops for urban consumers in Benin. *Bioforsk Report*, 6(40). ❧ Soumahoro, S. 1999. *Agriculture et emploi des jeunes: Cas de la production maraîchère à Cotonou et dans ses quartiers périphériques*. Cotonou, Faculty of Agricultural Sciences of the National University of Benin. (PhD thesis) ❧ Tokanou, R. & Quenum, R. 2007. *Étude sur le sous secteur du maraîchage au Sud-Bénin*. Final Report. Cotonou, MAEP. ❧ World Bank. 2010. *Project appraisal document on Benin: Agricultural productivity and diversification project*. Report No. 57177-BJ. Washington, DC.

Burundi

FAO. 2011. *Rapport de progrès du projet: Appui au développement de l'horticulture urbaine et péri-urbaine.* Rome. ❧ Niyongere, C. 2010. *La situation de l'horticulture urbaine et périurbaine en Afrique (SOUPHA) : Cas du Burundi.* Case study prepared for the International symposium on Urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Niyongere, C. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) au Burundi.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Republic of Burundi & FAO. 2009. *Programme nationale de sécurité alimentaire 2009-2015 (PNSA)*. Bujumbura. ❧ Republic of Burundi & FAO. Ministry of Agriculture and Livestock. 2011. *Projet HUP: FBPP/GLO/013/ BEL – Appui au développement de l'horticulture urbaine et péri-urbaine (HUP).* Bujumbura. ❧ Republic of Burundi. Ministry of Agriculture and Livestock & Municipal horticultural office (BMH) of Bujumbura. 2011. *Réalisations du BMH avec l'appui du projet FBPP/GLO/013/ BEL*. Bujumbura. ❧ World Food Programme. 2008. *Vulnerability and food insecurity in three urban areas of Burundi: An assessment of the impact of high prices on households in Bujumbura Mairie, Ngozi and Gitega cities.* Bujumbura.

Cameroon

Antonio-Nkondjio, C., Fossog, B.T., Ndo, C., Djantio, B.M., Togouet, S.Z., Awono-Ambene, P., Costantini, C., Wondji, C.S. & Ranson, H. 2011. *Anopheles gambiae* distribution and insecticide resistance in the cities of Douala and Yaoundé (Cameroon): Influence of urban agriculture and pollution. *Malar. J.*, 10:154. ❧ Bella Manga, F. 2010. *La situation de l'horticulture urbaine et périurbaine au Cameroun.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Bella Manga, F. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) au Cameroon.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Bopda, A.P. & Awono, L. 2010. Institutional development of urban agriculture – An ongoing history of Yaoundé. *In* G. Prain, N. Karanja, & D. Lee-Smith, eds.

African urban harvest: Agriculture in the cities of Cameroon, Kenya and Uganda. Ottawa, IDRC and Lima, CIP. ❧ Bopda, A.P., Brummett, R., Dury, S., Elong, P., Foto-Menbohan, S., Gockowski, J., Kana, C., Kengue, J., Ngonthe, R., Nolte, C., Soua, N., Tanawa, E., Tchouendjeu, Z. & Temple, L. 2010. Urban farming systems in Yaoundé – Building a Mosaic. *In* G. Prain, N. Karanja, & D. Lee-Smith, eds. *African urban harvest: Agriculture in the cities of Cameroon, Kenya and Uganda*. Ottawa, IDRC and Lima, CIP. ❧ Djuikom, E., Njine, T., Nola, M., Sikati, V. & Jugnia, L.-B. 2006. Microbiological water quality of the Mfoundi river watershed at Yaoundé, Cameroon, as inferred from indicator bacteria of fecal contamination. *Environ. Monit. Assess.,* 122**:** 171–183. ❧ Dongmo, T., Meffeja, F., Fotso, J.M. & Nolte, C. 2010. Crop–Livestock integration in the urban farming systems of Yaoundé. *In* G. Prain, N. Karanja, & D. Lee-Smith, eds. *African urban harvest: Agriculture in the cities of Cameroon, Kenya and Uganda*. Ottawa, IDRC and Lima, CIP. ❧ Endamana, D., Kengne, I.M., Gockowski, J., Nya, J., Wandji, D., Nyemeck, J., Soua, N.N. & Bakwowi, J.N. 2003. Wastewater reuse for urban and peri-urban agriculture in Yaounde, Cameroon: Opportunities and constraints. *In* J.A. Butterworth, P.B. Moriarty, M. Venter Hildebrand, B. van Koppen, B. Schreiner & D. Versfeld, eds. *Proceedings of the International symposium on water, poverty and productive uses of water at the household level, 21-23 January 2003, Muldersdrift, South Africa*, pp. 61-69. Natural Resources Institute, IRC International Water and Sanitation Centre, Department of Water Affairs and Forestry and International Water Management Institute. ❧ FAO & Republic of Cameroon. Ministry of Agriculture and Rural Development. 2011. *Stratégie nationale de développement de l'horticulture urbaine et périurbaine au Cameroun,* by B. Ngniado & T. Ondoa Manga. Yaoundé. ❧ Gockowski, J., Mbazo'o, J., Mbah, G. & Fouda Moulende, T. 2003. African traditional leafy vegetables and the urban and peri-urban poor. *Food Policy*, 28(3): 221–235. ❧ Guévart, E., Noeske, J., Solle, J., Essomba, J.M., Edjenguele, M., Bita, A., Mouangue, A. & Manga, B. 2006. Factors contributing to endemic cholera in Douala, Cameroon. *Med Trop (Mars)*, 66(3): 283-291. ❧ Nguegang, P.A. 2008. *L'agriculture urbaine et périurbaine à Yaoundé: Analyse multifonctionnelle d'une activité montante en économie de survie.* Bruxelles, Université Libre de Bruxelles. (PhD thesis) ❧ Nguendo Yongsi, H.B. 2011. Access and management of drinking water in developing cities: Evidence from Yaoundé (Cameroon). *Res. J. Environ. Sci.,* 5(2): 124-133. ❧ Nguendo Yongsi, H.B., Ntetu Lutumba, A., Bryant, R.C., Ojuku, T. & Hermann, T.M. 2009. Uncontrolled draining of rainwater and health. Consequences in Yaoundé - Cameroon. *Acta Universitaria*, 19(2): 20-30. ❧ Prain, G. & Lee-Smith, D. 2010. Urban agriculture in Africa: What has been learned? *In* G. Prain, N. Karanja & D. Lee-Smith, eds. *African urban harvest: Agriculture in the cities of Cameroon, Kenya and Uganda*. Ottawa, IDRC and Lima, CIP. ❧ Republic of Cameroon. 2009. *Growth and employment strategy paper, 2010/2020.* Yaoundé.

Cape Verde

Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS) & Sahel and West Africa Club (CSAO/OCDE). 2009. *Profil sécurité alimentaire: Cap Vert.* Final report. Ouagadougou and Paris (www.food-security.net). ❧ Economic Community of West African States (ECOWAS), Republic of Cape Verde & African Union. 2009. *Cap Vert - PNIA Programme 1. Amélioration de la gestion de l'eau*. Brief 1. Abuja, Praia and Addis Ababa. ❧ Economic Community of West African States (ECOWAS), Republic of Cape Verde & African Union. 2009. *Cap Vert - PNIA Programme 2. Développement des filières agricoles et promotion des marches*. Brief 2. Abuja, Praia and Addis Ababa. ❧ FAO. 2012. *Country fact sheet: Cape Verde*. AQUASTAT global information system on water and agriculture. Rome. ❧ FAO & Republic of Cape Verde. 2011. *Mise en oeuvre des installations hydroponiques pilotes au Cap-Vert* (TCP/CVI/3304). Technical cooperation programme project. Rome. ❧ International Development Association & International Monetary Fund. 2008. *Cape Verde: Growth and Poverty Reduction Strategy Paper II (2008–11).* Washington D.C., IMF and World Bank. ❧ Mitchell, J. 2008. *Tourist Development in Cape Verde: The policy challenge of coping with success.* Report on the tourism component of the Cape Verde Diagnostic Trade Integration Study of the Integrated Framework for trade-related technical assistance to Least Developed Countries, coordinated by the United Nations Development Programme. London, Overseas Development Institute. ❧ Pereira Rodrigues Silva, E.M. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) au Cap Vert.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Republic of Cape Verde. Ministry of Environment, Agriculture and Fisheries. 2008. *Suivi de l'application du Plan d'action du Sommet mondial de l'alimentation. Rapport national: Cap Vert.* Praia. ❧ Republic of Cape Verde. Ministry of Finance and Planning. 2004. *Growth and poverty reduction strategy paper (GPRSP).* Praia. ❧ Republic of Cape Verde. Ministry of Finance, National Planning Department. 2010. *Cape Verde: Global report on the progress of execution of the Growth and Poverty Reduction Strategy (GPRSP II) 2009.* Praia. ❧ Silva, J.H.C. 2009. *Importância da horticultura para a segurança alimentar*

em Cabo Verde - Estudo de caso na Ilha do Fogo. Lisbon, Instituto Superior de Agronomia, Universidade Técnica de Lisboa. (MA Thesis) ❧ World Bank. 2010. *Cape Verde: Initial assessment of the formal labor market*. Report No. 58551-CV. Washington, DC. ❧ World Bank. 2012. *Cape Verde: Country Brief* (http://go.worldbank.org).

