Building Urban Resilience

Assessing Urban and Peri-urban Agriculture in Ibadan, Nigeria

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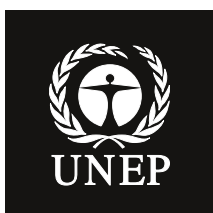
Preface

Food production in and around cities is an integral part of the urban fabric in much of the developing world. In these regions, urban and peri-urban agriculture (UPA) plays an important role in diversifying urban diets and providing environmental services in urban and peri-urban areas. As such, there is growing interest in UPA as a strategic component of urban resilience and climate change adaptation planning. However, advocacy for UPA in this capacity is outpacing the body of evidence regarding important stressors and drivers that act on UPA. Such knowledge is especially critical in the developing world where urban areas are experiencing rapid growth and transformation. In these regions, UPA is facing intensifying pressures from urban encroachment, waste disposal, pollution, and climate change that may undermine the sector's long-term viability.

The need to better understand these critical sustainability dimensions provided the impetus for city-level knowledge assessments of UPA, whose main findings are contained in nine underlying assessment reports including this one. The assessed cities were Dakar (Senegal), Tamale (Ghana), Ibadan (Nigeria), Dar es Salaam (Tanzania), Kampala (Uganda), Addis Ababa (Ethiopia), Dhaka (Bangladesh), Kathmandu (Nepal) and Chennai (India). All of the reports and the synthesis report can be found at *http://start.org/programs/upa*. The assessments were conducted in 2012, with initial stakeholder engagement beginning in 2011. The assessments were led by city-based teams, the composition of which varied, with some of the teams being comprised predominately of researchers and other teams comprising of a mix of researchers, city officials and urban NGO representatives.

The assessments seek to better understand the changing nature of UPA systems, and the critical interactions at the land-water-climate nexus that influence resilience of UPA in rapidly growing developing-country cities. The audience for these assessments includes national and city-level policymakers, sectoral experts and city planners, the research community, and non-governmental organizations (NGOs) that interface with urban farmers and other actors within the broader UPA sector.

The UPA assessments are part of a larger project on strengthening understanding of critical links between climate change and development planning in West Africa, East Africa and South Asia. The premise for the project is that progress towards undertaking effective action to address climate change risks in these regions is hindered by low levels of awareness of global climate change, lack of understanding of the findings of the Intergovernmental Panel on Climate Change (IPCC) and other sources of scientific information, lack of location and sector specific knowledge, and the need for strengthening capacities to undertake integrated assessments that support decision making. This multi-year project has been a collaborative effort between the World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP), START, the University of Ghana, the University of Dar es Salaam, and the Bangladesh Centre for Advanced Studies (BCAS).

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Acknowledgements

Acronyms and abbreviations

ADP	Agricultural Development Programmes
AFAN	All Farmers Association of Nigeria
CAFAN	Catfish Farmers Association of Nigeria
CBOs	Community-Based Organizations
CIP	Climate Information Portal
CMIP5	Coupled Model Intercomparison Project Phase 5
DESA	Department of Economic and Social Affairs of the United Nations
FAO	Food and Agriculture Organization of the United Nations
FEWS-Net	Famine Early Warning Systems Network
FGD	Focus Group Discussion
GCMs	General circulation models
GDP	Gross Domestic Product
GPS	Geographical Positioning Systems
IDRC	International Development Research Centre (Canada)
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IWMI	International Water Management Institute
LGAs	Local government areas
NAPA	National Adaptation Programme of Action
NFDP	National Fadama Development Programme
NGO	Non-Governmental Organizations
NLDP	National Livestock Development Programme
NMA	Nigerian Meteorological Agency
NPC	National Population Commission
NPK	Nitrogen (N), phosphorous (P), potassium (K)
MMT	Mean Maximum Temperature
OMF	Organo-Mineral Fertilizer
OYSADEP	Oyo State Agricultural Development Programme
OYSEMAS	Oyo State Emergency Management Agency
RCP	Representative Concentration Pathway
RUAF	Resource Centres on Urban Agriculture and Food Security
SAP	Structural Adjustment Programme
START	System for Analysis, Research, and Training
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UPA	Urban and Peri-urban Agriculture

Contents

Executive summary

This report presents the findings of a knowledge assessment on urban and peri-urban agriculture (UPA) for the city of Ibadan, Nigeria that was conducted in 2012. It examines the state of UPA in the city through the lens of intensifying urban pressures and increasing climate risks with the objective of identifying how these and other drivers potentially interact to affect the long-term sustainability of UPA, and what response options are needed to address existing and emerging challenges. The assessment is intended to:

1) describe the dominant characteristics of urban and peri-urban agriculture, and identify key knowledge gaps in these UPA systems;

2) explore the array of stressors that contribute to vulnerability of UPA systems to climatic and other environmental changes; and

3) identify critical areas for strengthening policies and institutional capacities that contribute to sustaining the UPA sector within the larger context of resilient cities and food systems.

The rapid expansion of urban centres in Nigeria brings both opportunity and peril with respect to food security. Urbanization and urban growth are taking place against a backdrop of adverse economic policies linked to the removal of subsidies on fertilizer and fuel, persistent high inflation, rising unemployment and extreme climate events, all of which impact on the country's food security. Urban and peri-urban agriculture is increasingly viewed as an option for helping to meet the food and nutritional security needs of burgeoning cities in Nigeria. However, the sector faces substantial obstacles and challenges to its long-term sustainability stemming from haphazard urban sprawl and accompanying land-use changes, widespread pollution and other forms of environmental degradation that create health hazards for producers and consumers of food grown in and around urban centres, increasing risks to production systems and food chains from extreme climate events, and lack of visibility in urban development policies and planning frameworks. These are all important issues in Ibadan.

Addressing the various sustainability challenges that UPA faces requires addressing critical knowledge gaps and, in some cases, a fragmented and outdated knowledge base about UPA. This assessment attempts to redress these knowledge gaps by providing a synthesis of experience, knowledge and scientifically credible information about UPA activities in and around Ibadan, and the multi-stressor context of vulnerability facing the sector. It is hoped that the findings will stimulate dialogue within and across relevant sectors and actors and that its recommendations will inform and support more resilient urban planning that holds food security as a core concern.

Key Findings

Agriculture is an important activity that features significantly in the land use of Ibadan. Agriculture in urban and peri-urban areas of Ibadan is an important activity in which different socio-economic and demographic classes are engaged, including in related activities as input suppliers, processors, marketers and transporters. Ibadan's UPA systems feature fresh vegetables, cereal and root crops,

and a rapidly growing livestock sector in peri-urban areas that includes fish farming. Poultry, eggs and fish produced in Ibadan not only provide for the city but in addition, day-old chicks and eggs are transported to other parts of the country and to other West African countries including Chad, Guinea, Republic of Benin, Togo, and Mali. Peri-urban farmers play a significant role in supplying food to the city, as more than two-thirds of farmers sell more than half their agricultural produce in Ibadan and nearby towns and cities.

Rapid urban development and population growth in peri-urban areas have negative implications for the availability of agricultural land and for the urban environment. The city has grown at a tremendous rate since the oil boom of the 1970s, and population projections indicate that the city's population will double in the 25 years between 2005 and 2030. Most of the growth is occurring radially in peri-urban areas, and often on environmentally sensitive lands that are used for agriculture and that provide important environmental services, namely floodwater management. As this growth pattern is likely to continue, the city could engulf a significant portion of present-day peri-urban areas, with outlying rural areas developing into new peri-urban ones. Less land will be available for agricultural activities in the city and the hydrology of the catchment area will be further affected by the loss of vegetation cover and subsequent concretization of land surfaces for settlements and urban infrastructure.

Increased intensity of urban pressures and climate risks are contributing to enhanced severity of flooding with negative implications for agricultural activities and urban food systems. The prevalence of heavy rainstorms combined with uncontrolled urban development on flood plains and wetlands, widespread degradation of forests and poor waste management practices have contributed to the incidence of severe flood events in the city. These have had resulted in adverse effects on the livelihoods of farmers and those engaged in agriculture-related activities, as well as damage to infrastructure and agricultural processing equipment. Floods have resulted in urban farmers facing major financial losses. The combination of rapid urban development and climate change is an important and growing source of vulnerability for UPA farmers and the city's food system. Multi-decadal analyses of meteorological characteristics show that Ibadan is experiencing a warming trend, and changes in the characteristics of seasonal rainfall.

The high volume of wastewater and solid waste generated in the city is negatively impacting the quality of soil and water for agriculture, giving possible rise to health risks. The discharge of untreated effluent and industrial wastewater into streams, rivers and drainage channels, and contamination of soils from industrial waste are major sources of pollution. These pose serious health risks to urban dwellers who consume produce grown on contaminated soils or irrigated or washed with wastewater. Major rivers and streams, such as the Alaro, Ogunpa, Ogbere, Kudeti, Gege and Ona, contain heavy metals of which zinc, lead and copper are the most abundant, and exceed acceptable limits in all of them. Heavy metal contamination of vegetables grown with wastewater in different parts of the city, particularly from around Eleyele Dam on the Ona, could pose serious human health risks from long-term exposure.

Significant knowledge gaps need to be addressed in order to develop appropriate responses to the sustainability challenges facing UPA. Carrying out this assessment revealed the paucity of up-to-date statistics that could be useful for fully assessing the significance of UPA. For instance, hard data on the number of people engaged in agricultural activities as either a primary or secondary income source are not available, nor is there hard data on how engagement in urban agriculture influences household food security. Efforts should be made by the relevant government agencies to

strengthen their research units and liaise with research institutions to undertake detailed surveys at local and city levels, so that credible data are available. Such data would help in the advocacy of UPA in urban planning efforts.

Knowledge about how extreme temperatures and rainfall affect livestock and plant diseases is another important knowledge gap, as is understanding of climate change impacts specific to horticultural crops, urban livestock and farmed fish, which remain vastly under researched relative to cereal crops and rural livestock systems. Detailed studies are also needed to better understand how rapid urban growth and subsequent land-use change may interact with a more extreme climate.

1

Introduction

Founded in 1829 as a war camp, Ibadan represents the pinnacle of pre-colonial urban development in Nigeria. Now the capital city of Oyo State in southwestern Nigeria, it was once described as the largest city in Sub-Saharan Africa (Lloyd and Mabogunje, 1968), and Ibadan remains the largest indigenous urban centre in Sub-Saharan Africa. Its designation, in 1952, as the regional and administrative headquarters of the old Western Region of Nigeria contributed to the city's rapid population growth—from a modest population of 60 000 in 1856, the population of the metropolis had increased to 1.34 million in 2006 (Adelekan, 2010) and, for the Greater Ibadan area, 2.55 million. With approximately 2 889 people per square kilometer (km^2), Ibadan has one of the highest population densities in Nigeria (NPC, 2006). Presently, Ibadan is the second most populated city after Lagos in Nigeria's southwest region. While the majority of Ibadan residents are traders, many are civil servants and a few are farmers producing a variety of agricultural products that contribute to the food system serving the urban population.

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Although many towns and urban centres in Nigeria originally developed from farming or fishing communities, today urban farming is not sufficiently recognized or promoted as a feasible means of bolstering food and livelihood security or as a strategy for greening the urban space (Ezedinma and Chukuezi, 1999; Adedeji and Ademiluyi, 2009). This state of affairs prevails in Ibadan where UPA has not been accorded due recognition by policy makers, although the practice has been ongoing since the early 19th century (UN-HABITAT, 1994; IWMI/RUAF, 2007).

Across Africa more generally, public policies are slow to acknowledge the multi-functionality of UPA, resulting in it remaining part of the unregulated, unmonitored informal economy with little empirical evidence on its economic value. This is reflected in the fact that UPA is rarely included in official statistics (Cohen and Garrett, 2010; de Zeeuw *et al.,* 2011). It was not until 2007, through the Resource Centres on Urban Agriculture and Food Security's (RUAF's) multi-stakeholder and planning initiative for urban agriculture, that the first attempt was undertaken to characterize and identify the challenges and prospects of UPA in Ibadan and to bring together all stakeholders to guide the process of strategic planning for urban agriculture in the city.

Urban and peri-urban farming is an important activity in Ibadan, contributing to the food supply and livelihoods of many along the value chain. Prevailing conditions of rapid urbanization, removal of subsidies, soaring inflation, and rising unemployment and natural disasters have been identified as factors that foster the growth of UPA in southern countries (Mougeot, 1994; 2005). Local authorities are key players in this context; however they typically fail to integrate the food production systems, or for that matter the spatial arrangement of food markets so as to enable access to food by the urban poor, when designing, planning and managing urban areas (FAO, 2011; Battersby, 2011).

In most low and middle-income countries, including those of West Africa, urban areas have expanded haphazardly with little land-use or strategic planning to guide changes. Increased competition between urban land uses and agricultural land in urban and peri-urban areas, in the absence of deliberate planning for urban and peri-urban food production, presents a significant challenge to the urban food system, and to food and nutrition security in cities. This is particularly true in cases where little effective control exists over land-use conversion from agriculture to non-agricultural uses (Satterthwaite *et al.*, 2010; FAO, 2011). Most agricultural land in and around urban centres in Nigeria, for example, is now being engulfed by urban development (Lynch *et al.*, 2001; Brinkmann *et al.*, 2012).

Urban food systems, including that of UPA, will face increasing challenges as both climate change and urbanization intensify over the course of this century. Increased frequency of flooding in poorly planned cities such as Ibadan will impact both urban food production and food chain infrastructure for moving food from rural and peri-urban locations into the city. Low-income groups in urban areas are particularly sensitive to disruptions in food access, thus the emerging challenge created by the convergence of rapid urban growth with climate change is of paramount concern.

2
Objectives and methods

Objectives of the study

This assessment examines UPA in Ibadan in a multi-stressor context of rapid urban growth, climate variability and change, and environmental degradation. This assessment focuses on urban and, in particular, peri-urban environments of the city, and the farming systems—food crops, livestock and aquaculture—within them. The assessment's conceptual framework illustrates the key drivers and stressors, development factors and peri-urban products and services that were considered. The assessment framework is presented in Figure 2.1.

The objectives of this assessment are to:
- assemble and synthesize knowledge on agricultural activities in urban and peri-urban areas of Ibadan, and to strengthen the knowledge base as related to the multiple stressors and drivers that contribute to UPA's vulnerability;
- identify where insufficient knowledge exists and highlight where additional research and assessment efforts are needed to support policy planning and decision-making at the city level; and
- strengthen capacity within the research community to undertake assessments, and foster networks of regional technical expertise, and to encourage stronger communities of practice engaged in the topic of urban food production and climate change.
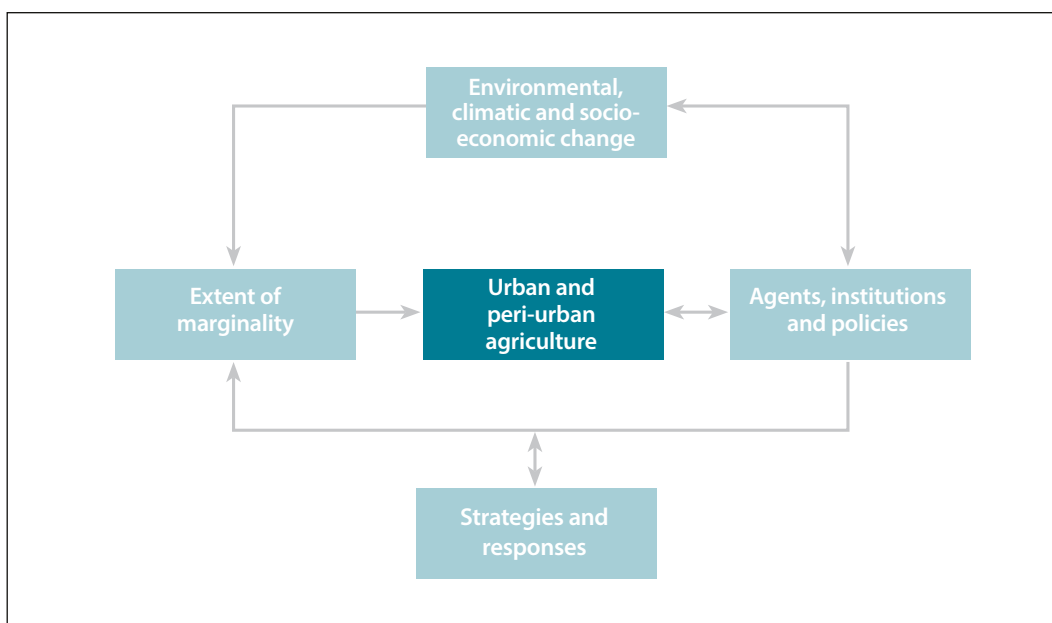
FIGURE 2.1
Conceptual framework

Description of methods

The Ibadan city assessment was carried out by an interdisciplinary team of researchers in agriculture, geography, development practice and urban planning, between May 2011 and December 2012. The assessment team worked in cooperation with the State Ministry of Agriculture, Departments of Agriculture in the peri-urban local government areas and the Oyo State Agricultural Development Program (OYSADEP). Decisions on the critical issues to study, and of the selection of specific sites and/or farming systems to examine, were made by the assessment team with inputs from key stakeholders during the assessment inception workshop, held in Ibadan in June 2011.

