

# CITIES, FOOD AND AGRICULTURE:

## CHALLENGES AND THE WAY FORWARD



Henk de Zeeuw and Marielle Dubbeling

# The RUAF Working Paper series

The International Network of Resource Centres on Urban Agriculture and Food Security (RUAF), facilitate joint learning within the RUAF partnership and share their experiences with others interested in the subject.

The working paper series have the following aim:

- To facilitate exchange and systematisation of the experiences;
- To improve and further develop existing RUAF working materials on the basis of the lessons learnt during implementation and by integrating materials developed in the regions;

The working papers focus on mid level staff of organisations interested to engage in urban agriculture and to learn from RUAF (multi-stakeholder and value chain development) approaches, as an organiser or facilitator, a working group or forum member, a trainer, etcetera and development organisations and universities active in this field. For some of the working papers there might be additional specific audiences.

## Working Papers already published include:

- WP 1 Multi-stakeholder Policy Formulation and Action Planning for Sustainable Urban Agriculture Development, 2008
- WP 2 Key Issues and Courses of Action for Municipal Policy Making on Urban Agriculture, 2008

*This working paper has been written as a discussion paper for the Technical Consultation "Agriculture, Food and Cities", September 24-25, 2009, Rome, jointly organised by Food and Agriculture Organisation of the United Nations - Food for the Cities Multi-disciplinary Action (FAO-FCIT) and RUAF Foundation International Network of Resource centres on Urban Agriculture and Food security). The preparation of this discussion paper was made possible by a grant from FAO-FCIT.*

# ABBREVIATIONS

ACCRN	Asian Cities Climate Change Resilience Network
AMS	American Meteorological Society
CBO	Community Based Organisation
CCCD	Commission on Climate Change and Development Ministry of Foreign Affairs, Sweden
CGIAR	Consultative Group on International Agricultural Research
CIRAD	Centre de Cooperation International en Recherche Agronomique pour le Developpement (French international agricultural research centre)
COAG	Commission on Agriculture of the Food and Agriculture Organisation of the United Nations
FAO-FCIT	Food for the Cities Priority Action of the Food and Agriculture Organisation of the United Nations
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit (German Technical Cooperation)
IASC	Inter-Agency Standing Committee (for coordination of Humanitarian Assistance)
ICLEI	Local Governments for Sustainability
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IPC	International Food and Trade Policy Council
IMF	International Monetary Fund
IWMI	International Water Management Institute
NGO	Non-Governmental (development support) Organisation
OECD	Organisation for Economic Cooperation and Development
RUAF	RUAF Foundation (International Network of Resource centres on Urban Agriculture and Food Security)
SIDA	Swedish International Development Cooperation Agency
UA (or UPA)	Urban (and Peri-urban) Agriculture
UNCHS	United Nations Centre for Human Settlements
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational Scientific and Cultural Organisation
UN FAO	Food and Agriculture Organisation of the United Nations
UNFPA	United Nations Population Fund
UN Habitat	See UNCHS
UNICEF	United Nations Children's Fund
USDA	United States Department of Agriculture
WFP	World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organisation

# CONTENTS

2

	<b>Page</b>
<b>1. Introduction</b>	<b>3</b>
<b>2. Cities, food and the urban poor: urgent challenges to build more resilient cities</b>	<b>5</b>
<ul style="list-style-type: none"><li>• Urbanisation, increasing urban poverty and food insecurity</li><li>• The impacts of rising food prices</li><li>• The impacts of climate change</li><li>• Growing scarcity of fresh water and growing pollution of streams due to disposal of wastewater and solid wastes</li></ul>	
<b>3. The importance of urban and peri-urban agriculture (UPA) for enhancement of urban food security and reduction of urban poverty</b>	<b>10</b>
<ul style="list-style-type: none"><li>• UPA and urban food security and nutrition</li><li>• UPA and poverty alleviation and local economic development</li></ul>	
<b>4. The importance of urban and peri-urban agriculture (UPA) for climate change adaptation, sustainable water management and building resilient cities</b>	<b>16</b>
<ul style="list-style-type: none"><li>• UPA and climate change adaptation</li><li>• UPA and sustainable water, wastes and nutrients management</li></ul>	
<b>5. The way forward: building more resilient and food secure cities through urban and peri-urban agriculture</b>	<b>20</b>
<ul style="list-style-type: none"><li>• National level</li><li>• City level</li><li>• International level</li></ul>	
<b>References</b>	<b>29</b>



# 1. INTRODUCTION

2008 will go down in history as the year in which the world's urban population outnumbered its rural population. According to the United Nations Population Fund, the world's urban population is expected to double from 3.3 billion in 2007 to 6.4 billion by 2050, and it is predicted that by 2030 60% of the world's population will live in cities (UNFPA, 2007). As cities expand, so do the food needs of urban families. The urbanisation process in many developing countries goes hand in hand with increasing urban poverty, growing food insecurity and malnutrition, especially for the urban poor.