Central African Republic

Central African Republic. 2011. *Poverty reduction strategy paper II 2011-2015: Reducing extreme poverty*. Bangui. ❧ Central African Republic. Ministry of rural development and agriculture. 2011. *Stratégie de développement rural, de l'agriculture et de la sécurité alimentaire (SDRASA) 2011 – 2015*. Bangui. ❧ Hovorka, A. J. 2003. Gender and urban agriculture: Emerging trends and areas for future research. *In* W. Bruinsma & W. Hertog, eds. *Annotated bibliography on urban agriculture,* pp. 280-290. Leusden, The Netherlands, ETC-RUAF and Washington, DC, TUAN. ❧ Kennedy, G., Nantel, G., Brouwer, I.D. & Kok, F.J. 2006. Does living in an urban environment confer advantages for childhood nutritional status? Analysis of disparities in nutritional status by wealth and residence in Angola, Central African Republic and Senegal. *Public Health Nutr.*, 9(2): 187-193. ❧ Magoumbala Ngoayo, W. 2010. *Rapport sur l'état de l'horticulture urbaine et périurbaine en Centrafrique.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Magoumbala Ngoayo, W. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) en Centrafrique.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Mbetid-Bessane, E. 2005. Paradoxe du marché de légumes à Bangui: Comment sécuriser les approvisionnements de la ville? *In*: *Recueil des résumés de l'atelier international - Agricultures et développement urbain en Afrique de l'ouest et du centre, 31 October-3 November, Yaoundé, Cameroon*. Montpellier, CIRAD. ❧ Ngana, F., Sougnabé, P., Gonné, B. & Ababa, A.M. 2010. Transformations foncières dans les espaces périurbains en Afrique centrale soudanienne. *In* L. Seiny-Boukar & P. Boumard, eds. *Savanes africaines en développement: Innover pour durer. PRASAC Proceedings, Garoua, Cameroon, 20-23 April 2009*. Montpellier, France, CIRAD. ❧ UNDP. 2006. *Pour une stratégie de croissance pro-pauvre et au service du développement humain: Contraintes et défis pour la République centrafricaine*, by G. Aho, ed. Canada. ❧ UNDP. 2007. *République centrafricaine: Suivi des objectifs du millénaire pour le développement*. New York, USA.

Chad

Allarangaye, M.D. 2010. *La situation de l'horticulture urbaine et périurbaine au Tchad.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Allarangaye, M.D. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) au Tchad.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Diop, A. & Richter, C. 2007. Opportunities and constraints of urban and peri-urban agriculture: A case study of vegetable production in N'Djaména. *In* E. Tielkes, ed. *Book of abstracts of Tropentag 2007, Utilisation of diversity in land use systems: Sustainable and organic approaches to meet human needs, October 9-11, 2007.* Göttingen, Germany, Cuvilier Verlag. ❧ IMF. 2010. *Chad: Poverty reduction strategy paper.* Report No. 10/230. Washington, DC. ❧ Mopate Logtene, Y. & Kabore-Zoungrana, C.-Y. 2010. Dynamique des élevages et caractéristiques des producteurs de porcs de la ville de N'Djaména, Tchad. *In* L. Seiny-Boukar & P. Boumard, eds. *Savanes africaines en développement: Innover pour durer. PRASAC Proceedings, Garoua, Cameroun, 20-23 April 2009.* Montpellier, France, CIRAD. ❧ Republic of Chad. 2010. *Programme national de sécurité alimentaire, 2011-2015*. N'Djaména. ❧ Sougnabé, S.P.,Yandia, A., Acheleke, J., Brevault, T., Vaissayre, M. & Ngartoubam, L. 2010. Farmers' phytosanitary practices in the savannahs in central Africa. *In* L. Seiny-Boukar & P. Boumard, eds. *Savanes africaines en développement: Innover pour durer. PRASAC Proceedings, Garoua, Cameroon, 20-23 April 2009.* Montpellier, France, CIRAD.

Republic of the Congo

Benani Hauri, I. 1993. *Agricongo: Un modèle de recherché dans le développement.* Paris, Centre de Documentation Internationale pour le Développement les Libertés et la Paix (http://base.d-p-h.info). ❧ Congo-Site. 2011. *Le jardin d'essai municipal de Brazzaville bientôt réhabilité* (http://www.congo-site.com). ❧ Elenga, F. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) en République du Congo.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Elenga, F. & Ngatse, J.M. 2010. *Rapport sur la situation actuelle de l'horticulture urbaine et périurbaine en République du Congo.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Gaye, A. 1999. L'approvisionnement des marches de détail. *In* P. Moustier, ed. *Filières maraîchères à Brazzaville: Quantification et*

observatoire pour l'action. Montpellier, France, CIRAD. ❧ Massengo, D. & Ngoyi, J.-T. 2004. Formation au maraîchage urbain à Brazzaville, l'action d'Agricongo. *Grain de sel,* 29. ❧ Moustier, P. 1999. *Filières maraîchères à Brazzaville: Quantification et observatoire pour l'action*. Montpellier, France, CIRAD. ❧ Programme international de recherche sur les interactions entre la population, le développement et l'environnement (PRIPODE). 2006. *Brazzaville, pauvreté et problèmes environnementaux.* Paris, Committee for International Cooperation in National Research Demography (CICRED). ❧ Republic of Congo. 2008. Régime agro-foncier, No. 25 of 2008. *Journal Officiel de la République du Congo*, 39. ❧ Republic of Congo. Ministry of Agriculture and Livestock. 2006. *Programme national pour la sécurité alimentaire (PNSA) – Première phase: 2008-2012*. Brazzaville. ❧ Republic of Congo. Ministry of Planning and Territorial Development. 2010. *Status report on implementation of the poverty reduction strategy, April 2008-March 2009.* Brazzaville. ❧ Syfia International. 2009. *Renforcer la société civile congolaise en améliorant sa visibilité dans les médias et sa crédibilité: Le maraîchage, un bon métier pour les jeunes* (http://syfia.over-blog.com). ❧ Tabuna, H., Kana, R., Degrande, A. & Tchoundjeu, Z. 2009. *Business plan d'une pépinière rurale de production et de commercialisation des plants améliorés des produits forestiers non ligneux en Afrique central.* Yaoundé, World Agroforestry Centre (ICRAF). ❧ UN-HABITAT. 2012. *Republic of the Congo* (http://www.unhabitat.org). ❧ World Bank. 2011. *Congo Republic: Country brief.* Washington, DC. (http://go.worldbank.org).

Côte d'Ivoire

Appessika, K. 2003.Case study highlights: Abidjan, Côte d'Ivoire. *In* UN-HABITAT. *The challenge of slums: Global report on human settlements 2003.* London and Sterling, USA, Earthscan. ❧ Assouma, Y., Allah, F., Djidji, A.H., Fondio, L., Mahyao, A. & Kouamé, C. 2008. *Enquête sur la production et la commercialisation des légumes traditionnels dans les zones urbaines et périurbaines d'Abidjan et de Yamoussoukro en Côte d'Ivoire.* CNRA/Projet IndigenoVeg. Report, 2008. Abidjan. ❧ Deza, A.M. & Kpangni, K.A.B. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) en Côte d'Ivoire.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Fondio, L. 2007. *Caractérisation des systèmes de production de légumes feuilles en zones urbaines et périurbaines d'Abidjan et de Yamoussoukro en Côte d'Ivoire.* CNRA/Projet Fis/Coraf, Final report, 2007. Abidjan. ❧ Fondio, L., Aidara, S., Djidji, A.H., Zohouri, G.P. & Gnonhouri, P. 2001. *Diagnostic prophylactique du secteur maraîcher de la région d'Abidjan (Délégation Régionale Sud de l'ANADER): Contraintes et ébauches de solutions.* Study report. Bouaké, Côte d'Ivoire, CNRA. ❧ Fondio, L., Djidji, A.H., Deza, A.M., N'Gbesso, M., Assouma, Y., Mahyao, A. & N'zi, J.C. 2010. *La situation de l'horticulture urbaine et périurbaine en Côte d'Ivoire.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Mahyao, A. 2009. *Approvisionnement des marchés urbains en légumes feuilles: Des solutions aux attentes des acteurs.* CNRA/Projet Fis/Coraf, Assessment report, 2006-2008. Abidjan. ❧ Matthys, B., Adiko, F.A. & Cisse, G. 2006. Le réseau social des maraîchers à Abidjan agit sur la perception des préoccupations et des risques sanitaires liés à l'eau. *VertigO*, 3. DOI : 10.4000/vertigo.1857 ❧ Pasquini, M.W., Weinberger, K., Assogba-Komlan, F., Kouame, C., Akplogan, F., Djidji, H., Achigan-Dako, E.G. & Young, E.M. 2012. Characterising urban and peri-urban production systems for African indigenous vegetables in four cities in Benin and Côte d'Ivoire. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Republic of Côte d'Ivoire. Ministry of Agriculture. 2005. *Plan directeur horticole 2006-2025*. Abidjan, Belgian Technical Cooperation. ❧ Republic of Cote d'Ivoire. Ministry of Planning and Development. 2009. *Strategy for relaunching development and reducing poverty (PRSP).* Abidjan.