The knowledge assessment was undertaken using the following methods:
   i.   Review of empirical research studies on different aspects of the assessment topic published in scientific journals, published and unpublished research reports and documents, and climate data sets.
   ii. Specifically designed, semi-structured questionnaires used with sample populations of different categories of UPA stakeholders.
   iii. In-depth interviews with key informants engaged as researchers, UPA practitioners and planners.
   iv. Spatial mapping of different categories of farming undertaken by on-ground identification of farms in Ibadan by 15 trained field assistants over a period of two weeks. An iterative process was employed to aid the location of all farms in any district. The use of Geographical Positioning Systems (GPS) by field assistants enabled the digital mapping of farm locations.
   v.   Secondary data collection that contained information on different farmer groups and associations—a number of registered farmers in different farming associations in the city, spatial location of farms, etc., and a review of newspaper reports, policy papers and other secondary data sources.

3
The city of Ibadan

Ibadan consists of 11 local government areas (LGAs) for governance and administrative purposes. Five of the LGAs are located in the metropolitan core of the city, while the remaining six are either predominantly peri-urban or rural settlements (Figure 3.1). Ibadan's total land area is 3 123 km², of which about 15 per cent is urban and the remaining 85 per cent is classified as peri-urban. Ibadan North LGA is the largest among the urban LGAs (145.58 km²) while Ibadan North West is the smallest at 31.38 km². The peri-urban LGA of Ido (865.49 km²) covers the largest land area.
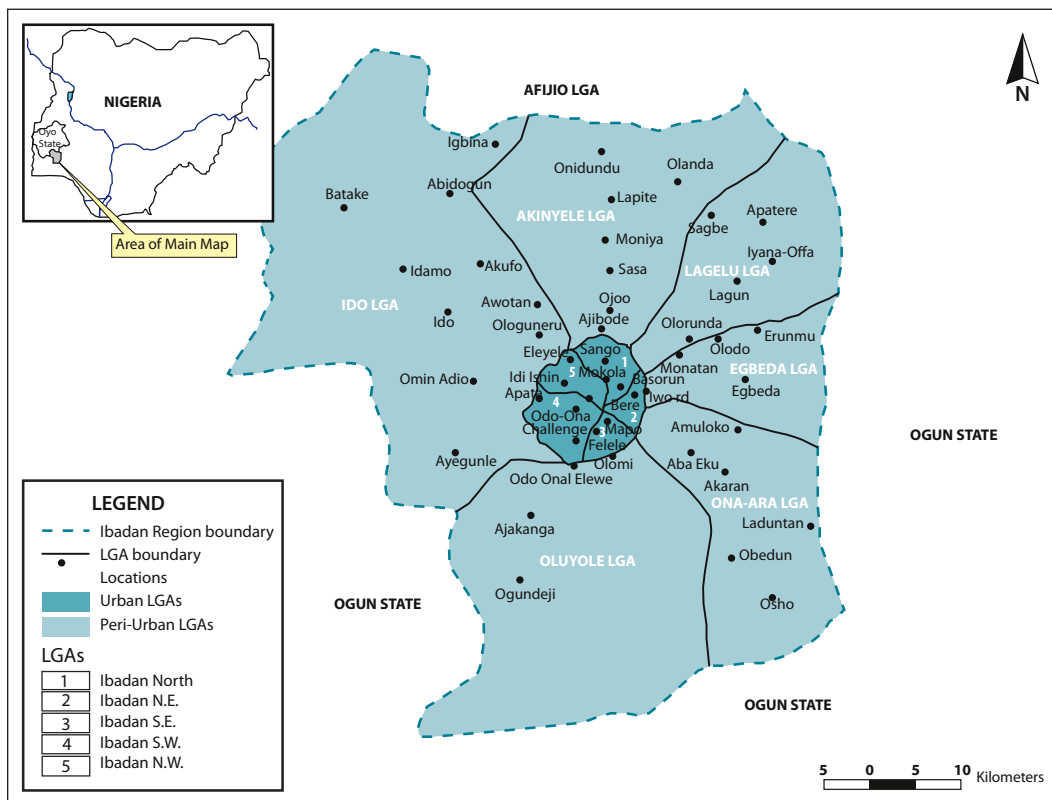
FIGURE 3.1
Urban and peri-urban LGAs of Ibadan

Urban growth trends

The existence of universally acceptable urban characteristics such as a non-agricultural economic base, density of physical development and services, heterogeneity of the population and occupational structure are taken into consideration in classifying a settlement as urban. The peri-urban area of a city, in addition to its agricultural economic base, will have evidence of a transforming landscape in terms of physical development and a diversity of economic activities. A peri-urban area may, therefore, be regarded as a dynamic interface with urban and rural features rather than a fixed geographical zone (Simon *et al.*, 2006).

The criteria for describing a settlement as urban in Nigeria are both dynamic and contextual. While the 1952 national census considered any compact settlement of 5 000 inhabitants or more as urban, the 1963 and 1991 censuses defined urban centres as settlements with populations of 20 000 or more. Urban growth in Ibadan has been associated with a process of peri-urbanization. Before 1970, Ibadan was surrounded by rural villages with virtually no peri-urban development. However, since the oil boom of the 1970s, national economic development has had a significant influence on the urbanization processes of the city. Ibadan has grown both in physical size and population, becoming a large, sprawling city with no discernible pattern of development. Extensive areas, which were earlier characterized by rural features, have either been incorporated into the city or transformed into peri-urban areas, such that former rural areas including Alakia, Bode-Igbo, Lalupon, Moniya, Odo-Ona, Ogbere and Olodo are all now part of peri-urban Ibadan.

Extensive peri-urban developments have taken place along the major roads and highways leading to other major towns in the region. Developed land increased from only 1 km^2 in 1830 to 214 km^2 in 1988 (Onibokun and Kumuyi, 1999), and an examination of the areal extent of the city using satellite imagery indicates that urban development has extended significantly in the last three decades with the developed land area for the city reaching 401 km^2 by 2012 (Figure 3.2).

The city's growth has been largely facilitated through transport development and the establishment of several educational and research institutions. The passage of the Lagos-Kano railway through Ibadan in 1901 played an important role in the development of the city (Onibokun and Kumuyi, 1999), while the convergence of two major trade routes—through Ijebu and Abeokuta—in the city encouraged the migration of large numbers of people who established trading activities in Ibadan in the 1950s and 1960s. Ibadan thus became a commercial focus of the entire Western Region of Nigeria. Many new developments took place after 1973, which encouraged the outward growth of the city in almost all directions (Areola, 1994), with the construction of the Ibadan-Lagos expressway generating the greatest urban sprawl, east and north of the city, in the 1980s. The Eleyele expressway in the west of the city also generated significant expansion in this part of the city. Since then the city has extended further into the neighbouring LGAs of Akinyele and Egbeda (Fourchard, 2003).

The phenomenal population increase in the city in more recent years has taken place mainly in the peri-urban areas (Table 3.1). While the average population growth rate per year in the metropolis was a mere 0.5 per cent between 1991 and 2006, the average growth rate for the peri-urban areas was 4.8 per cent a year over the same period.

Population and demographic projections for the city

Projections for the city suggest that over the next decade or more the number of inhabitants in Ibadan will increase by around 60 per cent (Figure 3.3). Similarly, Oladele and Oladimeji (2011) project that Ibadan's population will increase 68 per cent, and land conversion for urbanization will increase by 58 per cent between 2000 and 2020. The city is extending radially, and if this continues it could engulf significant areas that are currently peri-urban and transform more distant rural settlements into new peri-urban areas. The sharp increase in demand for land and physical development, in the absence of strict urban growth regulations, will likely result in a loss of important environmental services as well as a decrease in available land for agricultural activities in the city. The conversion from permeable land surfaces (e.g., agricultural lands, wetlands and forest remnants) into impermeable surfaces for housing and industry can change the hydrologic flow across the catchment area such that storm
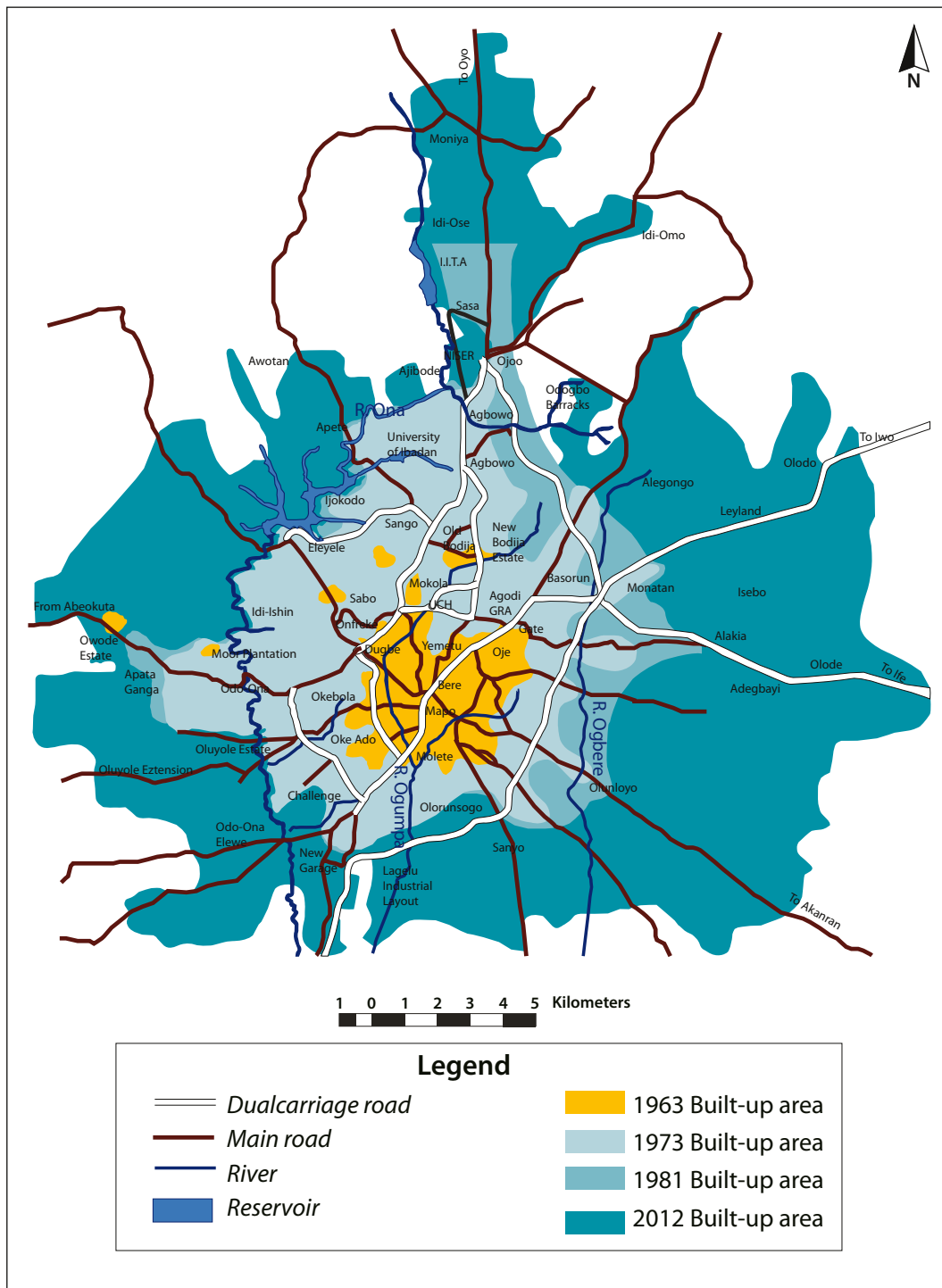
water runoff would increase, resulting in heightened flood risks. Furthermore, the urban heat-island effect could become more pronounced, with the urban environment warmer than the surrounding area. Studies are needed to better understand how rapid urban growth in Ibadan (and other Nigerian cities) changes critical environmental characteristics of the area and how these changes might be amplified by changing climate. This is an important knowledge gap.

TABLE 3.1
Population characteristics of urban and peri-urban LGAs, 1991–2006

LGA	Area (km²)	1991 population	2006 population	Population increase (%)	Growth rate (%)
URBAN					
Ibadan North	145.58	302 271	306 795	1.5	0.1
Ibadan NE	81.45	275 627	330 399	19.9	1.3
Ibadan NW	31.38	147 918	152 834	3.3	0.2
Ibadan SE	80.45	225 800	266 046	17.8	1.2
Ibadan SW	124.55	227 047	282 585	24.5	1.6
Total	463.41	1 178 663	1 338 659	13.6	0.9
PERI-URBAN					
Akinyele	427.26	140 118	211 359	50.8	3.4
Egbeda	136.83	129 461	281 573	117.5	7.8
Ido	865.49	53 582	103 261	92.7	6.2
Lagelu	283.92	68 901	147 957	114.7	7.6
Ona-Ara	369.37	123 048	202 725	64.8	4.3
Oluyole	577.10	91 527	265 059	189.6	12.6
Total	2 659.97	606 637	1 211 934	99.8	6.7

Source: National Population Commission (2007) and Survey Department Ministry of Lands, Housing and Survey, Ibadan.