The situation of the urban poor is precarious in the present context of volatile food prices and financial economic and fuel crises. Urban consumers are almost totally dependent on food purchases and the urban poor are the most affected in the current climate: they are the first to lose their jobs and 60-80% of their household expenditure is on food, hence these households suffer from both decreasing purchasing power and rising food prices. The 136th Council meeting of the FAO reported that "World hunger is projected to reach a historic high in 2009, with 1,020 million people going hungry every day (from 850 million in 2007). The urban poor will probably face the most severe problems in coping with the global recession....". In urban areas, the most vulnerable groups are the underemployed or unemployed citizens, refugees, the incapacitated, people dislocated by rural violence and conflict and immigrants escaping from poverty and hunger. Children and women are the most vulnerable within these groups (FAO, 2009b).

Inevitably, the effects of climate change will hit hardest on the urban poor, since they are often located in the most vulnerable parts of the cities and have the lowest capacity to adapt to such changes (Commission on Climate Change and Development, 2009; Satterthwaite, 2008).

These are urgent and pressing challenges demanding an equally urgent and adequate response from city and national authorities as well as international support organisations. Urban policies have to incorporate food security considerations and focus on building cities that are more resilient to crises. Urban and peri-urban agriculture will have to feature prominently in urban food security strategies, as an element officially recognised by the 15<sup>th</sup> FAO Committee on Agriculture (COAG) meeting in Rome in January 1999 and subsequently at the 2002 World Food Summit.

The UN Comprehensive Framework for Action of the High Level Task Force on the Global Food Crisis (UN, 2008)

explicitly recommends that "Interventions should also include support to increasing food production in urban areas" (page 11) and "A paradigm shift in design and urban planning is needed that aims at: (.....) Reducing the distance for transporting food by encouraging local food production, where feasible, within city boundaries and especially in immediate surroundings. Without sacrificing core principles to observe public health standards, this includes removing barriers and providing incentives for urban and peri-urban agriculture, as well as improved management of water resources in urban areas" (page 17).



Casablanca small farmers family  
Photo: Silvia Martin Han

This policy briefing has been prepared for the international expert consultation organised by FAO-Food for the Cities (FAO-FCIT<sup>1</sup>) and RUAF Foundation<sup>2</sup> (24-25 September, 2009, in Rome), attended by some 25 experts on urban food security and urban agriculture from international organisations, including senior staff of FAO, RUAF Foundation, IDRC, CGIAR-Urban Harvest, UN-HABITAT, World Bank, IFAD, Rockefeller Foundation, IWMI, CIRAD, IFPRI, ICLEI, GTZ, Heifer Int., Biodiversity Int., WFP and Milano 2015.

It provides evidence-based "food for thought and action" to senior policy makers in member states and relevant UN agencies, for example potential participants of upcoming events such as the High Level conference "How to Feed the World in 2050", the World Summit on Food Security and

the meeting of the UN Task force “Humanitarian Challenges in Urban Areas”. The document intends to stimulate and facilitate the development of pro-poor policies for urban and peri-urban agriculture at international, national and city levels.

Such policies will not only contribute to improving urban food security and nutrition, especially of the urban poor, but also to building more resilient cities by providing vulnerable urban groups with new opportunities for income and job creation, reducing the urban food(t) print and food-related energy use, facilitating productive reuse of urban (organic) waste, improving urban water management and creating a better urban living climate (urban greening, heat reduction, CO<sub>2</sub> capture, biodiversity). As such, urban and peri-urban agriculture not only constitutes an important social safety net in periods of food and economic crises, but it is also an essential component of strategies for building sustainable and healthy cities.

#### Note

- 1) **FAO-FCIT** is a multi-disciplinary action ([www.fao.org/fcit](http://www.fao.org/fcit)) established in 2000 dealing with themes related to urban development and food security. Its main objectives are:
  - i) To make member countries, municipal authorities and relevant institutions aware of the need to protect and improve urban and peri-urban food security especially of poor households;
  - ii) To provide policy guidance at the municipal and other levels to improve the efficiency of the urban food system as an integral component of the overall food supply and distribution system;
  - iii) To make available technical guidance and capacity building tools to improve the safety, effectiveness and sustainability of urban and peri-urban food and agricultural production and post-production systems.
- 2) **RUAF Foundation** is an international network of **R**esource centers on **U**rban **A**griculture and **F**ood security that supports multi-stakeholder policy development and program design and implementation regarding urban and peri-urban agriculture and strengthens the capacity of poor urban producers (and the NGO's and private organizations supporting them) to develop sustainable and safe urban farming systems and community based agri-food enterprises and market chains.