Democratic Republic of the Congo

Coghlan B., Brennan R.J., Ngoy, P., Dofara, D., Otto, B., Clements, M. & Stewart, T. 2006. Mortality in the Democratic Republic of Congo: A nationwide survey. *The Lancet*, 367(9504): 44-51. ❧ De Boeck, F. 2011.The modern titanic. Urban planning and everyday life in Kinshasa. *The Johannesburg Salon*, 4: 73-82. ❧ Democratic Republic of the Congo. 2006. *Poverty Reduction and Growth Strategy Paper (PRGSP)*. Kinshasa. ❧ FAO. 2010. *Growing greener cities in the Democratic Republic of the Congo.* Rome. ❧ Iyenda, G. 2005. Street enterprises, urban livelihoods and poverty in Kinshasa. *Environment and Urbanization*, 17(2005): 55. ❧ Kandala, N.B., Madungu, T.P., Emina, J.B.O., Nzita, K.P.D. & Cappuccio, F.P. 2011. Malnutrition among children under the age of five in the Democratic Republic of Congo (DRC): Does geographic location matter? *BMC Public Health*, 11: 261. ❧ Kashimba Kayembe, G. 2007. La pression de l'aménagement de l'habitat sur l'agriculture urbaine à Kinshasa: Cas du lotissement de l'espace maraîcher Nzeza Nlandu dans la commune de Kisenso. Université de Kinshasa. Mémoire présenté et défendu en vue de l'obtention du titre de Licencié en Sciences. *Mémoire Online* (http://www.memoireonline.com). ❧ Kifuani, K.M. 2008. Wastewater use and urban agriculture in Kinshasa, DR Congo. *In* M. Redwood,

ed. *Agriculture in urban planning: Generating livelihoods and food security*. London, Earthscan and Ottawa, IDRC. ❧ Lallau, B. & Dumbi, C. 2007. Can survival market-gardening be sustainable? Some evidence from Kinshasa (Democratic Republic of the Congo). *Cahiers Agricultures,* 16(6): 485-90. ❧ Mpanzu Balomba, P. 2005. *Microfinance en République Démocratique du Congo: Cas du site maraîcher de N'djili/CECOMAF à Kinshasa*. Faculté Universitaire des Sciences Agronomiques de Gembloux (FUSAGx) et Université Catholique de Louvain (UCL). *Mémoire Online* (http://www.memoireonline.com). ❧ Mutshail Mutomb, G. 2010. *La situation de l'horticulture urbaine et périurbaine en République Démocratique du Congo.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Mutshail Mutomb, G. 2010. *Aperçu technologique sur l'horticulture urbaine et périurbaine de la RDC / Cas de la ville de Lubumbashi.* Lubumbashi, Service National d'Appui au Développement de l'Horticulture urbaine et périurbaine. ❧ Mutshail Mutomb, G. & Bureau Municipal d'Horticulture de Kisangani. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) en République Démocratique du Congo.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Muzingu Nzolameso, B. 2005. Agriculture urbaine à Kinshasa: Alternative à l'insecurite alimentaire. Université Catholique de Louvain, Université de Liège, Fondation Universitaire Luxembourgeoise. *Mémoire Online* (http://www.memoireonline.com). ❧ Muzingu Nzolameso, B. 2008. Comportement organisationnel des sites maraîchers cooperativises vis à vis des contraintes environnementales. *In* J. Nizet & F. Pichault. *Les performances des organisations africaines. Pratiques de gestion en contexte incertain*, pp. 89-106. Paris, L'Harmattan. ❧ Pourtier, R. 2008. Reconstruire le territoire pour reconstruire l'état: La RDC à la croisée des chemins. *Afrique contemporaine*, 2008/3(227): 23-52. ❧ UN-HABITAT. 2008. *Document de programme-pays 2008-2009: République démocratique du Congo.* Bureau Régional pour l'Afrique et les Pays Arabes. Nairobi. ❧ Wagemakers, I., Makangu Diki, O. & De Herdt, T. 2010. Lutte foncière dans la ville: Gouvernance de la terre agricole urbaine à Kinshasa. *In* S. Marysse, F. Reyntjens & S. Vandeginste. *L'Afrique des grands lacs: Annuaire 2009/2010,* pp. 175-200. Paris, L'Harmattan. ❧ Yeta Sukisa, M. 2008. La pression de l'habitat sur le site maraicher de Lukunga dans la commune de Ngaliema à Kinshasa: Problématique de planification urbaine et pistes d'aménagement. Université de Kinshasa. Mémoire de fin d'étude. *Mémoire Online* (http://www.memoireonline.com).

Gabon

Edou Edou, G. 2006. *Les systèmes maraîchers urbains et périurbains de Libreville*. Libreville, PADAP-DASP, IGAD. ❧ Edou Edou, G. 2009. *Le système de suivi technico-économique en 2008: Analyse des indicateurs de l'activité maraîchère en zone urbaine et périurbaine de Libreville.* Libreville, PADAP-DASP, IGAD. ❧ FAO & the New Partnership for Africa's Development (NEPAD). 2005. *Gouvernement de la République Gabonaise: Appui à la mise en œuvre du NEPAD-PDDAA*. Rome and Johannesburg. ❧ Institut Gabonais d'Appui au Développement (IGAD). 2008. *Présentation pour le Séminaire régional du RAPAC, Sao Tome e Principe, 29 Sept. - 2 Oct. 2008*. Sao Tome e Principe. ❧ Mamboungou, M. J. 2009. *Analyse socio-économique de l'impact de l'IGAD dans la province de l'Estuaire*. Ouagadougou, Mémoire Université Polytechnique de Bobo-Dioulasso/Institut de Développement Rural, and Libreville, IGAD. ❧ Nondah, T. 2010. *Situation de l'horticulture urbaine et périurbaine en Afrique: Rapport du Gabon.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Nondah, T. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) au Gabon.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Organisation for Economic Co-Operation and Development (OECD) & African Development Bank(AfDB). 2007. Benin: Country notes. *In: African Economic Outlook 2007.* Paris and Abidjan, Côte d'Ivoire.

Ghana

Adeoti, A., Cofie, O. & Oladele, O. 2012. Gender analysis of the contribution of urban agriculture to sustainable livelihoods in Accra, Ghana. *J. Sustainable Agric.*, 36: 236–248. ❧ Amoah, P., Drechsel, P., Abaidoo, R.C. & Ntow, W.J. 2005. Pesticide and pathogen contamination of vegetables in Ghana's urban markets. *Arch. Environ. Contam. Toxicol.,* 50: 1–6. ❧ Amoako, P., Kumah, P. & Appiah, F. 2012. Pesticides usage in cabbage (*Brassica oleracea*) cultivation in the forest ecozone of Ghana. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Buechler S., Devi G., Mekala & Keraita B. 2006. Wastewater Use for Urban and Peri-urban Agriculture. *In* R. van Veenhuizen, ed. *Cities farming for the future: Urban agriculture for green and productive cities,* pp. 241-272. Philippines, IIRR/RUAF/IDRC. ❧ Cofie, O. 2010. *Emerging issues in urban and peri-urban agriculture (UPA) in West Africa: Briefing Note.* Accra, IWMI. ❧ Cofie, O., Danso,