FIGURE 3.3
Population trend for Ibadan, 1950–2025
Source of data: (DESA, 2013)
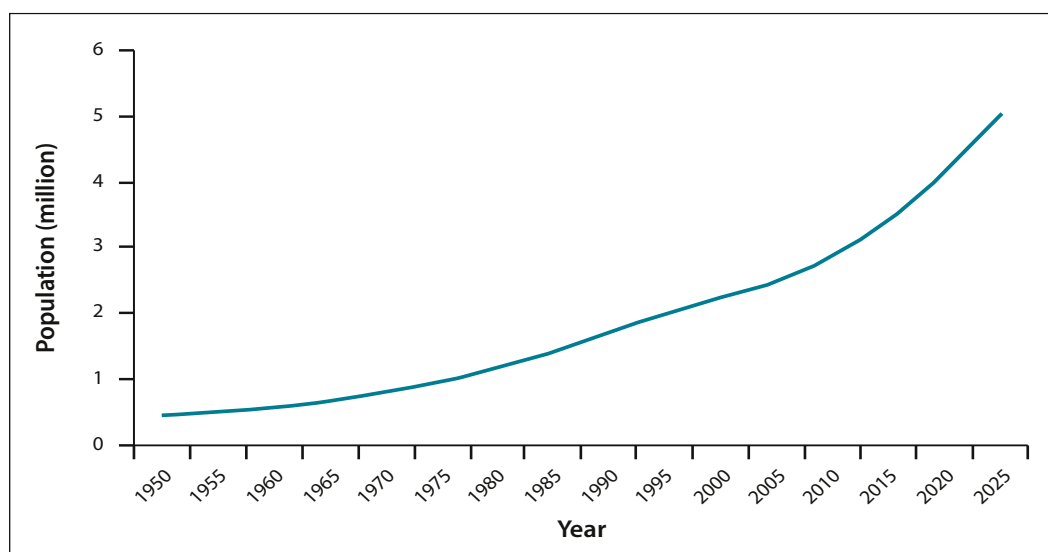
4
Climate information

Temperature trends and projections

Analyses of minimum and maximum temperatures over the city for the period 1981–2010 show a general warming trend (Figures 4.1 and 4.2). The rate of change of minimum temperatures is greater than the change observed for maximum temperatures.
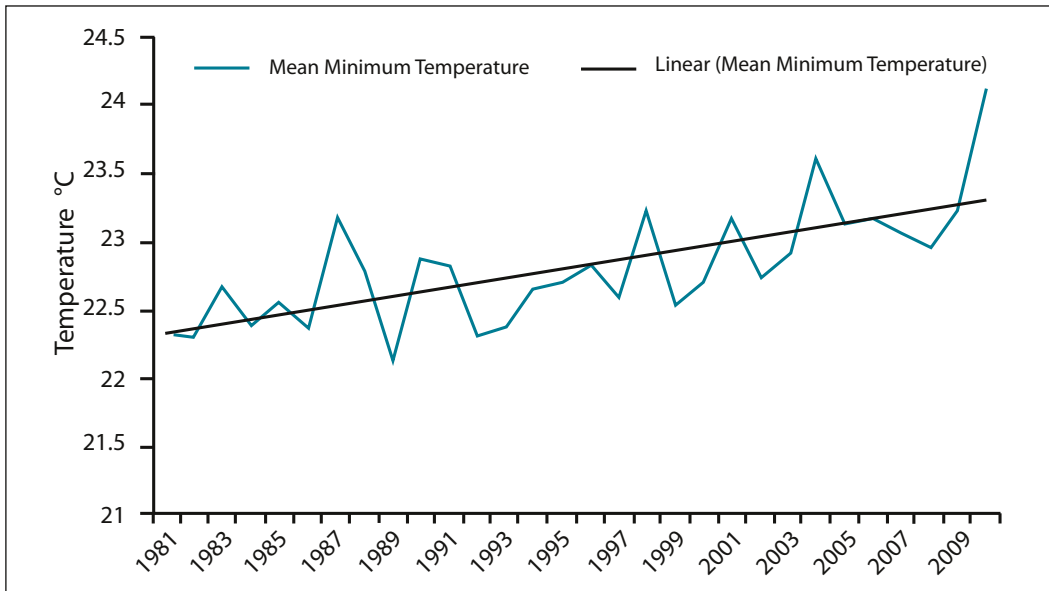
FIGURE 4.1
Mean annual minimum temperatures (°C) for Ibadan, 1981–2010

Source: Nigerian Meteorological Agency
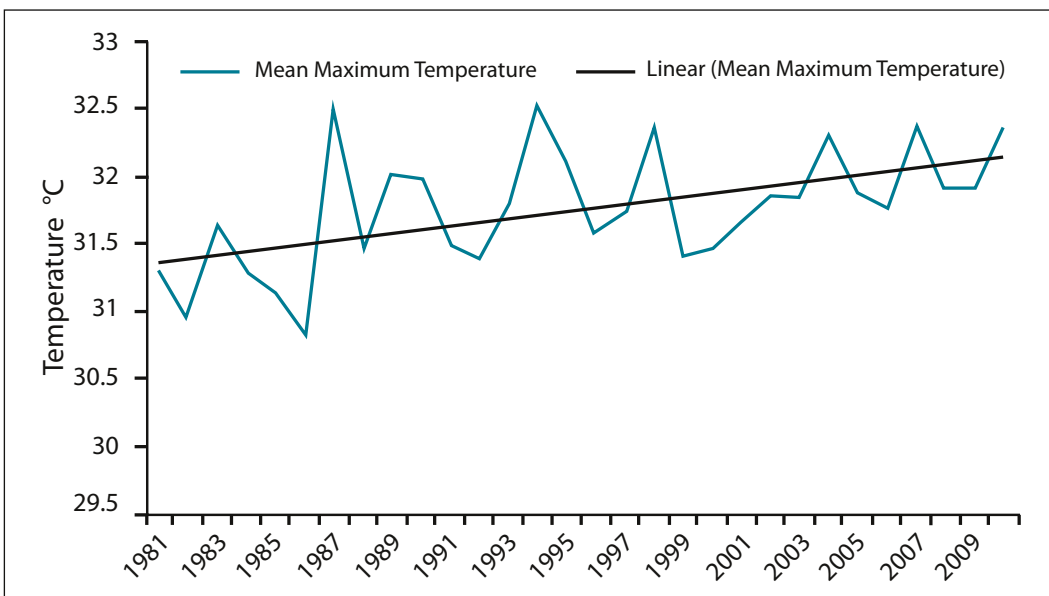
FIGURE 4.2
Mean annual maximum temperatures (°C) for Ibadan, 1981–2010

Source: Nigerian Meteorological Agency

Mean monthly maximum temperatures are projected to increase by 1.2 to 1.4° C in the 2040 to 2060 time period above historic baseline temperatures (1970–2000) for a low greenhouse gas emission scenario (Figure 4.3a) and by 1.6–2.0° C under a high scenario (Figure 4.3b). Mean monthly minimum temperatures exhibit a similar pattern with temperatures increasing by 1.1–1.4° C under the low scenario (Figure 4.4a) and 1.8–2.0° C under a high scenario (Figure 4.4b).

The figures below show an envelope of projected temperature change derived from a suite of regionally downscaled climate model projections from Coupled Model Intercomparison Project Phase 5 (CMIP5) set of climate models, under a future scenario of low (Representative Concentration Pathway [RCP] 4.5)[1] and high (Representative Concentration Pathway 8.5) greenhouse gas emissions. The projections are indicated as an envelope of possible future temperature rise; the middle bolded line represents the mean of the upper and lower bounds of the envelope. A wide difference between the lower and upper lines within a figure indicates relatively low agreement between the models, whereas a narrow difference indicates relatively high agreement between the models. Thus, while the future will become warmer, predictions of the extent of warming can vary widely across the models within a particular month and should be interpreted with caution. Climate projections were derived from the University of Cape Town's Climate Information Portal[2].

FIGURE 4.3a
Maximum temperature under an RCP 4.5 scenario

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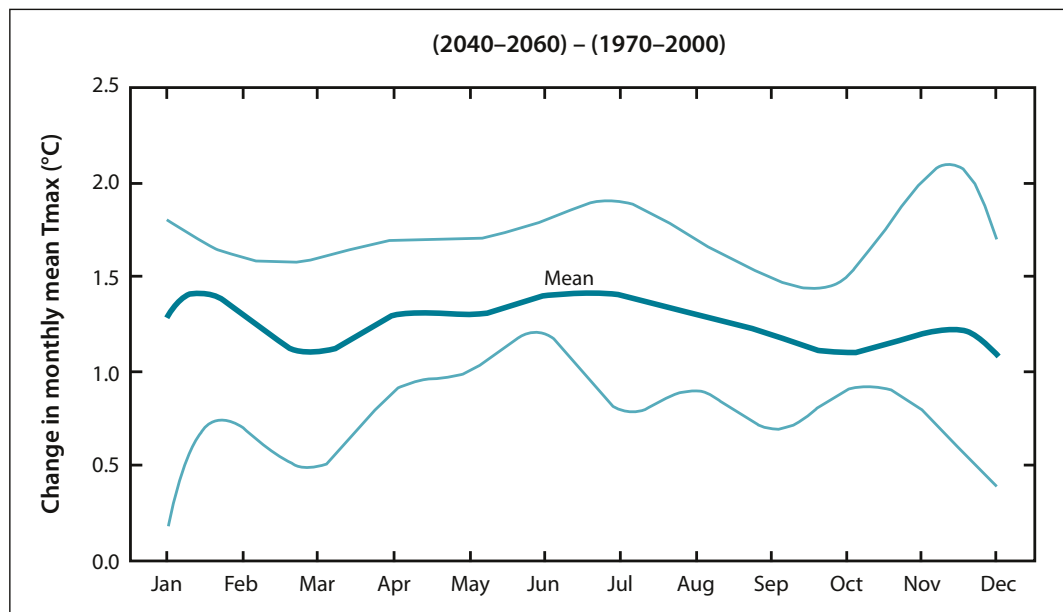
1 http://en.wikipedia.org/wiki/Representative_Concentration_Pathways
2 http://cip.csag.uct.ac.za/webclient/map

(2040–2060) – (1970–2000)
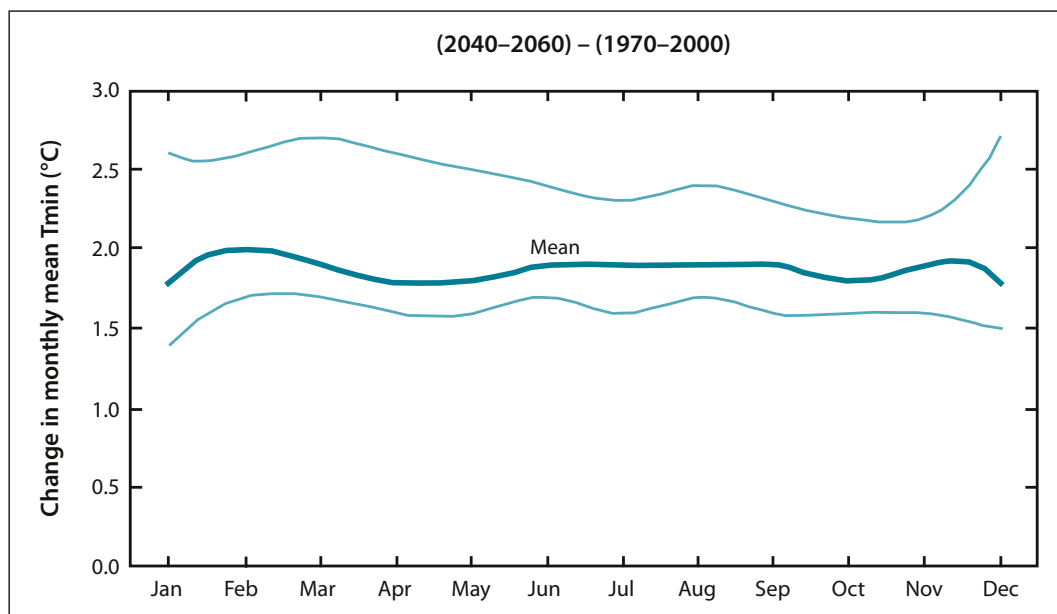
Rainfall trends and projections

In recent years, Ibadan has experienced changes in rainfall patterns exemplified by an increase in mean annual rainfall (Figure 4.5), a shorter wet season and the virtual disappearance of the short dry season, the so called August break (Chineke *et al.*, 2010). Analysis of rainfall records for Ibadan over a 30-year period, 1981–2010, shows marked variations in rainfall characteristics for the 1981–2000 period as compared with the 2001–2010 period (Table 4.2). Shorter wet seasons have been experienced in the latter 10-year period, with a mean of 169 days relative to 186 days during the earlier period, 1981–2000. Though a 10-year period is not sufficient time to establish whether there is a trend towards a shorter season, such a shift could have significant implications for crop farming in the region, which is largely rain-fed, as a shorter wet season translates into a reduction in the growing period. Analysis of Ibadan's rainy season length conducted by the University of Cape Town's Climate Systems Analysis Group found a slight but statistically insignificant decrease in rainfall length for the 1971 to 2005 period.

Heavier rainstorms have also been recorded in more recent years. In the period 2001–2010, six rainfall events with amounts more than 100 mm over a 24-hour period were recorded, while for 1981–2000 only one was recorded (Table 4.2). The mean number of rainstorm events of 31–50.9 mm also increased in the latter period. An analysis of heavy rainfall events for 1971–2005 (Figure 4.7) indicates that the month of June experiences the highest incidence of heavy rainfall, and June and July have experienced a slight increase of around 0.3 days/decade over the observed 35 years.

Future projections of rainfall (Figures 4.8 and 4.9) indicate that Ibadan will experience changes in rainfall distribution with an overall increase in annual rainfall by mid-century (2040–2060) compared with the baseline period of 1970–2000. The low (RCP 4.5) and high (RCP 8.5) emissions scenarios show general agreement, though with some changes in magnitude between the two. Projections for rainfall during Ibadan's April through October rainy season indicate increased rainfall in April, September and October, and in the normally dry months of February and March, and decreased

TABLE 4.2
Rainfall for Ibadan, 1981–2010

Rainfall Characteristic	1981–2000	2001–2010
Mean duration of wet season (days)	186	169
Mean number of rain days/year	85	80
Mean rainfall amount/year (mm)	1 029.9	1 125.7
Mean number of rain days with 31–50.9mm	6.3	9.3
Mean number of rain days with 51–100mm	3.1	4.8
Number of rain days >100mm	1	6

Source: Nigerian Meteorological Agency
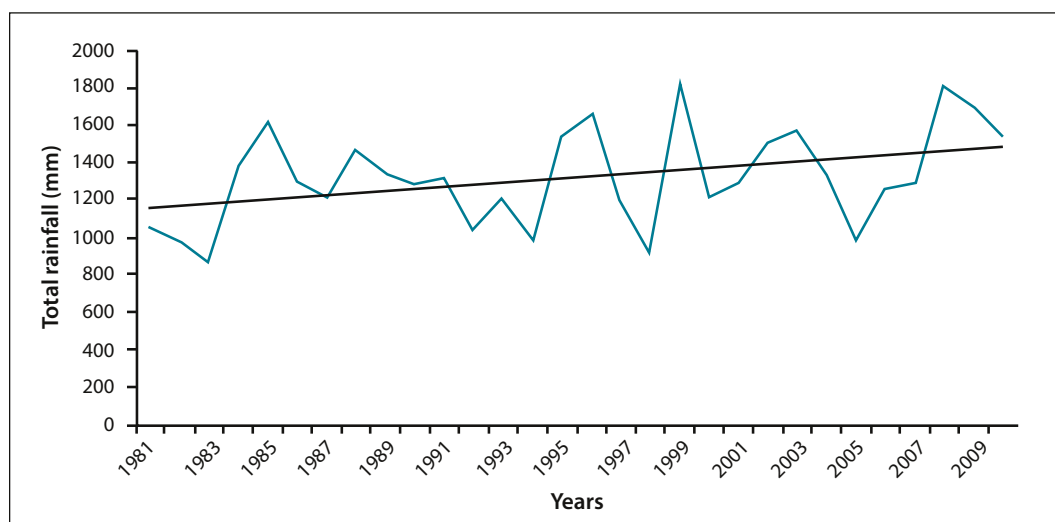
FIGURE 4.5
Annual rainfall for Ibadan, 1981–2010

Source: Nigerian Meteorological Agency
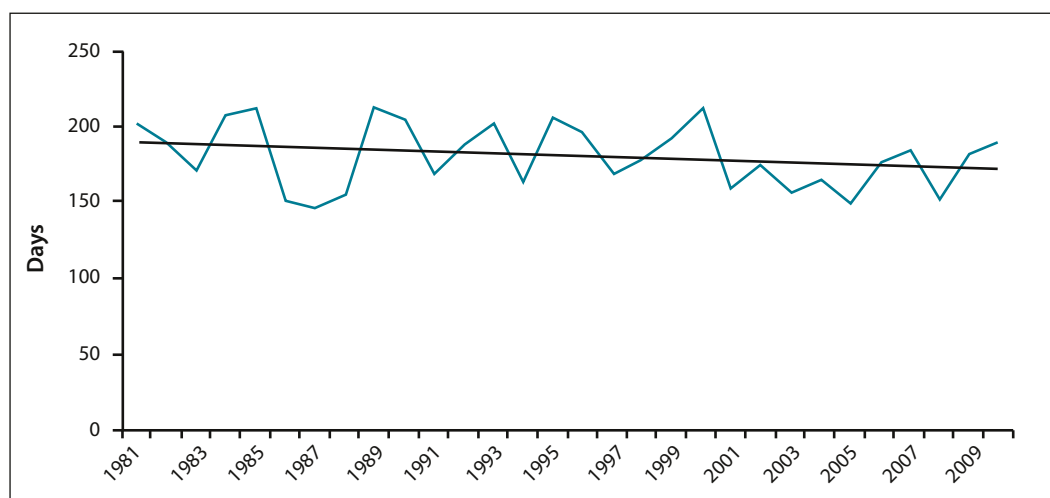
FIGURE 4.6
Length of wet season, days, 1981–2010