## 2. CITIES, FOOD AND THE URBAN POOR: URGENT CHALLENGES TO BUILD MORE RESILIENT CITIES

This chapter briefly discusses a number of important trends and challenges regarding cities, food and the urban poor. The next chapter provides research-based evidence on the potentials of urban and peri-urban agriculture for the development of adequate responses to such challenges.

### Urbanisation, urban poverty and urban food insecurity<sup>1</sup>

We are in an era of rapid **urbanisation**: the number of people around the world who live in cities is increasing steadily and there is general consensus that urban populations will continue to grow rapidly. In 2008, for the first time in history, more than half the world's population lived in urban areas. The world's urban population is expected to double from 3.3 billion in 2007 to 6.4 billion by 2050, and it is predicted that by 2030, over 56% of the world's population will live in cities (UN Population Fund, 2007). This urban population growth will be most significant in low income countries, notably in Africa and Asia (UNCHS, 2001).

Rapid urbanisation in many developing countries, especially those with lower incomes, is taking place at a time when the availability of non-farm jobs is limited. In fact, non-farm productivity in the least developed countries declined 9% from 1980-83 to 2000-03 (UNCTAD, 2006).

As a result, the urbanisation process is accompanied by a phenomenon referred to as the “**urbanisation of poverty**”: rural-to-urban migration combined with limited employment opportunities in cities is leading to a shift in the locus of poverty from rural to urban areas. The percentage of the poor living in cities is expected to increase from 30% in 2000 to 50% by 2035 (UNCHS, 2001). A recent World Bank and IMF report based on more than 200 surveys conducted in 90 developing countries showed that the growth in urban poverty was 30% higher than that of rural poverty during the 1993-2000 period. This translated into an additional 50 million urban poor in a period of just seven years (IMF, 2007). The total number of urban poor (those living on less than US\$1 a day) in developing countries is estimated at 1.2 billion (UN, 2008). It is common for 30–60% of the population in cities to be in informal settlements with little or no provision of basic infrastructure and services (Hardoy et al, 2001). In most developing countries cities, urbanisation has become virtually synonymous for slum growth. The slum population in these countries almost doubled in 15 years, reaching 200 million in 2005 (United Nations Population Fund, 2007).



*Watercress production in Antananarivo, Madagascar*  
Photo: Marie-Helene Dabat

Sub-Saharan African countries have the world's highest rates of urban growth and the highest levels of urban poverty. The slum population in these countries doubled in the period 1990 to 2005, when it reached 200 million (State of the World's Cities Report 2006/07). In Latin America, roughly half of the urban population is considered slum dwellers (UN Population Fund, 2007). In Asia, the percentage of the urban population living in slums ranges from 43% in southern Asia, to 37% in eastern Asia and 24% in western Asia. According to a World Bank study, rural poverty in Asia is declining significantly while poverty is increasing in the urban areas (World Bank, 2007).

Increasing urban poverty goes hand in hand with **growing food insecurity and malnutrition** in the cities. Urban food insecurity is often overlooked since at aggregate level, economic and social conditions in urban areas are much better than those in rural areas. The familiar images of “famine” situations are often from rural areas and rarely depict urban areas. But such aggregate figures do not account for inequality within the urban population that is generally much greater than within the rural areas (World Bank Development Report, 2000). Besides, such data mask the deep food insecurity and hunger issues in urban areas, which remain under-reported problems (UN FAO, 2004). Unlike in rural areas, problems of food insecurity in urban

areas are strongly related to inadequate purchasing power of the urban poor which limits their access to adequate quantities of nutritious food. In most developing countries, more than half of the urban population is below the poverty line. Hunger in the cities is chronic but is less visible and attracts much less attention from the media and policymakers. Moreover, the nutritional value of food consumed by the urban poor is often very low (Mutonodzo, 2009).

#### **Unhealthy living conditions aggravate food insecurity.**

The urban poor often live in neighbourhoods with poor sanitary conditions, limited access to clean water, high environmental pollution and consequently high and chronic exposure to health hazards. **Chronic infections** compromise the ability of the human body to make effective use of nutrients from consumed food (including mal-absorption and part of the nutrients being used to mitigate toxic effects of environmental contaminants) amplifying the impacts of an already poor diet (Yeudall, 2007).