G., Larbi, T., Kufogbe, S.K., Obiri-opareh, N., Abraham, E., Schuetz, T. & Forkuor, G. 2008. *Livelihood support potentials and policy issues for urban agriculture in Accra, Ghana*. Accra, RUAF and IWMI. ❧ Cofie, O. 2012. *Emerging issues in urban and peri-urban agriculture (UPA) in West Africa: Briefing note.* Colombo, Sri Lanka, IWMI. ❧ Cornish, G.A., Aidoo, J.B. & Ayamba, I. 2001. *Informal irrigation in the peri-urban zone of Kumasi: An analysis of farmers' activity and productivity.* Report OD/TN 103. Wallingford, UK, HR Wallingford, and London, Department for International Development. ❧ Danso, G., Drechsel, P., Wiafe-Antwi, T., Gyiele, L. 2002. Income of Farming Systems around Kumasi, Ghana. *Urban Agric. Mag.,* 7: 5-6. ❧ Drechsel, P., Cofie, O. & Niang, S. 2008. Sustainability and resilience of the urban agricultural phenomenon in Africa. *In* D. Bossio & K. Geheb, eds. *Conserving land, protecting water.* Oxfordshire, UK, CAB International. ❧ Dreschel, P., Graefe, S., Sonou, M. & Cofie, O.O. 2006. *Informal irrigation in urban West Africa: An overview.* IWMI research report 102. Colombo, Sri Lanka, International Water Management Institute. ❧ Egyir, I.S. & Beinpuo, E.N. 2009. *Strategic innovations in urban agriculture, food supply and livelihood support systems performance in Accra, Ghana.* Accra, RUAF and IWMI. ❧ Fialor, S. 2002. *Profitability and sustainability of urban and peri-urban agriculture (UPA) in Kumasi*. Accra, FAO/IBSRAM/IWMI. ❧ Kumah, P. 2010. *Survey on urban and peri-urban horticulture in Ghana.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Kumah, P., Banful, B. & Abubakari, A.H. 2010. *The state of urban and peri-urban horticulture in Ghana.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Larbi, T. O., Cofie, O., Amoah, P. & Veenhuizen, R. 2012. Strengthening urban producers' organizations for innovative vegetable production and marketing in West African cities: Lessons learnt from Accra and Ibadan. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Lee-Smith, D. 2010. Cities feeding people: An update on urban agriculture in equatorial Africa. *Environment & Urbanization,* 22(2): 483-499. ❧ Obuobie, E., Keraita, B., Danso, G., Amoah, P., Cofie, O. O., Raschid-Sally, L. & Drechsel, P. 2006. *Irrigated urban vegetable production in Ghana: Characteristics, benefits and risks.* Accra, IWMI – RUAF –CPWF. ❧ Republic of Ghana. 2010. *2008 Ghana Millennium Development Goals report.* Accra, National Development Planning Commission and UNDP-Ghana. ❧ Republic of Ghana. Ministry of Food and Agriculture (MOFA). 2007. *Food and Agriculture Sector Development Policy (FASDEP II).* Accra. ❧ Republic of Ghana. Ministry of Food and Agriculture (MOFA). 2011. *National irrigation policy, strategies and regulatory measures.* Accra, MOFA and Ghana Irrigation Development Authority. ❧ Republic of Ghana. National Development Planning Commission. 2007. *The implementation of the Growth and Poverty Reduction Strategy (GPRS II), 2006 – 2009: 2006 Annual progress report*. Accra. ❧ RUAF. 2010. *RUAF Partner Cities: Accra, Ghana* (http://www.ruaf.org).

Guinea-Bissau

Abreu, L. 2010. *Le développement de l´horticulture en Guinée- Bissau.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Abreu, L. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) en Guinée- Bissau.* Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Branisa, B., Klasen, S., Ziegler, M., Dreschler, D. & J. Jütting. 2009. *The Social Institutions and Gender Index (SIGI).* Paris, OECD. ❧ Republic of Guinea-Bissau. Ministry of Agriculture and Rural Development. 2011. *Projet de renforcement des capacités des petits producteurs en zone périurbaine (UTF/GBS/032/GBS).* Rome, FAO and Jeddah, Saudi Arabia, Islamic Development Bank. ❧ Republic of Guinea-Bissau. Ministry of Economy, Planning and Regional Integration. 2011. *Second national Poverty Reduction Strategy Paper (DENARP/PRSP II (2011-2015).* Bissau.

Kenya

African Studies Centre. 2006. *Farming as a livelihood source for urban dwellers: Results from a research project in Nakuru, Kenya.* Leiden, the Netherlands. ❧ CIP. 2012. *Urban Harvest Program: Urban wastewater research* (http://cipotato.org). ❧ Civil Society Urban Development Programme. 2011. *Kenya urban areas: A brief.* Nairobi. ❧ City Council of Nairobi. 2007. *City of Nairobi Environment Outlook Report. Executive summary.* Nairobi. ❧ Karanja, N. & Njenga, M. 2010. *Survey of urban and peri-urban horticulture in Africa: Kenya*. Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Gathuru, K., Karanja, N. & Njenga, M. 2007. Wastewater irrigation empowers Kenya's urban farmers. *New agriculturalist*, 2007(5). ❧ Government of Kenya. 2011. *The Urban Areas and Cities Act, 2011.* Nairobi. ❧ Hagen, E. 2009. Putting Nairobi's slums on the map. *Development outreach: Growing out of crisis*, 12(01): 41-43. ❧ Hildebrand, M. & Holst, B. 2008. A rapid urban

diagnostic and proposed intervention strategy for DIG in Mombasa, Kenya. *In* F. Daphnis, M. Carliez & M. Jenkins, eds. *Towards inclusive cities - The Urbis program: An urban capacity laboratory. A rapid diagnostic of seven cities in Africa, Asia and Latin America.* Bethesda, USA, the Development Innovations Group. ❧ Kilei, K. Minimizing health risks in UPA. *In* G. Ayaga, G. Kibata, D. Lee-Smith, M. Njenga & R. Rege, eds. *Policy prospects for urban and peri-urban agriculture in Kenya.* Results of a workshop organized by Kenya Agricultural Research Institute (KARI), Urban Harvest – CIP & International Livestock Research Institute (ILRI), KARI Headquarters, Nairobi, Kenya, 15 July 2004. ❧ Kyobutungi, C. 2008. *Precarious living conditions in urban settings: The case of Africa.* Presentation at the international conference "Urbanisation et développement durable", Brussels, 25 February 2008. Plate-forme population et développement. ❧ Lee-Smith, D. 2010. Cities feeding people: An update on urban agriculture in equatorial Africa. *Environment & Urbanization,* 22(2): 483-499. ❧ Lee-Smith, D. 2011. *Results of Urban Harvest research 2002-2008.* Presentation at regional workshop "Ensuring resilient food systems in African Cities", Nairobi, 13-14 December 2011. Mazingira Institute. ❧ Lee-Smith, D., Gathuru, K. & Kamau, L.N. 2011. *Urban agriculture and food security in Nairobi.* Nairobi, Mazingira Institute. ❧ Mireria, C., Atekyereza, P., Kyessi, A. & Mushi, N. 2007. Environmental risks of urban agriculture in the Lake Victoria drainage basin: A case of Kisumu municipality, Kenya. *Habitat International,* 31(2007): 375–386. ❧ Mireri, C., Kyessi, A., Mushi, N. & Atekyereza, P. 2006. *Urban agriculture in East Africa: Practice, challenges and opportunities.* Canada, City Farmer. ❧ Nabutola, W. 2011. *Planning and managing urbanization in Kenya following the new constitutional dispensation promulgated in August 2010.* Paper presented at FIG Working Week 2011, Bridging the Gap between Cultures, Marrakech, Morocco, 18-22 May 2011. ❧ National council for science and technology. 2005. *Urban agriculture surveys by NCST in Kenya*, by J.O. Onyatta. Workshop on urban micro-farming and HIV-AIDS, Johannesburg/Cape Town, South Africa, 15-26 August 2005. Nairobi. ❧ Ngugi, I.K., Gitau, R. & Nyoro, J.K. 2007. *Access to high value markets by smallholder farmers of African indigenous vegetables in Kenya.* Regoverning Markets Innovative Practice series. London, IIED. ❧ Ogolla, A. 2010. *Urban growth: Challenges and opportunities for horticultural production and trade in Kenya.* Video conference on high value horticulture for Eastern & Southern Africa, Kenya Development Learning Centre, 30 November 2010. ❧ Olack, B., Burke, H., Cosmas, L, Bamrah, S., Dooling, K., Feikin, D.R., Talley, L.E. & Breiman, R.F. 2011. Nutritional status of under-five children living in an informal urban settlement in Nairobi, Kenya. *J. Health Popul. Nutr.,* 29(4): 357-363. ❧ Onyango, C.M. & Imungi, J.K. 2007. *Post harvest handling and characteristics of fresh-cut traditional vegetables sold in Nairobi–Kenya.* Proceedings for the African Crop Science Conference, 8: 1791-1794. ❧ Oxfam. 2009. *Urban poverty and vulnerability in Kenya: The urgent need for coordinated action to reduce urban poverty.* Oxfam GB Briefing Note. Oxford, UK. ❧ Pascal, P. & Mwende, E. 2009. A garden in a sack: Experiences in Kibera, Nairobi. *Urban Agriculture*, 21. ❧ Pretty, J., Toulmin, C. & Williams, S. 2011. Sustainable intensification in African agriculture. *International Journal of Agricultural Sustainability,* 9(1): 5-24. ❧ Republic of Kenya. Ministry of Agriculture. 2010. *Draft national urban and peri-urban agriculture and livestock policy.* Nairobi. ❧ Republic of Kenya. Ministry of Agriculture. 2012. *Urban and peri urban agriculture project launched at Ruia, Njiru district in Nairobi.* Nairobi. ❧ Republic of Kenya. Ministry of Lands. 2006. *Draft national land policy.* Nairobi, National Land Policy Secretariat. ❧ Republic of Kenya. Ministry of Nairobi Metropolitan Development. 2008. *Nairobi Metro 2030: A world class African metropolis.* Nairobi. ❧ Republic of Kenya. Office of the Prime Minister, Ministry of State for Planning & National Development and Vision 2030. 2008. *First Medium Term Plan, 2008 – 2012. Kenya Vision 2030 – A globally competitive and prosperous Kenya.* Nairobi. ❧ Republic of Kenya. Office of the Deputy Prime Minister and Ministry of Local Government Department of Urban Development. 2008. *Concept paper for the preparation of a National Urban Development Policy (NUDP) 2008.* Nairobi. ❧ Thuo, A.D.M. 2010. Community and social responses to land use transformations in the Nairobi rural-urban fringe, Kenya. *J. Field Actions Sci*, 2010(1). ❧ UNICEF. 2012. *The state of the world's children 2012. Children in an urban world.* New York, USA.