Source: Nigerian Meteorological Agency

FIGURE 4.7
Days per month that the number of rain days exceeds the 95th percentile, indicating extreme precipitation (top), and the decadal trend in changes in days per decade of extreme precipitation (bottom)
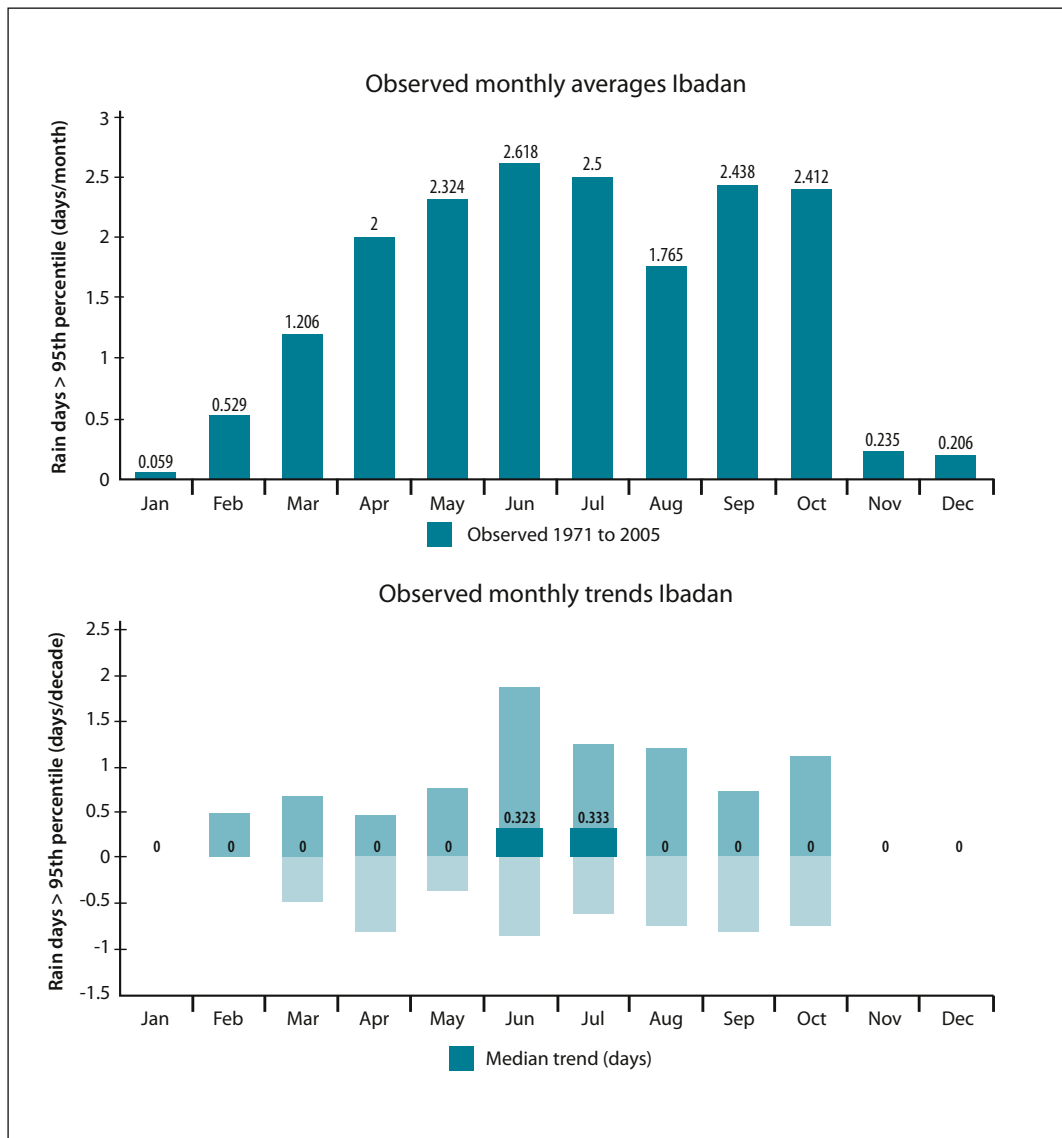
rainfall in May, June and August. Rainfall projections for July have a wide spread of increased and decreased rainfall so it is not possible to state with any certainty how rainfall in that month will change.

The bars in the figures below indicate the spread of the climate model results and thus the relative degree of uncertainty in the envelope analysis. The shorter the bar, the greater the degree of agreement between the models and the higher the certainty of future rainfall projections. The distribution of the bars is also important. Bars that are distributed predominately in one direction relative to the zero line indicate agreement between the models regarding the direction of future rainfall (increased rainfall—bar is mostly above the zero line—or decreased rainfall—bar is mostly below the zero line). Bars that evenly straddle above and below the line show poor agreement and thus a relatively high degree of uncertainty. For example, there is low agreement between the models for the month of July (tall bar and spread above and below the zero line), indicating high uncertainty, and close agreement between the models for the month of October (short bar and projections not straddling above and below the zero line), indicating lower uncertainty.

Heavy rainfall events

Multi-model ensemble projections of the change in heavy rainfall events for 2040–2060 relative to
1971–2005 baseline indicate increased incidence in heavy rainfall at the start of the rainy season
in April, and for June–November. However, while the relative change in incidence is high, up to a
60 per cent increase in April, the absolute incidence is likely to remain fairly low. It is important to
note that the projections presented here are for a single point location. Large-scale flooding events
can occur due to rainfall within a small, localized region. However, often, flooding events are the
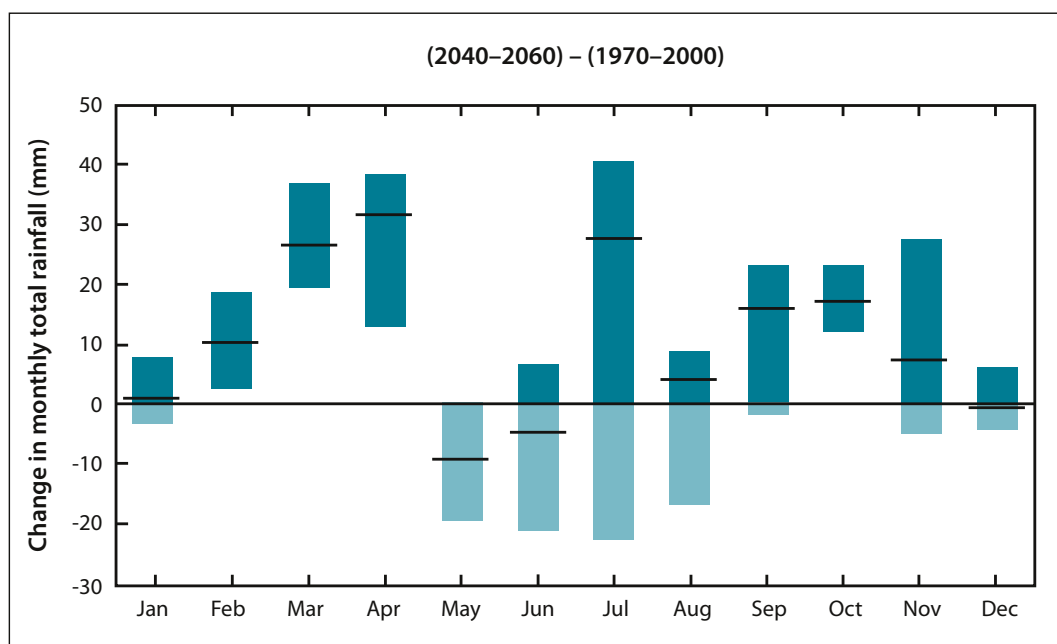
FIGURE 4.8
**Rainfall projections under
an RCP 4.5 scenario**
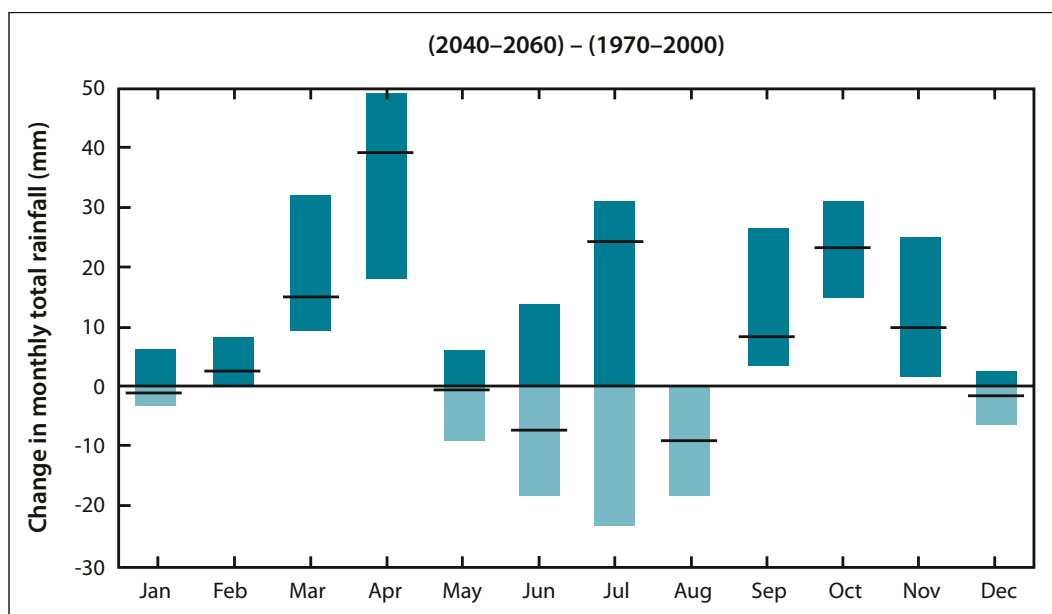
FIGURE 4.9
**Rainfall projections under
an RCP 8.5 scenario**

result of larger-scale catchment dynamics resulting in high river levels and high soil moisture content. Under such conditions, heavy local rainfall can lead to localized flooding.

FIGURE 4.10
**Change in rain days > 95th
percentile, days/month**
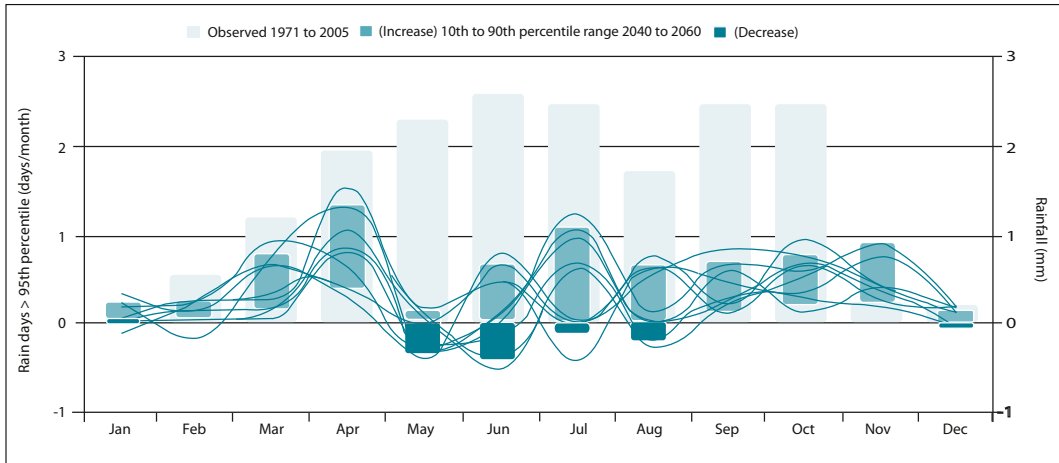
Wind

High-wind events have increased in Ibadan over the 1998-2008 period as compared with the 1989-1998 period (Adelekan, 2012) (Figure 4.11). These small-scale events can trigger high losses, particularly where housing and other infrastructure is of poor quality. In a survey of wind-affected areas of Ibadan from a 2008 high-wind event, Adelekan (2012) reported that nearly half of the residents experienced displacement from dwellings, losses that were compounded by thievery and disruption of livelihoods that occurred in the wake of the storm.

FIGURE 4.11
**Mean maximum wind
gusts, 1989-2008**

Source: Adelekan, 2012
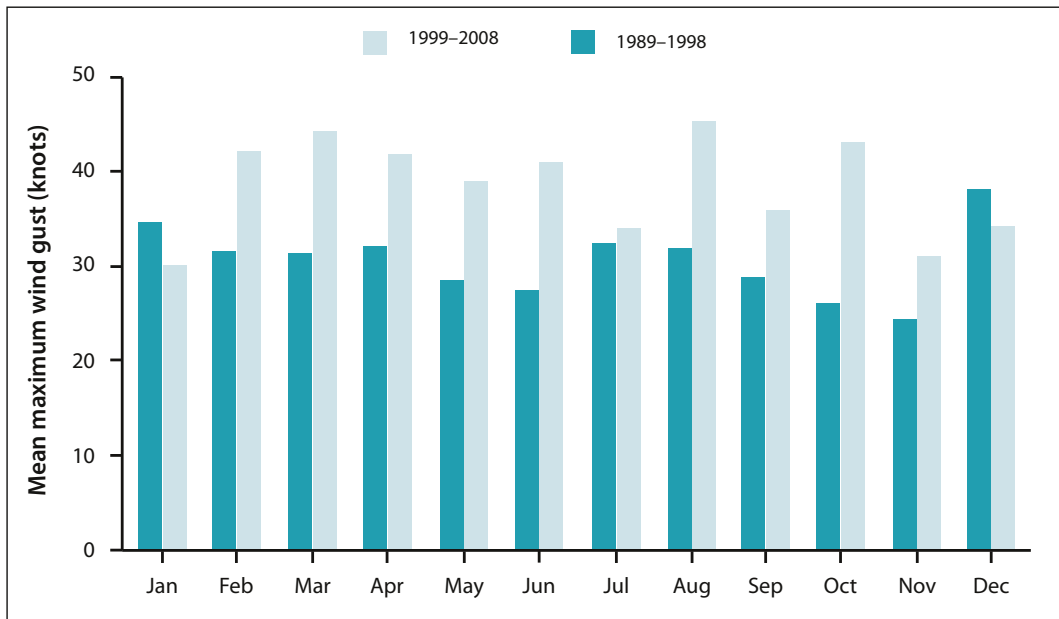
5

Urban and peri-urban agriculture

UPA's contribution to Ibadan's food supply

Urban and peri-urban agriculture is an important activity in Ibadan, providing a significant source of nutrient-rich foods to the city, and a source of livelihoods for farmers and those involved along the value chain. Past studies (Gbadegesin, 1991; Abumere and Oluwasola, 2001) estimated that 23–25 per cent of food crops sold in city markets were produced within the metropolis. In the Abumere and Oluwasola (2001) study, peri-urban locations were estimated to supply 54 per cent of food crops to the city, while the rural areas in the Ibadan region supply 14.5 per cent of food crops to the city. Less than 8 per cent of food comes from outside the state—the north of the country supplies the bulk of major grains including sorghum, millet and beans—while a high percentage of rice is imported from outside the country. More recently, the Food and Agriculture Organization of the United Nations (FAO, 2012) reported that urban and peri-urban horticulture provides as much as 80 per cent of the city's vegetable supply, and creates individual incomes ranging from US $330 to more than US $3 000 a year for a network of vegetable producers, input suppliers and vegetable traders, though this study is based on secondary data. Food grown in urban/peri-urban areas of Ibadan is largely marketed through informal channels including sale at farm gates, home sales, hawking and through urban markets. Only 5 per cent supply their produce to shops and supermarkets (IWMI/RUAF, 2007).