The growing urban food insecurity and malnutrition problem has not yet translated into policy action in most countries. Poverty and hunger are still viewed by many as a largely rural problem (USDA, 2009)

#### **The impacts of rising food prices**

The recent financial/economic crisis and the rising food, fuel and energy prices have affected the poor in all areas of developing countries, with a large impact on the urban poor.

FAO data indicate that the number of people with chronic food insecurity has risen by 100 million in just two years (or 10% of the 2007 total), the major part of which are urban poor (UN FAO, 2009b).

Due to the financial/economic crisis the purchasing power of the urban poor has deteriorated: economic growth has slowed down and exports from developing to developed countries are declining, resulting in a reduction in wages and employment, particularly in urban areas, pushing people further into poverty (Baker, 2008). Also, the rising fuel costs, which often constitute more than 10% of urban household expenditure, lead to loss of purchasing power for the urban poor (Baker, 2008)

The urban poor are particularly **vulnerable to changes in food prices and variation in income** since food makes up a large part of their household expenses (often over 60%) and urban consumers are almost exclusively dependent on food purchases. Variations in income or food prices have a significant and direct impact on their diets (lower food intake, turning to cheaper/less nutritious food), leading to a further reduction of health care and schooling expenditures or to the sale of productive assets (FAO, 2008a). It is estimated that the rise in food prices between early 2007 and 2008 increased the number of people living in extreme poverty in urban

areas in East Asia, South Asia, the Middle East and Sub-Saharan Africa by at least 1.5% (Baker, 2008).

Although prices of food and fuel have declined in the latter half of 2008 and early 2009, they still remain much higher than they were for much of this decade (USDA, 2009). Moreover, the financial and economic crisis is expected to continue affecting the urban poor in developing countries in the near future due to a worsening economic climate, reduced remittances and decreased aid from donors.

Following the forecast decline in export growth and capital inflows (IMF, 2009), the food security situation is expected to deteriorate further in many countries, especially for the urban poor. Countries with large balance of payment deficits and a high level of **dependence on food imports** will be hit the hardest. In many countries, imported foods, including basic staples such as grains and vegetable oils, are an important component of urban food supplies. In 2005-06, in 11 SSA countries, the import share of total grain supplies equalled 45% of consumption, while in 7 countries the import share was in the range of 30- 50%. High import dependence, especially for lower income countries with limited foreign exchange reserves, means that any increase in import prices or decline in export earnings could force a decline in food imports, causing their food security to deteriorate, hitting first and foremost the urban poor (USDA, 2009).

Maxwell et al (2009) argue that with growing urban populations more urban consumers are exposed to the fluctuations in world market prices, and question who will safeguard their food security: *“Economies such as Mozambique’s, Guatemala’s or Cambodia’s may be growing, but they are not doing so at a rate that sustains buffers for their poorest inhabitants, and the rural- (peri-) urban shift can put many more people in potential harm without a functioning government safety net. This has implications for future humanitarian interventions; is the international community sufficiently attuned to the potential for large-scale urban catastrophes, able to assess urban needs and able to intervene to protect food insecurity in non-agrarian settings?”* (Maxwell et al, 2009).

FAO, when analysing the effects and opportunities resulting from the high food prices, concludes that it would be better to build more resilient cities, enhancing local food production and diminishing the dependency on food imports, rather than expecting the international community to come to the rescue when things go sour. It notes, however, that carefully targeted safety nets and social protection programmes for the most food insecure and vulnerable will probably remain necessary—at least on the short term (FAO, 2008a).

#### **The impacts of climate change**

The current challenge posed by climate change and its interaction with urban poverty and food security is recognised globally. UN Habitat (2009) states that *“Cities are a major*



*part of the cause, suffering the most impacts and therefore play a primary role in finding the appropriate solution”.*

Changes in climate add to the challenges faced by cities and the urban poor. Many cities are at risk of becoming “**disaster traps**”. This could be through the direct effects of sea level rise, floods or hurricanes or through severe food supply problems due to droughts, hailstorms or frosts that affect agricultural production in their hinterlands -and thus the urban food markets. An increased rural-urban migration is likely to be an indirect effect of climate change.

Maxwell et al (2009) point out that the number of people affected by natural disasters is rising due to: (a) the rising frequency and intensity of natural disasters; (b) the increasing concentration of people in vulnerable locations and (c) the diminishing of their coping abilities (especially poor urban) due to malnutrition, poor access to water and sanitation, HIV-AIDS, tuberculosis etc..