Mozambique

African Development Fund. 2004. *The green zones women development project in Maputo.* Project completion report. South Africa, ONAR. ❧ Baden, S. 1997. *Post-conflict Mozambique: Women's special situation, population issues and gender perspectives to be integrated into skills training and employment promotion*. Report of a consultancy for the Action Programme on Skills and Entrepreneurship in countries emerging from armed conflict. Geneva, International Labour Office. ❧ Cassamo, A. 2005. *The local economy and professional training.* Paper prepared for workshop on urban micro-farming and HIV-AIDS, Johannesburg/Cape Town, South Africa 15-26 August 2005. Council of Maputo City. ❧ Crush, J. 2010. The prevalence of urban and peri-urban cultivation in contemporary Southern Africa. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Cruz e

Silva, T. 2002. União Geral de Cooperativas em Moçambique: Um sistema alternativo de produção? *In* B.S. Santos, ed. *Produzir para viver: Os caminhos da produção não capitalista*. Rio de Janeiro, Brazil, Civilização Brasileira. ❧ De Muro, P., Bocci, R., Gorgoni, S., Lombardo, L., Martone, E., Silici, L. & Russo, L. 2007. *Mozambique, Nigeria and Zambia case studies*. Social and environmental impact assessment - Draft report. Rome, Department of Economics, Università degli Studi Roma Tre. ❧ Delgado Henriques, C. 2009. *Urban growth management in Africa with geographical information technologies. Maputo city case study.* SCTV Barcelona. ❧ FAO. 2001. *Urban agriculture, household food security and nutrition in Southern Africa,* by F. Egal, A. Valstar & S. Meershoek. Paper prepared for the Sub-Regional Expert Consultation on the Use of low cost and simple technologies for crop diversification by small-scale farmers in urban and peri-urban areas of Southern Africa, Stellenbosch, South Africa, January 15-18, 2001. Rome. ❧ Henriques, C. & Tenedório, J.A. 2010. Mapping urban change to plan the future: Maputo city change model and the municipal structure plan. *In* R. Reuter, ed. *30th EARSel Symposium: Remote sensing for science, education and natural and cultural heritage.* Paris. ❧ International Trade Centre. 2009. *Tourism-led poverty reduction programme.* Geneva, Switzerland. ❧ International Trade Center. 2011. *Gearing up for inclusive tourism in Mozambique*. Geneva, Switzerland. ❧ Issa, A. 2009. *Cintura da cidade de Nampula: Já não há espaço para semear verduras*. Moçambique para todos (http://macua.blogs.com). ❧ Jantilal, H. *Survey of urban and peri-urban horticulture: Mozambique*. Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Madaleno, I.M. & Correia, A.M. 2001. *Alleviating poverty in Maputo, Mozambique.* Canada, Urban Agriculture Notes, City Farmer (http://www.cityfarmer.org). ❧ Nair, M. & Coote, C. 2007. *Mozambique: Trends in growth of modern retail and wholesale chain and related agribusiness.* Information sheet for the regoverning markets programme, by F. Proctor, ed. Stockholm, Swedish International Development Cooperation Agency (Sida). ❧ Republic of Mozambique. 2011. *Poverty Reduction Action Plan (PARP) 2011-2014.* Maputo. ❧ Republic of Mozambique. Ministry of Agriculture. 2007. *Concept, principles and strategy of the green revolution in Mozambique.* Maputo. ❧ Rodrigues, A. 2009. *A green revolution in Mozambique: A study about the government possibilities to launch a sustainable green revolution.* Rio de Janeiro, Brazil, Fundação Getulio Vargas and Escola Brasileira de Admnistração Pública e de Empresas. (PhD Thesis) ❧ Roth, M., Boucher, S. & Francisco, A. 1995. *Land markets, employment, and resource use in the peri-urban green zones of Maputo, Mozambique: A case study of land market rigidities and institutional constraints to economic growth.* Madison, USA, Land Tenure Center. ❧ Sambo, E. 2007. Horticultores do Infulene pedem formação. *CanalMoz* (http://www.canalmoz.co.mz). ❧ Sheldon, K. 1999. *Machambas* in the city: Urban women and agricultural work in Mozambique. *Lusotopie,* 1999: 121-140. ❧ Sitoe, T.A. 2010. *Diversificação produtiva e de atividades de geração de renda: Uma análise da produção hortícola no cinturão verde da cidade de Maputo- Região sul de Moçambique*. Porto Alegre, Brazil , Universidade Federal do Rio Grande do Sul, Faculdade de Ciências Econômicas. ❧ UN-HABITAT. 2010. *Mozambique cities profile: Maputo, Nacala and Manica*. Nairobi. ❧ UNICEF. 1988. *Children on the frontline: The impact of apartheid, destabilization and warfare on children in Southern and South Africa*. New York, USA. ❧ Veronez, L. & Meneses, M.P. 2011. *Maputo, Mozambique: The general union of agricultural and livestock cooperatives of Maputo*. Portugal, Centre for Social Studies, University of Coimbra. ❧ WHO. 2009. *World Health Organization, Africa region.* Johannesburg, South Africa. ❧ World Bank. 2011. *Mozambique: Country brief* (http://go.worldbank.org).

Nigeria

Abdu, N., Agbenin, J.O. & Buerkert, A. 2011. Phytoavailability, human risk assessment and transfer characteristics of cadmium and zinc loads in wastewater irrigated urban gardens in Kano, Nigeria. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Adelekan, I. O. 2009. Vulnerability of poor urban coastal communities to climate change in Lagos, Nigeria. *In* World Bank. *Proceedings of the 5th Urban Research Symposium, 28-30 June 2009*. Marseille, France. ❧ Akinmoladun, O.I. & Adejumo, O.T. 2011. Urban agriculture in metropolitan Lagos: An inventory of potential land and water resources. *J. Geogr. Reg. Plann.*, 4(10): 9-19. ❧ Akintoye, H.A. 2010. *Survey of urban and peri-urban horticulture in Nigeria*. Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Akintoye, H.A. 2010. *The state of urban and peri-urban horticulture in Nigeria.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Anosike, V. & Fasona, M. 2004. Gender dimensions of urban commercial farming in Lagos, Nigeria. *UA Magazine*, 12: 27-28. ❧ Binns, J.A., Maconachie, R.A. & Tanko, A.I.