Description of the UPA systems

A survey of agricultural activities in the 11 LGAs of Ibadan undertaken as part of this assessment identified 796 farms, over 90 per cent of which were in peri-urban zones. These farms fall into five main categories of which livestock farming and aquaculture are dominant, with more than 67 per cent of all farms falling into these categories (Table 5.1).

TABLE 5.1
Category, number and distribution of UPA activities in Ibadan

Activity	Urban	Peri-urban	Total
Aquaculture	10	120	130
Livestock (poultry, pig, goat and cattle)	15	394	409
Mono-cropping	25	129	154
Mixed-cropping	12	55	67
Mixed Farming (crop and livestock)	8	28	36
Total	**70**	**726**	**796**

Source: UPA assessment survey

Crop production

Within Ibadan's urban core, a majority of farmers (63 per cent) engage in urban agriculture for food self-provisioning and as a means towards household food security, while 34 per cent farm for commercial purposes. Only about three per cent farm because they have no other means of a livelihood (Yusuf *et al.*, 2008). The main food crops grown in core urban areas are leafy vegetables including amaranth and corchorus, fruit such as plantain/banana, citrus fruit and pineapple, arable crops including maize, cassava and yam, and tomatoes (Gbadegesin, 1991; Abumere and Oluwasola, 2001).

Land accessed for agricultural activities within the urban area includes private plots, land in and around residential areas, vacant plots on government and institutional land and land along rivers and roadsides (Figure 5.1) (IWMI/RUAF, 2007). Of these, vacant plots in major facilities such as research and educational institutions, hospitals, military and police barracks and airports afford farmers the largest area for crop farming. Food production in backyards and other smaller plots is also important, with 40 per cent of crop farmers using their backyards and two per cent boxes or pots. For crop production done outside of the home, 28 per cent farm on vacant plots, 19 per cent on rented land, and 11 per cent on land they own.

Vegetable farming in urban areas is mostly practiced around Ojo, Sango, Odogbo and Mokola military barracks, and Eleyele, Apete, Ologuneru and other swampy/wetland areas. As river catchments provide easy access to irrigation water, the flood plains of the Ogunpa, Kudeti and Dandaru rivers are used for urban, and outwards to peri-urban, production of maize, cassava, vegetables, plantain, and banana, and on-farm marketing. Small-scale agro-processing, especially those of cassava products (garri, starch, fufu and lafun), are typically located very close to rivers due to their need for plentiful water. Pig and fish farm operations are also predominately located near the rivers.
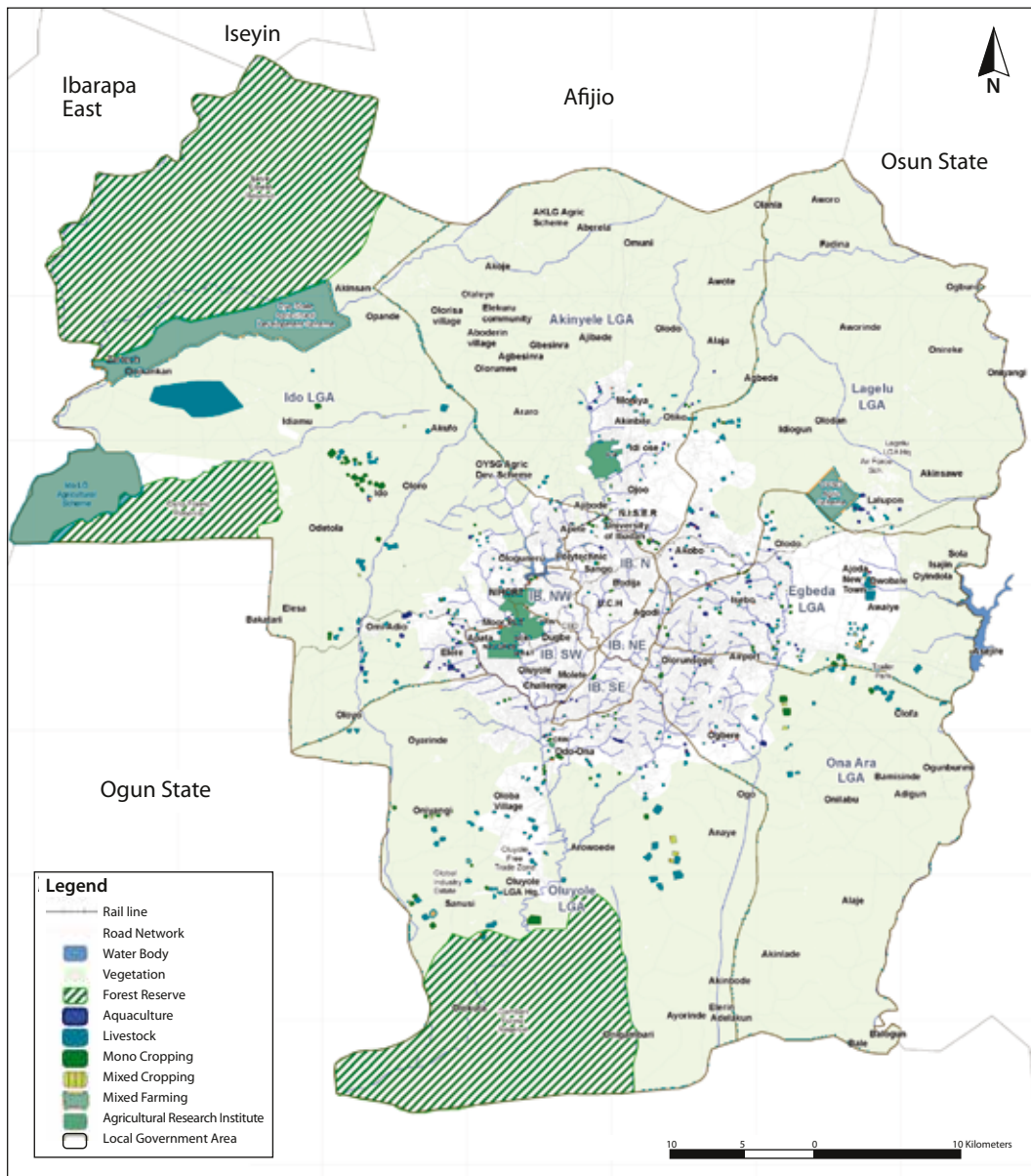
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Peri-urban farmers play an important role in the city's food supply, as a considerable proportion of food produced by these farmers is sold in Ibadan and nearby towns and cities. The majority of peri-urban farmers cannot be described as practicing subsistence farming given that more than 70 per cent sell more than half of their agricultural produce, 16 per cent sell less than half of what they grow while only four per cent consume all that they produce (Abumere and Oluwasola, 2001).

A striking feature is the specialized nature of peri-urban LGAs in the production of three staple food items: while Akinyele and Ido LGAs dominate in root crops production, Oluyole and Ona-Ara LGAs lead in maize production. In peri-urban areas where relatively large amounts of land are available, agricultural activities are characterised by farm settlements, livestock rearing and plantation agriculture. These areas include Olubokun farm settlement in Ido LGA, and cassava and banana plantations at Moniya and Laniba, both in Akinyele LGA. Other subsistence and commercial

TABLE 5.2

Registered crop farmers by type in Ibadan (urban and peri-urban)

Crop	Number of registered farmers
Cassava	1 309
Maize	231
Sweet Potato	241
Rice	104
Yam	246
Total	2 131

Source: All Farmers Association of Nigeria, Oyo State (2009/2010)

TABLE 5.3

Registered livestock farmers by type in Ibadan (urban and peri-urban)

Livestock	Number of registered farmers
Cattle	103[a]
Aquaculture	431[b]
Poultry	98[c]
Pigs	601[d]
Sheep and Goats	117[a]

Sources: a) All Farmers Association of Nigeria, Ibadan; b) Catfish Farmers Association of Nigeria, Oyo State; c) Poultry Association of Nigeria, Oyo State; d) Olugasa, 2006

farming practices are spread across the six peri-urban LGAs where cassava, maize, vegetables, yams, plantain and sweet potatoes are produced (Kintomo *et al.*, 1997; Ojo *et al.*, 2009; Olajide-Taiwo *et al.*, 2010).

Farmers engaged in cereal and tuber production in Ibadan tend to be officially registered by the Farmer's Association (Table 5.2). A review by the assessment team of the All Farmers Association of Nigeria 2010 report, more than half (61 per cent) of the 2 131 registered crop farmers are cassava growers, 80 per cent of whom have their farms in peri-urban locations, of which 35 per cent operate in Akinyele LGA. Similarly, 78 per cent of maize farmers are located in peri-urban areas, mostly in Ido and Akinyele LGAs. Rice and yam cultivation is almost entirely centred in Ona-Ara LGA—99 and 100 per cent of registered rice and yam growers, respectively. The above statistics give an indication of the importance of arable crop farming as an economic activity in Ibadan, although around two-thirds of all farmers in the region are small-scale and are not registered with an association.

Livestock production

The involvement of urban farmers in livestock production (cattle, sheep, goats, pigs and rabbits, poultry keeping and aquaculture) (Figure 5.3) has been attributed to the quick returns and profit margins it offers relative to cropping as well as the fact that less land is required. Many livestock farms in urban or peri-urban areas hire labourers from the city and from nearby villages. The interaction of the villagers with these large-scale farms has motivated the establishment of small-scale livestock farms in nearby villages.

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Pig farming

In Ibadan, pig farming is a male-dominated enterprise (Oni and Yusuf, 1999; Oguniyi and Omoteso, 2011), although women assist in lighter aspects such as feeding, watering and mucking out. Women are also closely involved in the raising of goats, sheep and poultry. Most pig farmers are married, and thus have access to family labour. In Ibadan about 70 per cent of the pig farmers are 31–50 years of age, while those of 51–60 are mainly pensioners who began pig farming to generate additional income. Oguniyi and Omoteso (2011) noted that 76 per cent of pig farmers in the city had more than five years previous experience, and almost 90 per cent finance their business from personal savings. Other sources of funding are cooperatives, family and friends.

Fish farming and aquaculture

In recent years, the potential for breeding fish in urban areas has gained recognition, resulting in greater participation by city dwellers. The less intensive nature of fish farming compared with poultry keeping, the small space requirement, the relatively light time and financial commitments required to maintain a farm, and enabling conditions for private sector investment have further encouraged participation (Miller and Tunde, 2011; Olagunju *et al.*, 2007). Pond sizes are predominately small, 57 per cent are 400 m² or less, 27 per cent 401-800 m² and just 16 per cent larger than 800 m². Fifty-three percent of farmers have no more than two ponds, 35 per cent have three or four, and 12 per cent have five or six ponds (Olagunju *et al.*, 2007).

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As of April 2010, 431 fish farmers were registered members of the Oyo State chapter of the Catfish Farmers Association of Nigeria (CAFAN). Results of this UPA Assessment Survey show that 32 per cent of catfish farmers operating in Ibadan have their farms within the urban area, while 68 per cent farm in peri-urban areas. Three-quarters of those engaged in aquaculture in Ibadan are male and the vast majority (92 per cent) had previously been employed as civil servants or worked in the private sector as bankers, teachers or in other professions. About 63 per cent are engaged in fish farming as their primary occupation and almost 90 per cent of fish farmers operate their farms for commercial purposes.

Poultry keeping

Southwest Nigeria is the hub of poultry production in West Africa, with Oyo State being a core region of hen production in Nigeria. Ibadan therefore plays an important role in poultry production—the Oyo State chapter of the Poultry Association of Nigeria estimates that there are 98 commercial poultry farms in Ibadan of which 93 are in the city's peri-urban areas and five in the urban area. Lagelu LGA hosts the largest number of poultry farms (44 per cent) followed by Egbeda with 27 per cent. In addition, there are a number of small-scale poultry farms in the city. Of the four very large poultry farms in the urban area, two each are located in Ibadan NW and Ibadan SW LGAs, respectively. According to University of Ibadan-based animal science experts, poultry and eggs produced in Ibadan not only provide for the city as day-old chicks and eggs are also transported to other parts of the country and other West African countries including the Republic of Benin, Chad, Guinea, Mali and Togo.

Characteristics of producers

Farmers in urban and peri-urban locations of Ibadan differ in terms of their socio-economic and demographic characteristics. Although more than 90 per cent of commercial vegetable farmers belong to the low-income group, this is not the case with other categories, particularly livestock keepers, including poultry and fish farmers, who are mostly well educated and from middle and high-income groups. The majority of vegetable garden owners in the city of Ibadan are part-time

farmers between the ages of 20-50 years. Most have some level of formal education, the majority of which are women, who are able to integrate small-scale production with other household duties (Kintomo *et al.*, 1997; Odebode, 2006; Olajide-Taiwo *et al.*, 2010).

An IWMI/RUAF (2007) survey of urban agriculture in three LGAs showed that, in addition to farming, 33 per cent derived part of their income from the civil service, 28 per cent from trading, and 13 per cent from other artisanal activities. The survey also noted that yearly income of 60 per cent of UPA farmers was less than ₦100,000 (approximately US $600) in 2007. Further, the majority of urban farmers, of whom about 60 per cent had less than 10 years of city farming experience, had previously practiced traditional farming in rural areas.

Finance

The IWMI/RUAF 2007 survey revealed that the major source of finance available to urban farmers is personal savings (43 per cent). Some farmers benefit from local contributions, cooperatives and loans from the Farmers Association, while a very few access credit from banks (3.5 per cent), money lenders (3 per cent) and other sources (3 per cent). There has been very limited access to government loans despite claims by the government that it has several programmes to assist farmers (Oyejide, 2006). In peri-urban areas, informal credit is the main source of finance but the percentage of farmers with access to this varies across LGAs—52–83 per cent of farmers have access to informal credit in Akinyele, Lagelu, Ona Ara and Egbeda LGAs, while only 23–30 per cent of farmers benefit from it in Ido and Oluyole LGAs, respectively (OYSADEP, 2001).

Water use and other inputs and management factors

Different sources of water are accessed for all categories of farming in the city. Streams, shared wells and water from drains are the major sources for irrigation, and some farmers grow crops on wetlands (IWMI/RUAF, 2007). Water management strategies vary from mulching to constructed drainage channels. Farmers also construct raised beds, and use watering cans and portable petrol-driven water pumps (Kintomo *et al.*, 1997; Ojo *et al.*, 2011). About 67 per cent of the farmers engaged in aquaculture access groundwater through deep wells, boreholes and springs—the others rely solely on streams and rivers (Estimated through the UPA Assessment Survey).

The large volume of wastewater generated from domestic and industrial activities in the city, if treated, could be safely utilized for horticulture, aquaculture and other uses. Reusing wastewater and by-products from agriculture and food processing in urban aquaculture has the potential of mitigating the problem of limited access to nutrient inputs and water resources faced by many farmers, while also reducing pressure on the limited supply of freshwater (Bunting *et al.*, 2006). However, the lack of a wastewater treatment facility in the city currently prevents realization of this opportunity.

Agricultural inputs are purchased on the open market, from other farmers, and a combination of other sources (IWMI/RUAF, 2007). Farmers in the city source their seeds mainly from imports, while peri-urban farmers obtain theirs from local markets or from saved seeds (Ojo *et al.*, 2011). If soil fertility is low, inorganic fertilizer (mainly NPK 15-15-15) or cured and uncured poultry manure is used, especially for plots that have three or four crop cycles per season. More sustainable options for soil fertility management could be achieved by stronger policy support for conversion of waste to fertilizer (Box 1).