*Changing climate increases the risk of flooding*  
Photo: Marielle Dubbeling

*Direct impacts of climate change in cities:* The UN Population Fund indicates that the impacts of climate hazards disproportionately affect people “who live in slum and squatter settlements on steep hillsides, in poorly drained areas, or in low-lying coastal zones” (UN Population Fund, 2007). Low-elevation coastal zones represent 2% of the world’s land mass but hold 10% of its total population. Cities in these zones are at risk from flooding and extreme storm events. There are 3,351 cities in such zones worldwide, of which 64% are in developing regions, and many of them are rapidly expanding (UN Habitat, 2009).

Many cities further inland face serious problems with flooding, as they are located close to rivers or at the foothills of high mountains, vulnerable to the effects of intensified precipitation or snowmelts.

According to UN Habitat, slum areas are anticipated to be the most vulnerable to effects of climate change, given the paucity of shelter and the absence of public services (UN Habitat 2009). In Asia, Africa and parts of Latin America, it is common for half of a city’s population to live in informal settlements, lacking piped water supply, paved roads, sewers, storm drains, and household waste collection. Many of such settlements are located in marginal areas that are less suited for construction and vulnerable to natural disasters: steep and unstable slopes (landslides after prolonged rainfall), low lying areas such as reclaimed swamp areas and river beds (flooding), earth quake prone zones etc., exposing their inhabitants to greater risk from storms, floods and natural disasters.

*Food supply problems:* Changing rainfall patterns will affect agricultural productivity, especially in African countries. If farmers do not adapt to changing circumstances (by using different crop varieties and improving water management) agricultural production could decline 10-25% by 2020 (Herren of the Millennium Institute, at an IFAD meeting in February 2009, pers.comm.). Lenton et al. (2008) state that southern Africa risks losing 30% of its coarse grain output by 2030 and countries like Mozambique, Zimbabwe, and Malawi face a 50% reduction in yields by 2020.

In addition, the share of arable land in tropical regions is expected to decrease. The World Bank’s projections are particularly worrisome for Africa, as they suggest a loss of more than 4% of total arable land by 2039 - faster in some regions - with eastern Africa losing up to 15% of its cropland area within the next thirty years (Lotsch, 2007).

Climate change is expected to put 49 million additional people at risk of hunger by 2020, and 132 million by 2050 (IFAD n/d). City economies will suffer as agricultural production in the surrounding countryside is hit by storms, floods or water scarcity. The decline in agricultural productivity will thus not only affect the rural population but also the urban poor. Maxwell et al state: “*Urban and peri-urban areas are similarly impacted, as natural causes can lead to increased (temporarily or sustained) higher food prices, food shortages, epidemics, and sudden settlement of those displaced by the shock. To make matters worse, natural causes of food crises are often cyclical, repeatedly affecting the same regions or agro-climatic zones*” (Maxwell et al, 2009).

However, attention to climate change adaptation in urban areas so far has been grossly inadequate. The earlier adaptation is incorporated into city investment and development plans, the lower the unit costs will be (Reid and Satterthwaite, 2007).

*Other (indirect) effects:* Due to the effects of climate change, marginal lands in rural areas could become less productive, forcing inhabitants to migrate to urban areas. Climate change could also worsen current trends in the depletion of biomass energy resources. Reduced stream flows could

reduce hydropower production, leading to negative effects on industrial productivity and more difficult and costly management of sanitation, waste disposal, water supply and public health in urban areas.

**Internal displacement of people in recent years**, caused by natural disasters or human-induced emergencies (e.g. Iraq, Georgia, Darfur, Democratic Republic of Congo and Afghanistan) has exacerbated the pressure on urban systems to provide basic services and livelihoods, and accelerated processes of massive slum formation, growing urban poverty, food insecurity, chronic malnutrition and poor health. The recent massive displacement in Pakistan has shown that only 18% of the internally displaced persons (IDPs) are living in camps, whilst 82% are living outside camps, settling mainly in the most marginal and under-served areas of cities. A large proportion of IDPs and refugees often end up living permanently in and around urban areas, even after short periods of displacement (IASC Task Force on Meeting Humanitarian Challenges on Urban Areas, unpublished draft, 2009).



*Market in Layamo IDP camp, Uganda*  
Photo: Astrid van Rooij

Food security is a specific concern to IDPs and refugees in urban areas as they have very limited resources to help them cope. Relief agencies face huge challenges in distributing food to affected populations due to difficulty in identifying beneficiaries and to the often weak capacity of local governments and NGOs to assist in distribution. Providing security, health care, access to safe water and sanitation, treatment for malnutrition, as well as child protection safety nets is equally challenging in an urban setting. Additionally, IDPs are among the most vulnerable to climate change. 80% of Khartoum IDP families live in urban temporary shelters made out of plastic and paper and 90% are regularly flooded (UNHCR, 2009).