2003. Water, land and health in urban and peri-urban food production: The case of Kano, Nigeria. *Land Degradation & Development*, 14(5): 431-444. ❧ Chaha, J.M., Onwubuyaa, E.A. & Asadua, A.N. 2010. An assessment of the contribution of urban crop agriculture in Nigerian cities: A case study of Enugu Metropolis, Enugu State, Nigeria. *J. Agric. & Food Inf.*, 11(3): 233-247. ❧ Ezedinma, C. & Chukuezi, C. 1999. A comparative analysis of urban agricultural enterprises in Lagos and Port Harcourt, Nigeria. *Environment and Urbanization,* 11(2): 135-144. ❧ Harris, F., Paquini, M.W., Dung, J. & Adepetu, A. 2006. The environmental and social impacts of peri-urban irrigated vegetable production around Jos, Nigeria. *In* D. McGregor, D. Simon, D. Thompson, eds. *The peri-urban interface: Approaches to sustainable natural and human resource use*. London and Sterling, USA, Earthscan. ❧ Ifatimehin, O.O. & Musa, S.D. 2008. Application of geoinformatic technology in evaluating urban agriculture and urban poverty in Lokoja, Nigeria. *Nigerian J. Geogr. Environ.,* 1(1): 21-32. ❧ Nigerian National Planning Commission. 2004. *Meeting everyone's needs: National economic empowerment and development strategy*. Abuja. ❧ Olajide-Taiwo, L.O., Cofie, O., Bamimore, K., Olajide-Taiwo, F.B. & Babajide, K.S. 2012. Prospects, challenges and institutional linkages of vegetable value chain in Ibadan city of Nigeria. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Olofin, E.A. & Tanko, A.I. 2003. Optimising agricultural land use in Kano. *UA Magazine*, 11: 9-10. ❧ Olomola, A. 1998. Urban agriculture and its implications for sustainable urban development in Nigeria. *In* K. Adeniji & V.I. Ogu, eds. *Sustainable physical development in Nigeria: A book of readings*, pp. 116–127. Ibadan, Nigeria, Nigerian Institute of Social and Economic Research (NISER). ❧ Oruwari, Y. & Jev, M. 2004. Integration of gender in municipal policies in Port Harcourt in Nigeria. *UA Magazine*, 12: 29. ❧ Osinubi, T.S. 2003. *Urban poverty in Nigeria: A case study of Agege area of Lagos State, Nigeria.* Ibadan, Nigeria, University of Ibadan. ❧ Pasquini, M.W. 2006. The use of town refuse ash in urban agriculture around Jos, Nigeria: Health and environmental risks. *Sci. Total Environ*., 354(1): 43-59. ❧ Sanusi, Y.A. 2012. Analysis of livelihood opportunities of peri-urban horticulture in Nigeria: A case study of Minna, Niger State. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Tanko, A.I. 2004. Access to land for urban and peri-urban agriculture in Kano. *In* RUAF and Urban Management Programme. *Proceedings of e-conference: Optimising agricultural land use in the city area* (http://www.ruaf.org). ❧ Ujoh, F., Kwabe, I.D. & Ifatimehin, O.O. 2010. Understanding urban sprawl in the Federal Capital City, Abuja: Towards sustainable urbanization in Nigeria. *J. Geogr. Reg. Plann.*, 3(5): 106-113. ❧ UNDP. 2007. *State Economic Empowerment and Development Strategy(SEEDS): Nigeria* (http://www.ng.undp.org/seeds.shtml). ❧ WHO. 2009. *World Health Organization, Africa region.* Johannesburg, South Africa. ❧ World Bank. 2008. *Africa infrastructure country diagnostic. Urban water supply in sub-Saharan Africa*, by S. Banerjee, H. Skilling, V. Foster, C. Briceño-Garmendia, E. Morella & T. Chfadi. Summary background paper. Washington, DC.

Rwanda

City of Kigali. Kigali Institute of Science Technology and Management. 2001. *Kigali economic development strategy final report.* Kigali. ❧ Etale, A. 2011. *Risks of urban agriculture: Lead and Cadmium intake by Kigali residents from locally grown produce.* Johannesburg, University of the Witwatersrand. (MA Thesis) ❧ FAO. 2012. *Programme de coopération décentralisée Italie/FAO: Projet d'agriculture urbaine et périurbaine de Kigali (PAPUK).* Final report. Rome. ❧ FAO & Republic of Rwanda. 2012. *Urban and Peri-urban Agriculture Strategy Plan (UPASP): FAO – TCP/RWA/3101.* Rome. ❧ OZ Architecture, EDAW Inc., Tetra Tech Inc., Engineers without Borders, Worthington Design & Economics Research Associates. 2007. *Kigali conceptual master plan.* Plan prepared for the Rwanda Ministry of Infrastructure. Denver, Longmont, Berkeley and San Francisco, USA. ❧ Republic of Rwanda. City of Kigali. 2002. *Kigali economic development strategy.* Kigali. ❧ Republic of Rwanda. Ministry of Finance and Economic Planning. 2011. *3-years of the Economic Development and Poverty Reduction Strategy (EDPRS): A summary implementation report 2008-2010.* Kigali. ❧ Sekomo, C.B., Nkuranga, E., Rousseau, D.P.L. & Lens P.N.L. 2011. Fate of heavy metals in an urban natural wetland: The Nyabugogo Swamp (Rwanda). *Water Air Soil Pollut,* 214: 321-333. ❧ UN-HABITAT. 2009. *Kigali shines as an example of a harmonious city*. Nairobi. ❧ World Bank. 2012. *Rwanda: Country brief* (http://go.worldbank.org).

Senegal

Canadian International Development Agency. 2012. *Profil de projet pour aménagement et développement économique des Niayes* (http://www.acdi-cida.gc.ca). ❧ Ba Diao, M. 2004. Situation et contraintes des systèmes urbains et périurbains de production horticole et animale dans la région de Dakar. *Cahiers Agricultures,* 13(1): 39-49. ❧ Cissé, I. & Fall, S.T. 2000. Impact du système de production horticole sur l'environnement des Niayes. *In* S.T. Fall & S.A. Fall, eds. *Cités horticoles en sursis? L'agriculture urbaine dans*

les grandes Niayes au Sénégal. Ottawa, Centre de recherches pour le développement international. ❧ FAO. 2010. *The West African regional integrated production and pest management (IPPM) programme: A case study,* by W. Settle & M. Hama Garba. Rome. ❧ FAO. 2012. Gender and land rights database (http://www.fao.org/gender/landrights/report/). ❧ Faruqui, N.I., Niang, S. & Redwood, M. 2004. Untreated wastewater use in market gardens: A case study of Dakar, Senegal. *In* C. Scott, N. Faruqui & L. Raschid, eds. *Wastewater use in irrigated agriculture: Confronting the livelihood and environmental realities.* Ottawa, CABI/IWMI/IDRC. ❧ Faye, J. 2008. *Land and decentralisation in Senegal*. Drylands issue paper no. 149. London, International Institute for Environment and Development. ❧ Kennedy, G., Nantel, G., Brouwer, I.D. & Kok, F.J. 2006. Does living in an urban environment confer advantages for childhood nutritional status? Analysis of disparities in nutritional status by wealth and residence in Angola, Central African Republic and Senegal. *Public Health Nutr.*, 9(2): 187-193. ❧ Matsumoto-Izadifar, Y. 2009. Senegal: Making better use of agribusiness potential. *OECD Journal: General papers*, 2(7): 53-78. ❧ Ndiaye, A. 2011. *La réforme des régimes fonciers au Sénégal: Condition de l'éradication de la pauvreté rurale et de la souveraineté alimentaire*. Centre pour la Communication Scientifique Directe of the Centre national de la recherche scientifique. halshs-00653556, 1. ❧ Niang, S., Diop, A., Faruqui, N., Redwood, M. & Gaye, M. 2002. Reuse of untreated wastewater in market gardens in Dakar, Senegal. *Urban Agriculture Magazine*, 8: 35-36. ❧ Re, V., Faye, S.C., Faye, A., Faye, S., Gaye, C.B., Sacchi, E. & Zuppi, G.M. 2011. Water quality decline in coastal aquifers under anthropic pressure: The case of a suburban area of Dakar (Senegal). *Environ. Monit. Assess.,* 172(2011): 605–622. ❧ Republic of Senegal. 2006. *Poverty Reduction Strategy Paper II*. Dakar. ❧ Republic of Senegal. 2007. *Stratégie de croissance accélérée: Présentation résumée*. Meeting of the Comité National de Pilotage de la SCA, 26 January 2007 (http://www.un.org). ❧ Republic of Senegal. 2011. *Document de politique économique et sociale (DPES 2011-2015)*. Dakar. ❧ Republic of Senegal. Ministry of Agriculture. 2010. *État de l'horticulture urbaine et périurbaine au Sénégal*. Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. Dakar. ❧ Roquet, D. 2008. Leaving to last better: Migration as an answer to the drought in Senegal. *Espace Populations Sociétés*, 2008(1): 37-53. ❧ RUAF West Africa. 2010. *Pikine: Dakar – Senegal* (http://www.ruaf.org). ❧ Souare, M., Sambe, L., Mbaye, M. & Balde, D. 2011. *Rapport du Sénégal sur l'utilisation saine des eaux usées en agriculture.* Report to International kick-off workshop for joint FAO/UNW-DPC/UNU-INWEH capacity development project on safe use of wastewater in agriculture, 14-15 Nov., 2011 Bonn, Germany (http://www.ais.unwater.org). ❧ Sposito, T. 2010. *Agriculture urbaine et périurbaine pour la sécurité alimentaire en Afrique de l'ouest. Le cas des micro-jardins dans la municipalité de Dakar*. Milan, Italy, Università degli studi di Milano, Facoltà di Agraria, Dipartimento di ingegneria agraria. (PhD Thesis) ❧ Sy Gaye, Seydi Ababacar. 2010. *Sondage sur l'horticulture urbaine et périurbaine (HUP) au Sénégal*. Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Tepe, I. 2004. *Le lotissement à la périphérie de Thiès: Problématique d'une gestion foncière entre la ville de Thiès et la communauté rurale de Fandène: Enjeux, perceptions et pratiques des acteurs*. Working paper No. 43. Mainz, Germany, Department of Anthropology and African Studies, Johannes Gutenberg-Universität. ❧ Tounkara, S. & Zelem, M.C. 2012. La valorisation environnementale et économique de déchets organiques dans le maraîchage périurbain à Dakar au Sénégal: Acteurs, opportunités, contraintes et risques. *In* FAO and ISHS. *Proceedings of the International symposium on urban and peri-urban horticulture in the century of cities: Lessons, challenges, opportunities, 6-9 December 2010.* Dakar. (in press) ❧ Touré, O. & Seck, S.M. 2005. *Family and commercial farming in the Niayes area of Senegal.* Drylands Programme Issue paper No. 133. London, International Institute for Environment and Development. ❧ Unite-PDMAS. 2010. Unité de Coordination et de gestion du Programme - Programme de Développement des Agricoles du Sénégal (PDMAS). *Presentation du programme* (http://www.pdmas.org). ❧ USAID. 2010. *Senegal: Property rights and resource governance*. USAID country profile (http://usaidlandtenure.net).