> **Box 1. Productive use of urban wastes for food production**
>
> The large quantity of solid waste generated within the city constitutes a major environmental problem in the absence of proper and efficient waste management or recycling systems. The wastes are, however, rich in organic matter and other plant nutrients that have the potential to provide a readily available supply of organic fertilizer for farming.
>
> Nearly 70 per cent of the solid wastes generated in urban Ibadan could be easily composted, according to Bammeke and Sridhar (1989). Attempts have been made to harness this potential with the support of a UNDP/UNICEF-funded pilot initiative designed to convert biodegradable wastes to organic fertilizer in one of the inner city communities (Wahab *et al.*, 2010). A 5 tonne capacity plant was commissioned in November 2002 to produce 50 kg bags of organic fertilizer per day for sale to farmers within and around the city limits. In pilot tests, the finished compost and compost enhanced with additional nitrogen and phosphates produced yields comparable to those treated with synthetic fertilizer. The initiative also generated economic returns and employment for the local community involved (Sridhar and Adeoye, 2003; Adeoye *et al.,* 2008). However, the irregular supply of electricity to the composting plant has hindered the capacity of this plant to consistently produce compost.

As few farmers patronize input agencies, the adoption of improved varieties and technologies from the university and research institutes is limited. The use of agrochemicals is found to be more prevalent on peri-urban farms, possibly due to the smaller size of farms in the city (IWMI/RUAF, 2007; Olajide-Taiwo *et al.*, 2011). Weeding is carried out either with hoe or by hand depending on the crops being grown and cropping system. Many farmers manage their farms themselves, using family or hired labour as required for various field operations. In the case of crop farms, labour use varies from 3 000 to 10 000 hours per hectare with initial clearing operations, construction of drainage channels and seed-bed preparation accounting for very high labour use (Kintomo *et al.*, 1997; Ojo *et al.*, 2011).

Urban development pressures have led to more intensive use of existing land and overcultivation, with a consequent depletion of soil fertility of farmlands and farmers having to rely on fertilizers to ensure high yield. Extension agents interviewed during the assessment process also noted that the removal of subsidies by the federal government means that many small-scale farmers can no longer afford to use fertilizers on their farms, resulting in some either abandoning or changing away from crop farming because it is no longer profitable.

6

Policy, institutions and governance that influence UPA

Almost all government policies or programmes in Nigeria invariably affect food supply, demand and pricing to varying extents. Support for agricultural inputs has been a central element of Nigerian agricultural policy and consists primarily of attributing public subsidies so that farmers can more easily acquire inputs such as fertilizers and improved seeds. Nigeria's agricultural policy, which invariably influences what transpires at the city level, is nevertheless limited by a general lack of coherence, absence of continuity, a top-down approach with little participation by stakeholders, and minimum support for small enterprises.

A number of national policies and programmes have been specifically formulated to improve the productivity and income potentials of farmers. While the 1970s were characterized by a general lack of interest in supporting agriculture due to the profits of oil exploitation, in the wake of the major food crisis in the country in 1976, programmes were put in place to boost agricultural production such as *Operation Feed the Nation* (1976–1979) and *Green Revolution* (1979–1983), which provided subsidized inputs and access to credit. These two programmes also strongly encouraged urban dwellers to engage in agricultural production. The momentum generated by the programmes was

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Box 2. Opportunities created By UPA

Urban development and socio-economic influences in the Ibadan region have led to the migration of rural people and farm labourers to the city. UPA offers opportunities for engaging unskilled, newly urbanized people in different stages of solid waste collection, production and marketing of organic fertilizers, greening the city, and related agricultural activities. In this respect, environmental restoration indirectly becomes a new employment area that some researchers suggest could offer prospects for revitalization in economically distressed urban areas (Armar-Klemesu and Maxwell, 2001; Nierenberg, 2011). Other job opportunities exist in processing, storage, marketing and transportation. UPA also offers opportunities for the unemployed and recent graduates of technical colleges, polytechnics and colleges of agriculture to be profitably employed through skills development in the local production of farm implements, equipment and machines

Locally fabricated cassava grater

for agro-processing. Skills development in processing agricultural products and the production of organic fertilizers are additional opportunities for enhancing economic power among the urban population. While there are several potential entry points for UPA-related livelihoods, the extent to which UPA creates employment opportunities is unknown due to a lack of studies.

reversed, however, with the introduction in 1987 of the Structural Adjustment Programme (SAP), which resulted in a rollback of agricultural subsidies. Other key programmes that support agriculture include the Agricultural Development Programmes (ADP), the National Livestock Development Programme (NLDP), and the National Fadama Development Programme (NFDP).

The World Bank-supported Oyo State Agricultural Development Programme (OYSADEP) has contributed to the promotion of the adoption of new methods and agricultural innovations by farmers in rural and peri-urban areas of Ibadan. Specifically, OYSADEP seeks to stimulate efficient agricultural production through the transfer of proven and adaptable technologies in all areas of agriculture including cultivation of crops, rearing of livestock and production of fish, with the aim of increasing farmers' productivity and enhancing incomes and standards of living. OYSADEP has, however, had little or no direct impact on agricultural activities in Ibadan's metropolis because the agency largely focused on rural and peri-urban areas. Urban farmers nevertheless have easier access to consultants and market information and are more exposed to the extension activities of agro-chemical companies, though not always with positive results.

Official policy recognition of urban agriculture could help to foster wider secondary benefits of UPA within the urban economy (Box 2). To integrate the needs posed by urban growth with other important socio-economic activities, it is critical that UPA is integrated in urban development plans such that land-use and land-zoning regulations provide for it.

7
Challenges facing UPA

Vulnerability of UPA in the city was examined by administering specially designed questionnaires to different categories of farmer and other stakeholders. In-depth interviews with key informants were also conducted. Identified constraints to UPA provided by practitioners during a UPA-stakeholder workshop organized by the assessment team include inadequate finance, adverse weather/climate factors, poor pricing, pests and diseases, prohibitive cost of farm inputs and absence of agricultural extension visits. Other constraints noted were problems associated with disposal of farm waste, misuse of agrochemicals, inadequate access to land and loss of farmlands as a result of competition from other land uses.

Urban encroachment

The traditional land-tenure system in Nigeria is a complex and delicate problem facing agricultural development. Prior to the promulgation of the Land Use Decree in 1978, almost all lands in southern Nigeria, including the Ibadan region, were administered under customary tenure, which is the major

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type of traditional landholding in Nigeria. Under this system land is held by the community, through the family, the village or the clan. The right of an individual to use land, therefore, derives strictly from his or her membership in the community. This traditional land-tenure system is guided by two basic tenets: first, the title of any member of the community to land is usufructuary and land no longer in use by an individual usually reverts to the community; and second, outright sale of land is completely prohibited. The federal government's 1978 Land Use Decree was intended to ease access to land by creating two forms of rights of occupancy, the statutory right and the customary right, granted by the governor of a state and local government respectively.

In Ibadan the traditional system has been largely displaced by individual ownership and land has become a marketable commodity even though land ownership is theoretically vested in the government through the land-use decree. Land stipulated for cropping is limited in size to not more than 500 ha, or 5 000 ha for grazing land, but the governor may grant a statutory right of occupancy to any person for a variety of purposes—residential, commercial, industrial, agricultural, recreational, etc. The implication of this change in land-tenure rules is that, subject to existing legal provisions, an investor can buy agricultural land and then apply for Certificate of Occupancy or Governors Consent for a change of use as stipulated in sections 6(2) and 22 of the Land Use Decree. The creation of this informal land market has had the effect of diminishing the availability of land for UPA, as more lands are developed for housing and industry.

The most obvious impact of urbanization in Ibadan is the increase in the built-up area within the city and the outward movement of people and activities from the main city to the city fringes and erstwhile rural lands. The changing nature of the peri-urban land market and intensifying development pressures have led to increased uncertainty about whether "idle" lands can be cultivated (Jaiyebo, 2003). The sprawl into rural areas, mainly the southern and southeastern parts since the 1980s, has led to a decline in large agricultural lands. A study of the four forest reserves within the city, for instance, showed the phenomenal rate at which forests have been converted for urban use since the 1970s. Olurin (2004) showed that by 2002, 90 per cent of the original forest reserve in 1961 had been encroached upon for urban development (Figure 7.1). Oladele and Oladimeji (2011) estimated that 58 per cent of the land in peri-urban Ibadan will be converted for settlement and other infrastructure by 2020 compared with 2000. The quarrying of sand, gravel, rocks and red earth, one of the most widespread new economic activities in Ibadan region, has also resulted in the loss of agricultural land including valleys with rich alluvial soils, which have either been leased or sold for quarrying purposes.

Wetlands favoured for the cultivation of arable crops and vegetables, especially during the dry season, have also been affected. Urban development in the Eleyele catchment has reduced the riparian wetland forest and the surrounding light forest from 3.84 km^2 in 1984 to 1.09 km^2 in 2004, with the built-up area increasing from 4.47 km^2 to 7.52 km^2 (Tijani *et al.*, 2011). In addition to the resultant loss of agricultural land and consequent reduction in the availability of crops during the dry season, wetland loss also has implications for flood and water resource management in the city. The encroachment of flood plain and channelization of major rivers and streams, such as the Dandaru, Kudeti and Ogunpa which cut across the city, have further reduced the space available for UPA within the city. Oladele and Oladimeji (2011) estimate that the area characterized as urban fringe increased by 27 per cent between 1986 and 2000 at the expense of farmland and water bodies, including wetlands.
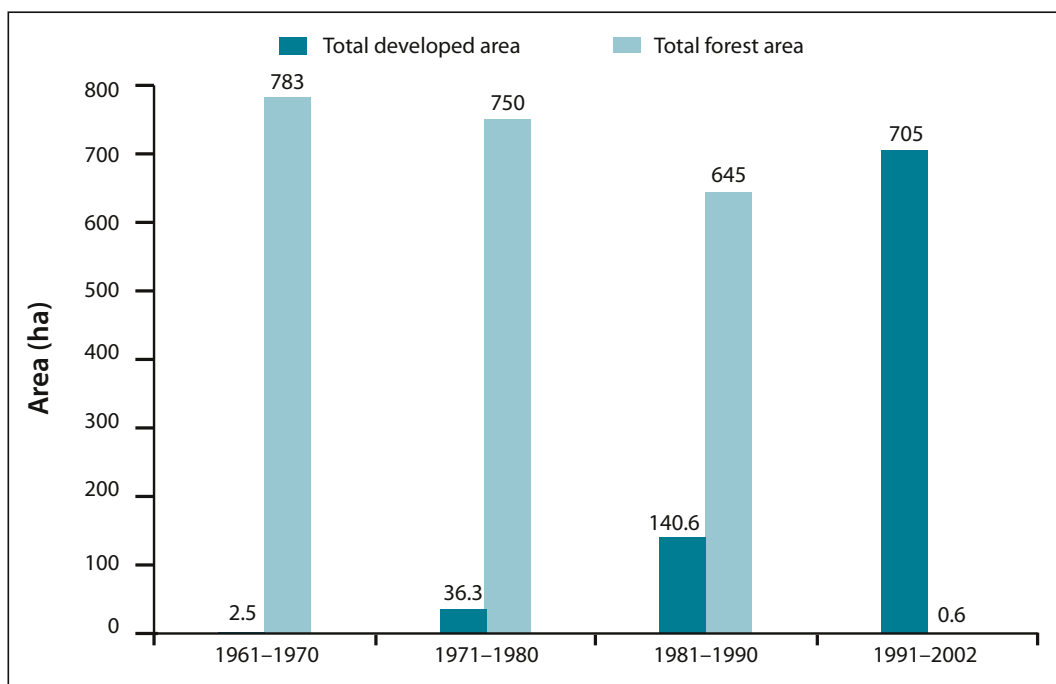
Nigeria's most important wetlands have shrunk by two-thirds in the past 30 years   © Dr. M. Idris

Waste generation and disposal

Population growth and increasing industrial activities have resulted in the significant generation of wastes of different types: an average of 0.71 kg of waste is generated per person per day, meaning that, based on the 2006 population for Ibadan, some 48 586 tonnes of waste are generated in the city each year (SIP, 2010). Of this, around 66 per cent is domestic waste, 20 per cent commercial waste and 11 per cent comes from industrial sources (Adewumi *et al.*, 2005).

Due to the lower population densities in peri-urban Ibadan, less waste is generated compared to the urban metropolis. However, the current trend of siting of waste dumps outside city limits has the potential of introducing contaminants into peri-urban soils and water sources. The inability of municipal authorities to effectively manage the huge quantity of waste generated in the city has led to uncontrolled and direct dumping of domestic, agricultural and industrial wastes in open dumps, rivers and wetlands. This practice has been recognized as one of the most critical problems facing the city (Omoleke, 2004).

Solid waste dump and disposal in Bodija, Ibadan   © I. Adelekan

The use of surface waters for waste disposal has been facilitated by Ibadan's drainage network. The Ogunpa River and its major tributary, the Kudeti, drain the eastern part of Ibadan while the Ona and its numerous tributaries including the Alalubosa, Alaro, Oshun and Yemoja drain the western part of the city. It is in this section of the city that more recent residential and industrial developments have taken place, resulting in large volumes of industrial wastewater being discharged into the rivers and streams since the majority of industries do not have effective wastewater treatment plants. In the Oluyole Industrial Estate, effluents are routinely discharged directly into surrounding streams and rivers through the drainage system. Major rivers such as the Ona and Alaro that flow through the industrial estate have become highly turbid, particularly at the points of discharge in the industrial zone, and the rivers and streams throughout the metropolis have become the recipients of waste streams in amounts exceeding their natural purification capacity (Osibanjo *et al.*, 2011).

The high levels of contamination from industrial and other wastes constitutes a risk to urban and peri-urban agriculture activities, which depend to a large extent on these water sources (Tijani *et al.*, 2004; Ipeaiyeda and Onianwa, 2009; Awomeso *et al.*, 2009; Omoloye, 2009; Ogedengbe and Akinbile, 2010; Adedeji *et al.*, 2011; Osibanjo *et al.*, 2011). Major rivers and streams in the city including the Alaro, Gege, Kudeti, Ogbere, Ogunpa and Ona contain heavy metals of which zinc, lead and copper are the most abundant, and exceed acceptable limits in all streams (Tijani *et al.*, 2004). These contaminants result from the deposition and discharge of industrial effluents and chemical wastes on lands and water bodies. Contamination of soils from industrial wastes also constitutes a problem. Omoloye (2009) observed that cadmium (9.63 mg/kg) and mercury (2.33 mg/kg) accumulated in the soil beyond safe limits due to the location of an Exide Battery plant (1 km radius) in the vicinity of Wofun village, a peri-urban settlement predominantly inhabited by peasant farmers.

Heavy metal contaminants constitute a major environmental pollution risk in Ibadan and pose serious health risks to the urban population (Adedipe *et al.*, 2005; Oladeji, 2008; Omoloye, 2009; Adedeji *et al.*; Ladigbolu and Balogun, 2011). It also has serious implications for UPA because effluents and wastes do not decompose completely. Rather, non-degradable contaminants remain in the environment, and in most cases, the heavy metals in contaminated soils can be taken up by and later accumulate in edible plants, thereby increasing risks of heavy metal exposure by consumers (Nieboer and Yassi, 1998). However, the level of bioaccumulation in plants and subsequent exposure to consumers can vary substantially depending on the soil pH, organic matter and clay content as well as plant characteristics. It has been observed that the most important sources of chemical contamination of urban agricultural sites in Nigeria are derived from industrial processing plants or leachates from solid waste dumpsites (Margaret, 1996; Ogunyemi *et al.*, 2003).

Significant differences in heavy metal concentration are found in vegetables that are grown with wastewater in different parts of the city (Adams *et al.*, 2010). Vegetables produced in the city around the Eleyele Dam on the Ona River have the highest percentages of lead, arsenic, and cadmium. Heavy metal contamination of fish in water bodies in the city has also been established (Olaifa *et al.*, 2004). Monitoring studies are needed to determine the level of contamination of foods produced in and around Ibadan in order to provide evidence that would prompt action to reduce producer and consumer health risks.