According to the IASC Task Force on Humanitarian Challenges on Urban Areas (IASC, 2009) traditional modes of (direct) food distribution in the aftermath of humanitarian crises are proving to be neither effective nor desirable in urban areas, except perhaps during and immediately after a crisis. The revival and diversification of livelihoods, especially for the most vulnerable groups, holds the key to sustainable recovery.

A factor that interacts with climate change is the **urban heat island effect**. Buildings, concrete, tarmac, human and industrial activity in urban areas have caused cities to reach and maintain higher temperatures than the surrounding countryside. Concrete and tarmac increases run-off, which decreases the evaporation rate, further increasing temperature. The increased heat is known as urban heat island. The annual mean air temperature in a large city is 2-3° C higher than in the rural areas surrounding the city with a peak in the built-up core where on a calm, warm day the temperature difference may go up 11°C (American Meteorological Society, 2000). Various cities have seen increases of 0.2°-0.8°F in each consecutive decade (Rosenberg, n.d.) depending on their speed of growth.

The increased heat of our cities increases discomfort for everyone, leads to an increase in the amount of energy used for cooling and refrigeration purposes, and increases pollution. The heat dissipated by cooling devices adds to the heat island effect. Increased heat enhances photochemical reactions, which in turn increases the particles in the air and thus contributes to the formation of smog and clouds.

### **Growing scarcity of fresh water and increased pollution of streams due to disposal of wastewater and solid wastes**

The urban demand for fresh water is rising rapidly, due to population growth as well as increasing supply, coverage and overall urban economic growth, while availability of fresh water is becoming a serious problem. In the Middle East and northern Africa (a region with only 1% of the world's freshwater resources but 5% of the world's population) the average per capita availability of water has dropped from 3300m<sup>3</sup> in 1960 to 1200m<sup>3</sup> in 2002 (World Bank, 2002).

In 1995, 31 countries were classified as water scarce or water stressed, and it is estimated that 48 will fall into these categories by 2025, affecting 2 billion people mainly in Asia and Africa (WHO, 2006). This is a best-case scenario according to another estimate (UNESCO, 2003) that projects 7 billion people in sixty countries water scarce by 2025. A majority of the 19 cities for which the most rapid growth is predicted (with populations expected to more than double) are in chronically water-short regions of the developing world (UN Population Division, 2002).

The destruction of shallow riverine and coastal aquifers, through over-pumping and pollution, has significantly contributed to a water crisis in many cities.

In water-scarce countries (especially in the Near East and North Africa, South Africa, Pakistan, and large parts of India and China) and in densely populated areas, **growing competition between industrial, energy and domestic uses of water and agricultural use of water** can be observed.

Agriculture irrigation is the main fresh water use in many countries, especially in arid and semi-arid zones (overall around 70% - but in some countries up to over 90% - against 22% for industry/energy and 8% for domestic uses). According to the United Nations Environment Programme, the world needs to increase its water supply for irrigation by 14 - 17% by 2030 just to meet its dietary needs (cited in UNESCO, 2003). When a country faces water scarcity, central and local governments tend to restrict agricultural water use in favour of urban industrial, energy and domestic uses, with important negative consequences for national food production (UN Water, 2007). Concurrently, water demand for food production is increasing due to rising populations as well as due to changes in urban food consumption patterns: as urban dwellers move towards richer and more varied diets (from tubers to rice; from cereals to meat, fish and high-value crops) that require more water to be produced (1 kg of wheat requires 400-2000 litres - 6 times higher than tubers; 1 kg of meat requires 1000 to 20,000 litres, depending on the type of animals, feed, and management practices) (UN Water, 2007).

The combination of these trends has important negative effects on public health and urban ecology, including ground-water contamination and the pollution of fresh water bodies downstream of the cities - most often used for multiple domestic and agricultural purposes. Water treatment capacity in most developing countries cities is very limited and existing treatment is often ineffective. Development of treatment infrastructure lags increasingly behind the creation of water supply systems in cities. A common occurrence in many cities is that only part of a city is connected to a sewerage system and often not more than 10-30% of the wastewater collected is treated before discharge, and even less so in most cities in Sub Saharan Africa (WHO/UNICEF, 2000).

Furthermore, the quantity of **solid organic waste** produced by the cities (market wastes, wastes of agro-industries and food wastes from restaurants and households) **is increasing dramatically**. On average, 0.6 kg of solid waste is produced on average per city inhabitant per day.