Tunisia

Bouraoui, M. 2003. Urban agriculture in Tunisia: Residual space or a new territorial component? The case of Greater Tunis. *J. Alpine Res.*, 91(4): 43-54. ❧ Bouraoui, M. 2005. Agri-urban development from a land-use planning perspective: The Saclay Plateau (France) and the Sijoumi Plain (Tunisia). *In* L.J.A. Mougeot, ed. *AGROPOLIS: The social, political, and environmental dimensions of urban agriculture*. Ottawa, IDRC and London, Earthscan. ❧ Chabbi, M. 2004. *Potentialités et obstacles à la constitution d'une région urbaine: Le cas du Grand Tunis.* Paper prepared for the 40th ISoCaRP Congress 2004. Geneva, Switzerland. ❧ Chabbi, M. & Abid, H. 2008. *La mobilité urbaine dans le Grand Tunis: Évolutions et perspectives*. Valbonne, France, PNUE-PAM-Plan Bleu. ❧ Elloumi, M.J. 2004. *Review of the implementation of the Environmental Impact Assessment (EIA), Case of Tunisia.* Report prepared for the Economic Commission for Africa of the United Nations. ❧ Elloumi, M. 2011. Agriculture périurbaine et nouvelles fonctions

du foncier rural en Tunisie. *In* M. Elloumi, A.-M. Jouve, C. Napoléone & J.-C. Paoli, eds. *Options Méditerranéennes, B 66 – Régulation foncière et protection des terres agricoles en Méditerranée*. Paris, CIHEAM-IAMB and Rome, FAO. ❧ Elloumi M., Jouve A.-M. 2003. Introduction générale. *In* M. Elloumi & A.-M. Jouve, eds. *Bouleversement fonciers en Méditerranée, des agricultures sous le choc de l'urbanisation et des privatisations*, pp. 11-35. Montpellier, France, Karthala-CIHEAM. ❧ GlobalNet. 2010. *Aménagement du territoire, la Tunisie pense déjà à 2050* (http://www.gnet.tn). ❧ Hammami, M. & Sai, M.E. 2008. Problèmes fonciers et agriculture périurbaine dans le Grand Tunis: Mutation foncières et stratégies des agriculteurs. *New Medit*, 7(1): 58-64. ❧ Hammami, S. & Sayari, N. 2010. *La situation de l'horticulture urbaine et périurbaine en Tunisie.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) ❧ Houimli, E. 2008. *Les facteurs de résistance et de fragilité de l'agriculture littorale face à l'urbanisation: Le cas de la région de Sousse Nord en Tunisie.* Versailles, France, École Nationale Supérieure du Paysage de Versailles. (PhD Thesis) ❧ Houman, B. & Bouraoui, M. 2009. Optimising use of water for urban agriculture: Responding to the challenge of growing water scarcity in Tunisia. *Urban Agriculture Magazine*, 22: 48. ❧ IDRC. 2007. *Rainwater and greywater harvesting in urban and peri-urban agriculture in Ariana-Soukra (Tunisia)* (http://www.idrc.ca). ❧ Meddeb, S. 2009. *Les capacités de résistances des agricultures périurbaines face au processus de métropolisation*. Toulouse, France, Université Toulouse II and Sousse, Tunisia, ISA Ch-M. (Thesis) ❧ Mizouri, M. & Mtimet, A. 2001. Pression urbaine sur les terres agricoles péri-urbaines du Grand Tunis. *In* D. Camarda & L. Grassini, eds. *Options méditerranées, A44 – Interdependency between agriculture and urbanization: Conflicts on sustainable use of soil and water*. Paris, CIHEAM-IAMB and Rome, FAO. ❧ Rejeb, H. 2011. Urban and peri-urban agricultural issues in Tunisia. *Watch letter*, 18: 4. ❧ Signoles, P. 1985. *L'Espace tunisien: Capitale et état-région*. Tours, France, Laboratoire URBAMA. ❧ Tej, A.2011. *L'horticulture urbaine et périurbaine en Tunisie, diagnostic et prospectives: Cas de l'olivier au Sahel.* Portorož, Slovenia, EMUNI and, Sousse, Tunisia, ISA Chott Meriem. (Master) ❧ Toumi, S. 2010. *Quelles conditions agro-économiques et socio-spatiales pour l'émergence d'un projet agriurbain durable dans le Grand-Tunis?* Poster presented at the seminar "Projet de paysage et recherche". Marseille, France, Laboratoire de recherche de l'ENSP (LAREP). ❧ Toumi, S. & Vidal, R. 2010. A comparison of urban agriculture and short food chains in Paris and Tunis. *Urban Agriculture Magazine*, 24: 31-34. ❧ Univeristy of Sousse, Euro-Mediterranean University (EMUNI) & National Agricultural Research Institute of Tunisia (IRESA). 2010. *Master in Landscape, Territory and Patrimony: Higher School of Agronomical Sciences Chott Mariem*. Sousse, Tunisia. ❧ URAM-Urbanconsult. 1997. *Atlas du Grand Tunis: Gouvernorat de Tunis – Ariana – Ben Arous*. Tunis, Ministère de l'Environnement et de l'Aménagement du Territoire, Direction Générale de l'Aménagement du Territoire. ❧ Vidal, R. 2004. *Développement urbain et espaces ruraux sur le littoral sahélien*. Comité mixte franco-tunisien de coopération universitaire (CMCU) projet . Paris and Versailles, France, ESHE-ENSP.

Uganda

David, S., Lee-Smith, D., Kyaligonza, J., Mangeni, W., Kimeze, S., Aliguma, L., Lubowa, A. & Nasinyama, G.W. 2010. Changing trends in urban agriculture in Kampala. *In* G. Prain, N. Karanja & D. Lee-Smith, eds. *African urban harvest: Agriculture in the cities of Cameroon, Kenya and Uganda*. Ottawa, IDRC and Lima, CIP. ❧ Dubbeling, M. & Pasquini, M. 2010. *The growth of cities in East-Africa: Consequences for urban food supply.* Paper developed by the RUAF Foundation for the World Bank (http://www.globalhort.org/). ❧ Hooton, N., Lee-Smith, D., Nasinyama, G. & Romney, D. 2007. Championing urban farmers in Kampala: Influences on local policy change in Uganda. ILRI/ODI/KUFSALCC/Urban Harvest Working Paper. *ILRI Research Report 2.* Nairobi, ILRI. ❧ Lee-Smith, D. 2010. Cities feeding people: An update on urban agriculture in equatorial Africa. *Environment & Urbanization*, 22(2): 483-499. ❧ Maxwell, D., Levin, C. & Csete, J. 1998. Does urban agriculture help prevent malnutrition? Evidence from Kampala. *Food Policy*, 23(5): 411–424. ❧ Nasinyama, G.W., Cole, D.C. & Lee-Smith, D. 2010. Health impact assessment of urban agriculture in Kampala. *In* G. Prain, N. Karanja & D. Lee-Smith , eds. *African urban harvest: Agriculture in the cities of Cameroon, Kenya and Uganda*. Ottawa, IDRC and Lima, CIP. ❧ Nyapendi, R., Best, R., Ferris, S. & Jagwe, J. 2010. Identifying market opportunities for urban and peri-urban farmers in Kampala. *In* G. Prain, N. Karanja & D. Lee-Smith, eds. *African urban harvest: Agriculture in the cities of Cameroon, Kenya and Uganda*. Ottawa, IDRC and Lima, CIP. ❧ Republic of Uganda. 2010. *National development plan (2010/11 - 2014/15)*. Kampala. ❧ Republic of Uganda. Ministry of Agriculture, Animal Industry & Fisheries. 2010. *Agriculture Sector Development Strategy and Investment Plan: 2010/11- 2014/15.* Kampala. ❧ Republic of Uganda. Ministry of Lands, Housing and Urban Development. 2011. *The Uganda national land policy*. Kampala. ❧ Republic of Uganda & UNFPA. 2007. *State of Uganda population report 2007: Planned urbanization for Uganda's growing population*. Kampala.

Semwanga, M.A. 2010. *Survey of urban and peri-urban horticulture in Uganda*. Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) Semwanga, M.A. & Seruwagi, P. 2010. *Uganda's country report: Contributions to "The State of Urban and Peri-urban Horticulture in Africa".* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) Ssembalirwa, E. 2008. *Urban agriculture in Kampala City, Uganda*. Kampala, City Council of Kampala.