Increased climate risks

Flood risks

An increase in heavy rainfall events and flooding are key risks associated with climate change that have direct relevance to UPA, and to urban food systems and food security more generally. The pattern of higher-intensity rainstorms in recent years has resulted in increased runoff arising from reduced vegetation cover over the city, a higher percentage of artificial surfaces and poor drainage systems, which trigger flooding. Major flood events with devastating effects on agriculture in the city occurred in 2010, 2011 and 2012. In particular, the rainfall event of 26 August 2011, during which 187.5 mm of rain fell—the highest recorded amount for 51 years—resulted in unprecedented flooding with widespread impacts on the city's commercial infrastructure, settlements, food system and UPA sector. The extreme rain event, which occurred during what is normally the August break in the rainy season, caused widespread damage estimated to be in excess of 30 billion Naira (Agbola *et al.*, 2012).

This flood event provided an apt example of the compounding risks of overdevelopment in environmentally sensitive areas converging with extreme climate events. The intensity of the flooding was exacerbated by extensive illegal building within stream setback corridors, siltation of waterways and the upstream Eleyele Dam, deforestation in the surrounding area, and blockages of culverts and drainage channels with municipal solid waste (Agbola *et al.*, 2012; Ajayi *et al.*, 2012).

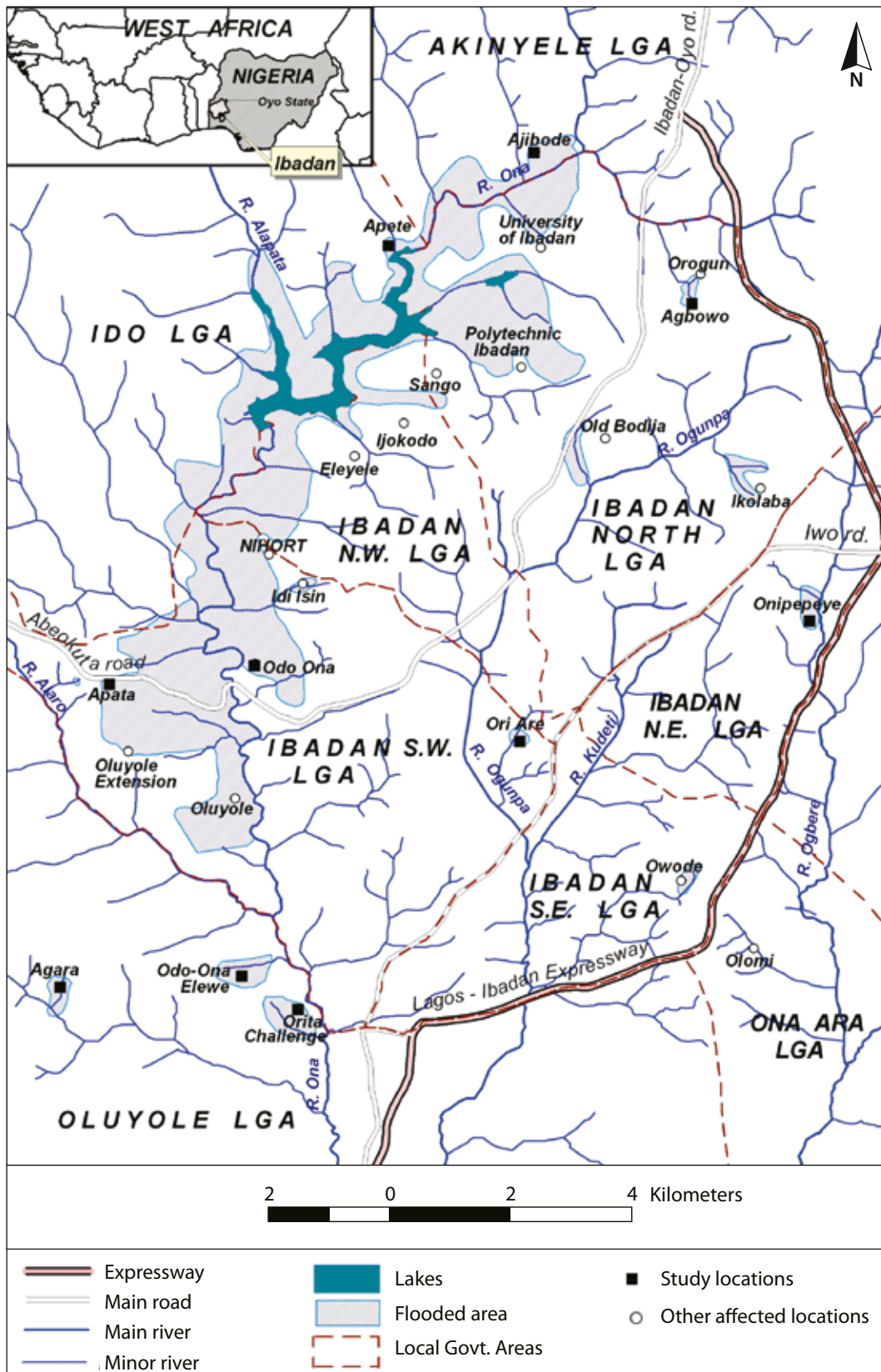Collapsed bridge linking Apete to other parts of Ibadan, 2011 © I. Adelekan

FIGURE 7.2
Flooded areas of Ibadan in August 2011
Source: Adelekan, 2015

The UPA sector and the urban food system infrastructure faced high losses. Seedlings, farm crops and large numbers of livestock, poultry and fish were lost to the flood, and infrastructure and agricultural processing equipment were also damaged. For many farmers, investments were either severely damaged or totally wiped out, as reported in national newspapers (Box 3). Transportation in the city was also affected. Apata, Oluyole and Owode estates, amongst others, were completely cut off from other parts of Ibadan as a result of the flood that overflowed or damaged bridges linking the communities. Damage to three bridges over rivers at Odo-Ona, Oluyole and Apete hindered the movement of people and the transportation of goods, including agricultural products. The complete cut-off of Apete from the rest of the city owing to the collapse of the bridge linking the community to other parts of the city resulted in increased prices of food (Sunday Tribune, 28 August, 2011).

Many fish farmers in Ibadan encountered huge losses from the heavy rainfall and subsequent flood episode, which caused the collapse of dykes around fish ponds, and destruction of earthen ponds, washing fish away. The fish farm at the University of Ibadan lost 200 000 fry, 10 000 fingerlings, 30 000 juveniles, 1 000 pieces of African Snakehead (*Parachanal obscura*), 2 600 medium-size catfish, 250 0.8 kg point-of-sale catfish, 500 2kg brood-stock catfish and about 1 000 table-sized red tilapia (University of Ibadan Bulletin, 2011). As a commercial venture, the fishpond satisfied the nutritional needs of members of the university community, causing havoc among fish consumers on the university campus (pers com, Head, Department of Fisheries and Aquaculture, University of Ibadan). Poultry farms lost three weeks of production of day-old chicks as the supply of eggs for incubation was affected. Fish farms and poultry farms in the city were reported to have been seriously affected by subsequent flooding in 2012. The newspaper media reported estimates by trade associations of hundreds of millions in lost Naira for fish farmers and poultry operations (Momoh *et al.*, 2011, cited in Agbola *et al.*, 2012).

Box 3. Impacts of 26 August 2011 flood

A farmer at Ologuneru, a peri-urban location in Ibadan, revealed that several hectares of his cassava farm were completely destroyed. "I've never seen or witnessed such flood before in my life. It uprooted cassava and destroyed all the maize I planted," he lamented. Bose Bademosi explained that her cassava processing machines and all the cassava tubers brought in by customers for grinding and processing into such other products as *fufu* and *garri* were swept away. In her words, "I didn't know that rain water could uproot cassava-processing machines that were tightly and strongly fixed to the ground. I don't think that flood was ordinary. You need to see the level of damage done to our processing factory at Olunde in Ibadan. The flood destroyed all that we had in the factory."

Many poultry and livestock farmers were also touched by the disaster. In the Odo-Ona area, a well-known sheep and goat farmer lost more than 50 sheep and goats, while in Aho village, Ajibode, a peri-urban community renowned for poultry farms, fish ponds and piggeries, the flood wreaked havoc as farmers' investments were wiped out. A farmer who lost all his coops, which housed 331 birds, including 300 layers, 29 turkeys and two broilers, indicated that before the flood he made a minimum net profit of ₦17 000 from selling eggs and poultry. The flood, however, resulted in a loss of more than ₦1 million investment for him. Another farmer revealed that he lost 500 fish, 120 pullets, 47 cockerels and 13 turkeys in the disaster. "Apart from the buildings, this farm was worth more than ₦1 million. Now they are all gone. It took me 19 years to build up this farm and I lost it all in one night."

Sources: The Sun, 02 September 2011; Nigerian Tribune, 11 October 2011

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These recent severe flood events in the city are illustrative of the potential risks from a more extreme climate that are facing farmers and those engaged in agriculture-related activities such as transportation, processing, storage and marketing, as well as direct impacts on urban food security resulting from reduced access and availability of food, particularly by the urban poor who are already food insecure.

Farmer perceptions of changing weather patterns

Focus group discussions and informational interviews were conducted with UPA farmers to better understand the state of local knowledge about observed changes in weather patterns that may impact on food production. The following section describes these observations, which point to where more research is needed to more fully understand and assess emerging risks and impacts of climate change.

A large proportion of UPA farmers in Ibadan depend on rainfall, streams and wells for crop cultivation and livestock, including fish farming, thus changes in rainfall patterns and characteristics in terms of annual rainfall amount, length of the rainy season, and onset of the rains have significant effects on agriculture. Crop farmers reported that changes in rainfall patterns in recent years have impacted significantly on maize production—traditionally, there are two maize planting seasons: the first in April/May and the second in July/August. The survey indicated that many farmers can no longer plant twice a year as a result of the delayed onset of rains—one planting, in April, is now practiced by the majority of farmers except for those who farm close to rivers, around wetlands or irrigate their land. Delayed onset of the rains was also noted in peri-urban farmer assessments carried out by Agbola and Ojeleye (2007). This change in rainfall patterns has led to more farmers turning to cassava production. Furthermore, the farmers noted that early cessation of rains has resulted in low yield of their late season crops.

Rainstorm damaged maize farm at the University of Ibadan   © I. Adelekan

Farmers noted that an increase in heavy rainfall in recent years has negatively affected the productivity of some farm crops, such as cowpeas and pepper, as this affects flowering and subsequent yields. The onset of the rainy season is also associated with outbreaks of insect pests and diseases; farmers often use pesticides to cope with these, which add to the cost of production and if not used appropriately may also result in contamination of crops and health risks for those who apply them.

Farmers in the focus groups noted that conditions are warmer than in previous times, and that temperatures are not favourable for vegetable production, though they are beneficial for drying of harvested cassava. Farmers were particularly concerned about how excessively high temperatures would affect diseases of poultry and pigs, based on their observations of increased livestock diseases during warm periods. There is a significant knowledge gap with respect to potential disease dynamics under warming conditions.

8

Food prices and urban food security in Ibadan

Food prices in Ibadan markets fluctuate as a result of a number of factors, including government policies on tariffs of imported foods, removal of subsidies on fertilizer and fuel prices, global food prices, rainfall distribution during the cropping season, and civil unrest. For example, the reduction of fuel subsidies in recent years has contributed to high transportation costs for agricultural produce, increased cost of feeds for fish, livestock and poultry and higher cost of living for farmers, all of which translate into rising food prices. Moreover, the closure of land borders with neighbouring countries arising from recent political and social conflicts, particularly the Boko Haram insurgency in northern Nigeria, has also contributed to reduced profitability for agriculture. For example, in 2012, ten trailer loads of eggs destined for export from Ibadan to other West African countries was returned to Ibadan, resulting in an egg glut and a consequent fall in price of eggs in the city—a crate of 30 eggs was sold for ₦100 during this period in Ibadan instead of the normal price of ₦800–₦900.

Since 2007 and continuing through 2012, widespread floods have been experienced across the northern and southern states of the country, which have affected agricultural production and consequently food prices. According to FEWSNET, food prices rose sharply in September 2007 following the spate of flooding that resulted in below average harvests of major food crops. This situation was compounded by the global rise in food prices, particularly so for rice.

In 2008, food prices remained high; peaking in July, following the late start of the wet season and the unofficial rise in the cost of diesel fuel. The above-average rains resulting in an early harvest for a range of crops caused some decline, but prices of most food commodities were still substantially higher compared to the five-year average. Prices were higher than their five-year averages by 90 per cent for maize, 100 per cent for cowpea, 35 per cent for imported rice, and 55 per cent for garri in August 2008. Compared to August 2007, prices of staples for the month of August 2008 were higher by 128 per cent for maize, 83 per cent for garri, 107 per cent for cowpea and 28 per cent for imported rice. The removal of import tariffs on rice resulted in the price of imported rice increasing from ₦114/kg in March to ₦187/kg in May and ₦150/kg in September, 2008 (FEWS-Net, 2008).

The effect of recent high food prices on food insecurity in Ibadan is not known. However, analysis by Ajani *et al.,* (2006) estimated that 76 per cent of Ibadan residents reported some level of food insecurity, with about 30 per cent of respondents reporting moderate to severe hunger. A few analyses have been done to understand the effects of high food prices on food security (Badmus and Ogundele, 2009; Odozi and Omonona, 2012) but none have approached the issue through the lens of urban food security.

The extent to which UPA can address food insecurity in Ibadan and other cities in Nigeria is an open question, as there have been no studies to date to assess its potential. Nigeria does rank high among

African countries for which there are data on the proportion of the poor involved in UPA and the share of income they derive from it (Figures 8.1 and 8.2), suggesting that UPA may be an important contributor to household food security for those urban poor who have the available space and resources to engage in urban farming. However, the extent to which UPA can serve as an effective buffer against recent upwardly spiraling food prices is not known. This is an important knowledge gap in light of the global discourse on resilient urban food systems and the food localization movement.