In low income countries, over 50% (up to 90% or more in some cases) of all municipal waste is organic matter (Obeng and Wright, 1987; Asomani-Boateng and Haight, 1999). Most of the organic waste that is currently collected goes to landfill. In many cities waste collection is often restricted to the central districts and the wealthy neighbourhoods and much of the organic waste is left to rot on the streets or is dumped along riverbanks or on open land near the city limits, leading to contamination of soils and water (Mbuyi, 1989). In Ghana, for example, 58% of the solid waste generated is dumped by

households at designated dumping sites, 25 % is dumped at non-designated sites, and only 5% is actually collected (20% in the two largest cities of Accra and Kumasi) (GSS, 2000). The situation in other African cities is hardly different with 20-50% of solid waste collected in the largest cities. In India, about 50% of generated waste is collected. About 90 % of the Municipal Solid Waste (MSW) collected in Asian cities end up in open dumps.

The organic waste component of landfills is broken down by micro-organisms to form a liquid - 'leachate' - which contains bacteria, rotting matter and even chemical contaminants. Leachate can be a serious hazard if it enters a watercourse or a water table. Digesting organic matter in landfills also generates methane, which in large quantities is a harmful greenhouse gas.



*Valuable resources not recovered, Accra*  
Photo: Pay Drechsel

#### Note

- 1) Food insecurity exists when people do not have adequate physical, social or economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (UN FAO, 2002)



### 3. THE IMPORTANCE OF URBAN AND PERI-URBAN AGRICULTURE (UPA) TO ENHANCE URBAN FOOD SECURITY AND REDUCE URBAN POVERTY

This chapter and the next provide research-based evidence on the potential of urban and peri-urban agriculture in developing adequate responses to the challenges discussed above.

#### UPA, urban food security and nutrition

In the Comprehensive Framework for Action in response to the global food crisis (UN, 2008) the United Nations state that *“Any long-term strategy to reduce the pressure on food prices will also need to encompass more effective strategies to promote sustainable urbanisation. A paradigm shift in design and urban planning is needed that aims at: (.....) Reducing the distance for transporting food by encouraging local food production, where feasible, within city boundaries and especially in immediate surroundings. Without sacrificing core principles to observe public health standards, this includes removing barriers and providing incentives for urban and peri-urban agriculture, as well as improved management of water resources in urban areas”*

Production of food (e.g. green vegetables, eggs, milk, and meat from small animals) by poor urban households can supply 20-60% of their total food consumption. Urban households that are generally involved in some sort of farming or gardening have a **better and more diverse diet** and eat more vegetables than non-farming households of the same wealth class and also more than households from higher wealth classes (who consume more meat). These households are in most cases **more food secure** than households not involved in urban agriculture. Urban agriculture contributes to diversity in the diet and reduces the urban trend of eating more processed, high-sodium foods (Purnomohadi, 2000; Maxwell and Zziwa 1992; Maxwell et al 1998; Mbiba, 2000; Potutan et al. 2000; Foeken 2006; Yeudall et al 2007; Zezza and Tasciotti. 2008; Motunodzo 2009).



*Urban agriculture also produces food for others, Cuba*  
Photo: Hans Peter Reinders

Locally produced food is fresher, more nutritious and diverse than food products bought in supermarkets or in fast food chains. It also leads to more regular food intake, which is crucially important for young children, the elderly or sick household members (e.g. HIV/AIDS and TB patients) and pregnant and lactating women. Involvement in agriculture also leads to better mitigation of diseases (better nutrition and home-grown medicinal plants), more physical exercise, less dependency on gifts and food aid and enhanced self esteem.

Alongside these obvious benefits, there are concerns related to the safety of produce from urban agriculture. This has to do with crop/animal production that takes place close to busy roads or industrial areas (risk of contaminating soils, water and produce with heavy metals), use of urban wastewater for irrigation (risk of diseases from pathogens) and raising animals close to people in combination with poor sanitation (risks of diseases transferred by animals). Such risks need to be properly managed



through appropriate accompanying measures (education for farmers and consumers, adequate zoning, among others - see page 20 below). Simply declaring urban agriculture an illegal activity has proven to be an inadequate policy since urban agriculture has continued anyway, with the illegality only making matters worse. The health risks of urban agriculture depend very much on the type of agriculture, the sanitary and ecological conditions in its location and the way agriculture is practiced. With adequate management, health risks can be reduced to acceptable levels in most cases (Boschio et al, 2007).