United Republic of Tanzania

Dongus, S. 2000. Vegetable production in open spaces: Spatial changes from 1992 to 1999. Urban Vegetable Promotion Project, Dar es Salaam. *In* City Farmer. *Urban gardens: Growing food in the city.* Vancouver, Canada. Hall, A. 2009. *A green lung for the stone town: The challenge of developing a green structure for the users of Zanzibar historical city core*. Uppsala, Sweden, Swedish University of Agricultural Sciences, Department of Landscape Architecture. (MA Thesis) HODECT. 2010. *National horticultural development strategy.* Horticultural Development Council of Tanzania. Arusha, Tanzania. Jacobi, P. 1997. *Importance of vegetable production systems in Dar es Salaam, Tanzania*. Urban Vegetable Promotion Project. Dar es Salaam. (mimeo) Jacobi, P., Amend, J. & Kiango, S. 2000. Urban agriculture in Dar es Salaam: Providing an indispensable part of the diet. *In* N. Bakker, M. Dubbeling, S. Gündel, U. Sabel-Koschella & H. de Zeeuw, eds. *Growing cities, growing food. Urban agriculture on the policy agenda*, pp. 257-278. Feldafing, Germany, Deutsche Stiftung für internationale Entwicklung (DSE). Kiango, S. 2001. Overview of urban agriculture in Tanzania. *In: Proceedings of the National workshop on urban agriculture – Potential, support and information needs, Dar es Salaam, Tanzania, 11-13 June, 2001*, pp. 59-75. Dar es Salaam, Urban Vegetable Promotion Project and University of Dar es Salaam, Faculty of Arts and Social Sciences. Kitivo, J.M. 2009. *Mushroom sub-sector: A viable urban agricultural economic activity for Dar es Salaam community.* M.Sc. project report in Community Economic Development. Dar es Salaam, Open University of Tanzania and Manchester, NH, USA, Southern New Hampshire University. (mimeo) Kitivo, J. 2010. *Survey of urban and peri-urban horticulture in Tanzania*. Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) Kitivo, J. 2010. *The state of urban and peri-urban horticulture in Tanzania.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) Mvena, Z.S.K, Lupanga, I.J. & Mlozi, M.R.S. 1991. *Urban agriculture in Tanzania: A study of six towns.* Morogoro, Tanzania, Sokoine University of Agriculture. National Bureau of Statistics. 2009. *Tanzania: National Household Budget Survey (HBS) 2007.* Dar es Salaam, Ministry of Finance and Economic Affairs – National Bureau of Statistics. Stevenson, C., Kinabo, J. & Nyange, D. 1994. *Urban horticulture in Tanzania: A study of the production, marketing and consumption of fruits and vegetables in Dar es Salaam, Dodoma, and Arusha.* Dar es Salaam, Urban Vegetable Promotion Project. The Revolutionary Government of Zanzibar. 2010. *The Zanzibar strategy for growth and reduction of poverty: 2010-2015.* Zanzibar City. UNDP. 1996. *Urban agriculture: Food, jobs and sustainable cities*, by J. Smit, A. Ratta & J. Nasr, eds. New York, USA. United Republic of Tanzania. Ministry of Agriculture and Co-operative Development. 1997. *Agricultural and livestock policy, 1997.* Dar es Salaam. United Republic of Tanzania. National Bureau of Statistics. 2011. *Tanzania in figures (2010).* Dar es Salaam, Ministry of Finance.

Zambia

Hampwaye, G., Nel, E. & Ingombe, L. 2009. *The role of urban agriculture in addressing household poverty and food security: The case of Zambia*. Global Development Working Paper Series, 19. Hichaambwa, M. 2010. *Developments in the horticultural supply chains in Zambia*. Paper prepared for Global Horticultural Initiative video conference on Post-harvest and transport technologies: Reducing losses and improving quality in fruits and vegetables in Eastern and Southern Africa. Rome, Global Horticulture Initiative. Hichaambwa, M. & Tschirley, D. 2010. How are vegetables marketed into Lusaka? The structure of Lusaka's fresh produce marketing system and implications for investment priorities. *Zambia Policy Synthesis*, 40: 1-6. Lusaka City Council & Environmental Council of Zambia. 2008. *Lusaka City State of environment outlook report: Executive summary.* Lusaka. Mbuvami, T. 2010. *RUAF partner cities: Ndola, Zambia.* RUAF, Harare (http://www.ruaf.org). Mwenda, E. 2010. *Country report- Zambia.* Case study prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) Mwenda, E. 2010. *Survey of urban and peri-urban horticulture in Zambia*. Document prepared for the International symposium on urban and peri-urban horticulture in the century of cities, Dakar, Republic of Senegal, 6-9 December 2010. (mimeo) RUAF & MDPESA. n.d. *Urban Agriculture Policy for City of Ndola*. Municipal Development Partnership for Eastern and Southern

Africa. Harare. ❧ Sanyal, B. 1987. Urban cultivation amidst modernisation: How should we interpret it? *J. Plann. Educ. Res.,* 6(3): 187-207. ❧ UNDP. 1996. *Urban agriculture: Food, jobs and sustainable cities,* by J. Smit., J. Nasr & A. Ratta. New York, USA.

Others

Angola: Kennedy, G., Nantel, G., Brouwer, I.D. & Kok, F.J. 2006. Does living in an urban environment confer advantages for childhood nutritional status? Analysis of disparities in nutritional status by wealth and residence in Angola, Central African Republic and Senegal. *Public Health Nutr.,* 9(2): 187-193. ❧ WHO. 2009. *World Health Organization, Africa region.* Johannesburg, South Africa.
Burkina Faso: RUAF. 2010. *Bobo Dioulasso (Burkina Faso).* RUAF Partner Cities. Leusden, the Netherlands (http://www.ruaf.org/node/1132). ❧ UN-HABITAT. 2010. *The state of African cities 2010. Governance, inequality and urban land markets.* Nairobi.
Madagascar: Dubbeling, M. & Pasquini, M. 2010. *The growth of cities in East-Africa: Consequences for urban food supply.* Paper developed by the RUAF Foundation for the World Bank. Leusden, the Netherlands, RUAF. ❧ RUAF. 2010. Distance to the city and performance of food chains in Antananarivo, Madagascar. *UA Magazine*, 24: 24-27.
Morocco: Martin Han, S. & Pieschel, M. 2009. Sustainable development of megacities of tomorrow: Green infrastructures for Casablanca, Morocco. *UA Magazine,* 22: 27-29.
Namibia: FAO. 2002. *The status of urban and peri-urban agriculture, Windhoek and Oshakati, Namibia,* by S.J. Dima, A.A. Ogunmokun & T. Nantanga. Windhoek.
South Africa: City of Cape Town. 2007. *Urban agricultural policy for the City of Cape Town.* Cape Town, South Africa. ❧ Crush, J., Frayne, B. & McLachlan, M. 2011. *Rapid urbanization and the nutrition transition in Southern Africa.* Urban Food Security Series No. 7. Kingston, Queen's University and Cape Town, South African, African Food Security Urban Network. ❧ Oldewage-Theron, W. & Rozanne Kruger, R. 2011. Dietary diversity and adequacy of women caregivers in a peri-urban informal settlement in South Africa. *Nutrition,* 27(2011): 420–427. ❧ Schönfeldt, H.C., Gibson, N. & Vermeulen, H. 2010. The possible impact of inflation on nutritionally vulnerable households in a developing country using South Africa as a case study. *Nutrition Bulletin*, 35(3): 254–267. ❧ Van Averbeke, W. 2007. Urban farming in the informal settlements of Atteridgeville, Pretoria, South Africa. *Water SA Manuscript,* 33(3): 337-342. ❧ WHO. 2009. *World Health Organization, Africa region.* Johannesburg, South Africa.
Zimbabwe: Bulawayo City Council. 2008. *Urban agriculture policy.* Bulawayo, City Council and MDP-ESA, RUAF. ❧ MPD & Associates. 2010. *Urban agriculture in Zimbabwe.* Harare.

Abbreviations

CGIAR	Consultative Group on International Agricultural Research
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
ha	hectare
IGAD	Gabonese Development Support Institute
NGO	non-governmental organization
RUAF	Resource Centres on Urban Agriculture and Food Security
SENAHUP	National Urban and Peri-urban Horticulture Support Service
sq m	square metre
UGC	General Union of Cooperatives
UN	United Nations
UNDP	United Nations Development Programme
UN-HABITAT	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
UPH	urban and peri-urban horticulture
WHO	World Health Organization

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African policymakers need to act now to steer urbanization from its current, unsustainable path toward healthy, ***greener*** cities that ensure food and nutrition security, decent work and income, and a clean environment for all their citizens. This report highlights a key component of sustainable urban development: urban and peri-urban horticulture (UPH). Based on an Africa-wide survey and on case studies prepared by national experts, the report reviews the current state of UPH in countries across the continent, from Algeria to Zambia, and in cities from Nairobi to Dakar. It presents major findings, detailed profiles of urban and peri-urban horticulture in 22 countries, and recommendations for the development of market gardens to serve Africa's rapidly growing urban population.

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