FIGURE 8.1
Households participating in urban farming, by expenditure quintile

Source: Zezza and Tasciotti, 2010
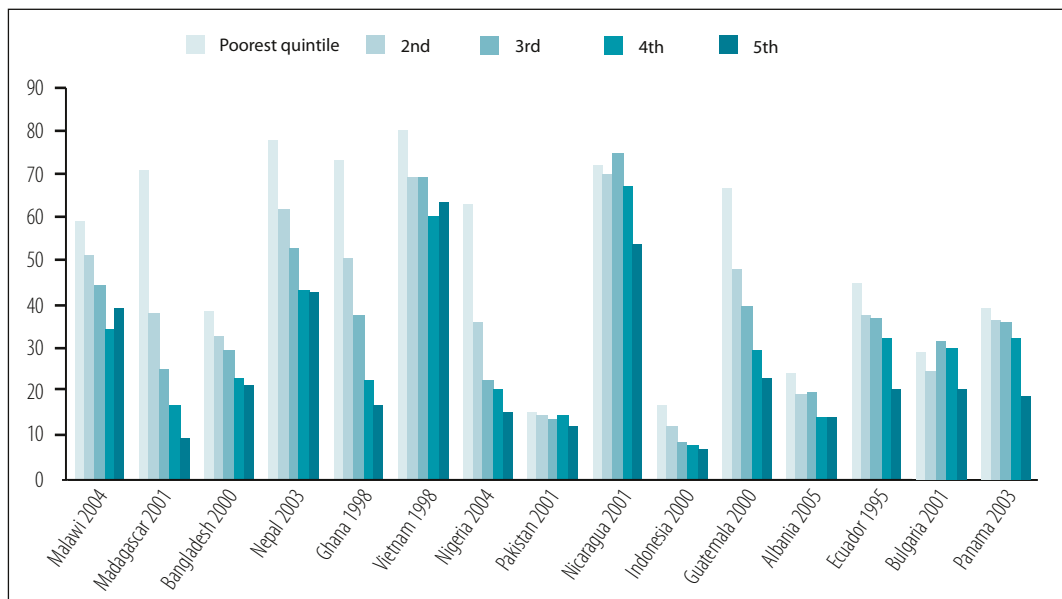
FIGURE 8.2
Share of income from UPA, by expenditure quintile

Source: Zezza and Tasciotti, 2010
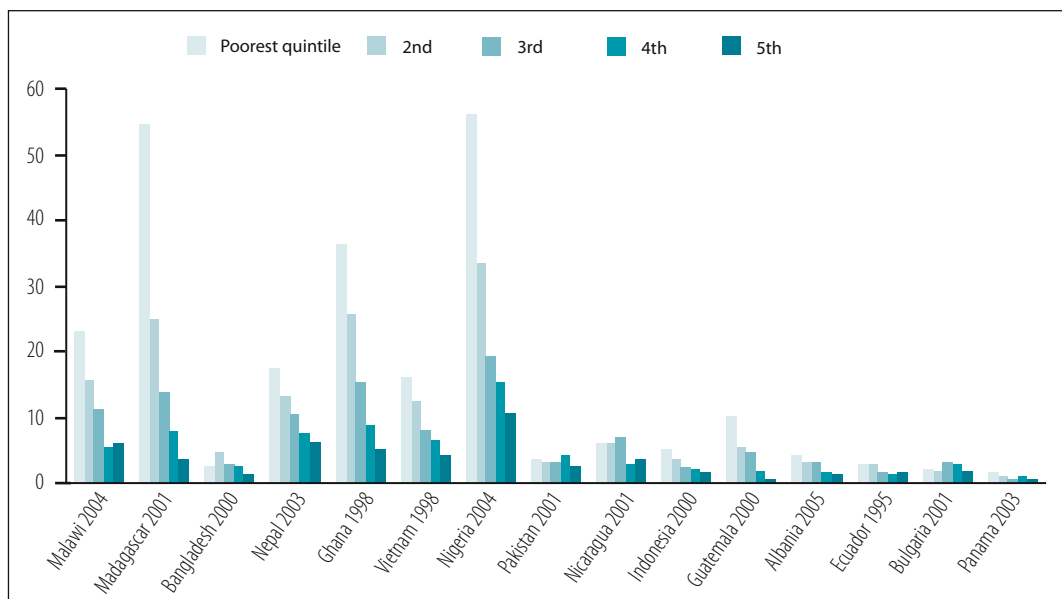
Note: The bars correspond to expenditure quintiles, from the poorest ('Poorest quintile', on the left) to the richest ('5th', on the right). Countries are ordered by level of Purchasing Power Parity GDP per capita.

9
Recommendations

This report demonstrates that the UPA sector in Ibadan provides a critical source of fresh, nutrient dense foods for the city's food basket, and is an important livelihood resource for those engaged in UPA. This report also demonstrates, however, that the sector is facing critical challenges to its long-term sustainability stemming from unregulated urban sprawl, environmental degradation, and extreme climatic events. This assessment offers several recommendations to city planners, government officials, researchers, and other stakeholders to consider for addressing these sustainability challenges.

Devise policies that recognize and support urban and peri-urban agriculture. Urban agriculture, in particular, and peri-urban agriculture to some extent, lacks much-needed recognition from policy makers. Currently, existing legislation and policies at the state and city level neither explicitly prohibit nor support UPA. Development of an urban agricultural policy framework and municipal planning strategies would do much to provide the confidence to promote regulatory integration, while giving greater visibility to and support for UPA. Addressing urban encroachment on land that supports UPA must be a priority in policy formulation. Land-use plans for wards within the city, LGAs, and the city as a whole need to be developed. One potential entry point for this would be to delineate space for UPA at ward and neighbourhood levels through incorporating it into neighborhood-improvement plans, ward-development and urban-renewal plans (IDRC, 2003). Currently, plans for urban renewal do not take this into consideration.

Encourage a leadership role by the State Ministry of Agriculture. The Oyo State Ministry of Agriculture needs to assume a more active leadership role in championing the recognition of UPA, as well as providing the needed incentives and technical assistance to practitioners. One important entry point would be through the engagement of the ministry with private sector, NGOs and other stakeholders. Large commercial private enterprises, like Zartech, Hope Poultry, Ajanla Farms and Obasanjo Farms, are the visible private-sector players involved in UPA and would be an obvious entry point. Other players need to be identified and their activities coordinated to enhance collaboration and boost UPA in Ibadan. This coordination can be done either by creating a UPA unit in the State Ministry of Agriculture or by establishing a functional multi-stakeholders forum for all groups involved in UPA, set up and facilitated by the State Ministry of Agriculture. There is also the need to explore synergies among all stakeholders, and provide platforms to share knowledge and experiences.

Actors: Officials in the Oyo State Ministry of Agriculture, Oyo State Agricultural Development Programme (OYSADEP), The FADAMA project.

Bring greater visibility to UPA in urban land-use planning. Although an urban- and regional-planning law presently exists, which guides the activities of the Ministry of Physical Planning and Urban Development, in its current form the law is not adequate with respect to the actual policies

guiding land use. This results in haphazard urban development that encroaches upon flood plains, wetland areas and forest reserves as well as onto agricultural lands. Given the projections of rapid urban growth in Ibadan over the next one to two decades, there is a strong need to review existing planning laws to minimize environmental and climatic risks associated with haphazard planning.

To this effect, a master plan needs to be prepared for the city, which should take account of the following recommendations: 1) reduce urban encroachment pressures on streams and drainage channels, which are becoming increasingly clogged with solid wastes, contributing to flooding of the city; 2) keep floodplains and other environmentally sensitive lands, including wetlands and forests, from being used for illegal development; 3) reduce direct discharge of effluents into streams; and, 4) aid the recognition of UPA's multifunctionality as an urban land-use category that requires safeguarding. For example, providing setbacks for streams, which should not be built on but can be used for urban agriculture, would contribute to keeping floodplains and other environmentally sensitive lands from being used for illegal urban development and waste disposal. Such landscape-scale considerations would be consistent with adaptation planning for both rapid urban growth and climate change given the likely increase in flooding as land surfaces are concretized and high rainfall events potentially increase. Such efforts would also raise the visibility of UPA and contribute to its support.

Another specific policy need is that of improving tenure for urban farmers operating on a temporary basis on public land. The law currently allows only seven days notice for all occupants of public land operating on a temporary occupation license. This law needs to be reviewed to provide for a minimum of one year's notice. It is also important that land-use and land-zoning regulations are amended to provide for UPA activities.

Actors: Ministry of Physical Planning and Urban Development, Ministry of Lands, Ministry of Justice, the House of Assembly.

Address pollution risks to water use and management. The network of rivers, streams and drainage channels in Ibadan need to be protected from use as waste disposal channels. This will contribute to ensuring cleaner water, reduced contamination potential of UPA products, and reduced flood risks. Thus, in addition to the land-use policy recommendation, there is a need to reduce urban encroachment and waste disposal into surface waters and drainage channels. Such efforts should include regularly desilting rivers and streams to facilitate the flow of floodwaters and reduce pollution, and channelizing of water bodies such as the Odo-Ona and Ogbere Rivers in order to reduce the incidence of floods. The city government should also consider, as a long-term strategy, providing wastewater treatment facilities for Ibadan that would provide a reliable source of safe irrigation water. Such efforts would need to be linked to formulation of stronger pollution abatement laws and regulatory mechanisms to ensure that industries and other establishments develop environmental best practices for wastewater and effluents discharge.

Efforts to address water pollution should also include building broader awareness of health and safety risks associated with production and consumption of UPA products, for example with respect to safe handling of agro-chemicals, irrigation using polluted water sources and appropriate post-harvest handling to ensure reduced contamination risk.

Actors: Ministry of Water Resources, Ministry of Environment and Habitat (Department of Environmental Sanitation and Sewage).

Support robust waste-to-resource management planning. Solid waste generation in the city has enormous potential for production of organic fertilizer. That potential has not been adequately exploited, as the capacity of the existing five organic fertilizer plants in the city, even if operating at full capacity, cannot cope with the enormous quantities of organic waste generated. City planners therefore need to appreciate the resource potential of solid waste and work with the private sector to invest in waste-to-fertilizer plants.

There are a number of co-benefits associated with this, apart from the increased supply of organic fertilizer and possible reduction in the cost of fertilizer. Crop production would be enhanced, and the fertilizer plants would provide employment for workers at different stages of waste collection and separation, fertilizer production and marketing. The city would be cleaner, and there would be less clogging of streams and drainage channels, which is critical for enhancing flood risk management. Feasibility studies need to be carried out to better understand the potential of these resources and to identify policies and measures that encourage waste recovery for agriculture. Also, assessments of waste streams need to be carried out such that sources of potential contaminants, heavy metals, for example, are identified and measures put in place to minimize contamination risks to organic fertilizers.

Actors: Oyo State Ministry of Agriculture, Oyo State Ministry of Environment, Science and Technology, Oyo State Waste Management Board, Raw Materials Research Council of Nigeria, and the private sector.

Strengthen urban food supply chains to risks of disruption from flooding. The rapidly growing urban population needs greater food access and stability, and farmers need to ensure the profitability of their enterprises. As demonstrated in this report, greater attention needs to be paid to strengthening critical points in food processing and transport systems that may be vulnerable to extreme events, such as floods and high winds. Planning for other extreme events associated with climate change, such as heatwaves, needs to also be considered. In the case of UPA, which mostly produces perishable products—fruit and vegetables, eggs, dairy, meat and fish—better storage facilities, including cold storage, could become more important in a warming and more variable climate.

Actors: Input dealers, producers/farmers, processors, marketers, transporters, policy makers, researchers, extension practitioners, NGOs, state and local government officials in the departments of agriculture, environment, land and public health.

Bolster climate risk management and adaptive capacities. Planners and policy makers in the city need to be proactive to climate risk management in the face of present climate variability, extreme weather events and expected impacts of possible climate change. In addition to the aforementioned measures with respect to land-use planning and flood risk management, measures that could be considered in adapting to climate change include:
  i.   development of effective early warning systems for floods and other extreme weather events;
  ii.   establishment of a disaster risk reduction unit within the Oyo State Emergency Management Agency (OYSEMA);
  iii. provision of weather insurance to protect farmers from climate risks;
  iv.   establishment of a multi-stakeholder dialogue process to increase communication and share learning about climate change; and

v.   promotion of forestry and agro-forestry to reduce the urban heat-island effect and climate-
induced landslides and floods, and to promote resilient landscapes.

Address critical knowledge needs and capacity gaps. Carrying out this assessment revealed the
paucity of up-to-date statistics that could be useful for fully assessing the significance of UPA. For
instance, hard data on the number of people engaged in agricultural activities as either primary or
secondary income sources are not available, even though information on occupations was collected
during the 2006 National Population Census, nor is there hard data on how engagement in urban
agriculture influences household food security. Efforts should be made by the relevant government
agencies to strengthen their research units and liaise with research institutions to undertake detailed
surveys at local and city levels, so that credible data are available. Such data would help in the
advocacy of UPA in urban planning efforts.

Knowledge about how extreme temperatures and rainfall affect livestock and plant diseases is another
important knowledge gap, as is understanding of climate change impacts specific to horticultural
crops, urban livestock and farmed fish, which remain vastly under-researched relative to cereal crops
and rural livestock systems. Detailed studies are also needed to better understand how rapid urban
growth and subsequent land-use change may interact with a more extreme climate.

There is also need for increased training of farmers and extension on safe practices for UPA, as this
will have a positive impact on farmers as well as protect public health. To this end, the government
should strengthen existing farmers' associations such as the All Farmers Association of Nigeria
(AFAN). Targeted training and technical assistance should also be provided to urban producer groups
to strengthen their organizations and improve their production, processing and marketing activities
and related food safety measures. Further, urban farmers should be given the same improved access
to loans and farm inputs from relevant agencies of government at reduced or subsidized rates as rural
farmers.

Sorting grains   © Jan Chip

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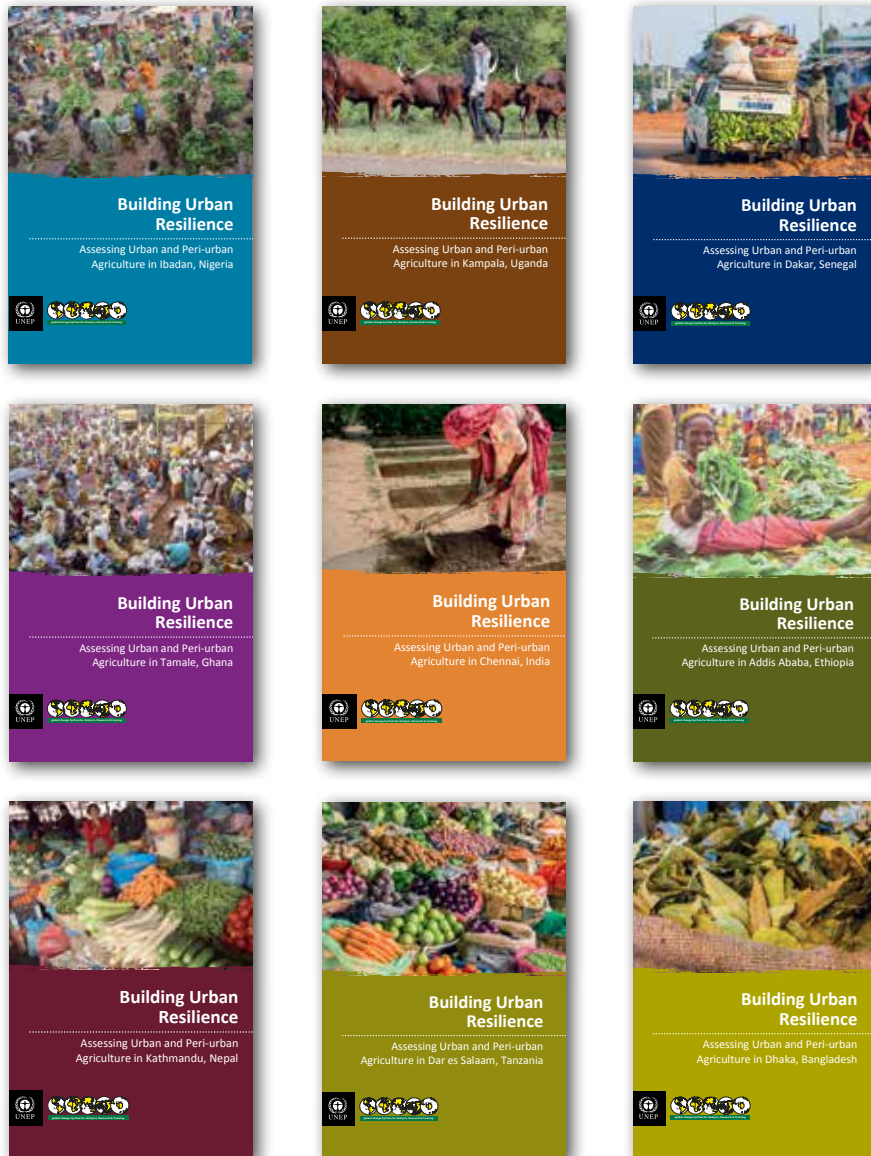
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This report represents one from a series of nine city-level reports on urban and peri-urban agriculture (UPA), which together form a larger knowledge assessment. The knowledge assessment was carried out in Dakar (Senegal), Tamale (Ghana), Ibadan (Nigeria), Dar es Salaam (Tanzania), Kampala (Uganda), Addis Ababa (Ethiopia), Dhaka (Bangladesh), Kathmandu (Nepal) and Chennai (India). The nine reports and a synthesis report can be downloaded at: http://start.org/programs/upa

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This assessment report presents the findings of a knowledge assessment on urban and peri-urban agriculture (UPA) for the city of Ibadan, Nigeria, that was conducted in 2012. The assessment examines the state of UPA in the city through the lens of intensifying urban pressures and increasing climate risks with the objective of identifying how these and other drivers potentially interact to affect the long-term sustainability of UPA, and what response options are needed to address existing and emerging challenges.