The positive value of urban agriculture is not limited to urban households involved in production. Urban agriculture **increases the availability of fresh, healthy and afford-**

**able food** for a large number of other urban consumers, as much of the food produced by urban farmers is bartered or sold locally. It is estimated that 15-20% of the world's food is produced in urban areas (Armar-Klemesu, 2000). Table 1 shows that in many cities urban and peri-urban agriculture meets a substantial part of the urban demand for vegetables (especially fresh leafy vegetables) as well as for fresh milk, poultry, eggs and – to a minor extent- pork and fruits. The volume of crops and animal products of urban and peri-urban agriculture often represents a substantial part of the urban annual food requirement, e.g. in Nakuru 8% (Foeken, 2006), Dakar 10% (Mbaye and Moustier, 2000), Kampala 40% (International Potato Centre, 2007), and Hanoi 44% percent (Mubarik et al. 2005).

**Table 1: Food provided by urban and peri-urban agriculture**

City	Percentage of urban demand met by UPA						
	Leafy vegetables	All vegetables	Eggs	Poultry	Milk	Pork	Fruit
Havana, Cuba (G. Novo & Murphy, 2000)		58					39 <sup>1)</sup>
La Paz, Bolivia (Kreinecker, 2000)		30					
Dakar, Senegal (Mbaye and Moustier, 2000)		70-80		65-70	60		
Dar Es Salaam, Tanzania (Jacobi et al, 2000)	90				60		
Addis Ababa, Ethiopia (Tegegne et.al. 2000)		30			79		
Accra, Ghana (Cofie et al., 2003)		90					
Ibadán, Nigeria (Olajide-Taiwo, et al. 2009)	80						
Brazzaville, Congo (Moustier (1999)	80						
Nouakchott, Mauretania (Laurent, 1999)	90						
Antananarivo, Madagascar (Moustier 1999)	90						
Jakarta, Indonesia (Purmomohadi, 2000).		10					16
Shanghai, China (Yi-Zhang & Zhangen 2000)		60	90	50	90-100	50	
Hong Kong, China (Smit, Nasr & Ratta, 1996)		45		68		15	
Singapore (Smit, Nasr & Ratta, 1996)		25					
Hanoi, Vietnam (GTZ, 2000; Phuong Anh et al., 2004)	80	0-75 seasonal variation	40	50		50	
Vientiane, Laos (Kethongsa, Khamtanh and Moustier (2004)	100	20-100 seasonal Variation					

Source: Compiled by RUA Foundation

<sup>1</sup> Non citrus

Urban agriculture improves urban poor access to fresh and nutritious food not just by making it available at close proximity to cities but also by reducing its cost, as locally-produced food involves less intermediaries and less transport, cold storage, processing and packaging. Marketing chains in urban agriculture are normally much shorter and more varied than in rural agriculture, reducing the costs of wholesalers and retailers in the total chain; transport costs are lower, while more products are sold fresh and unpackaged soon after harvest, thus reducing related storage, packaging and cooling costs. Consequently, the price differential between producer and final consumer (which may go up to 1:10 in rural agriculture) is lowered to 1:2 or 1:3 in urban agriculture (Moustier and Danso, 2006).

Intensive horticulture can be practiced on small plots, making efficient use of limited water and land resources. Horticultural species, as opposed to other food crops, have a considerable yield potential and can provide up to 50 kg of fresh produce per m<sup>2</sup> per year depending on the technology applied. In addition, due to their short cycle, horticultural crops provide a quick response to emergency needs for food (several species can be harvested 60 to 90 days after planting).



*Woman growing vegetables in front of her house, Uganda*  
Photo: Action Against Hunger

In addition urban agriculture complements rural agriculture and increases the efficiency of the national food supply by:

- Providing products that rural agriculture has trouble with, such as perishables that require rapid delivery upon harvest (e.g. fresh milk and vegetables);
- Substituting for food imports intended for urban consumption and thereby saving on foreign exchange.

One should also value the fact that urban agriculture acts as a market stabiliser by **complementing rural production in the dry season and/or when rural areas are poorly accessible during the rainy period** (Moustier and Danso, 2006).

Finally, the cultural role of UPA deserves mentioning. A large part of the current urban population was not born in the city where they live. Each of these migrant groups has its own food preferences, which are not always easily available in the local market or, if they are, they can be unaffordable. Migrant groups often turn to growing these familiar foods in their urban and peri-urban gardens or plots in an attempt to maintain their own **food culture and identity**.

### **UPA, poverty alleviation and local economic development**

Households involved in urban and peri-urban agriculture are mainly (but not exclusively) the urban poor, each working small pieces of land intensively or keeping a small number of animals.

Smit et al (UNDP, 1996) estimated that 800 million people worldwide were involved in urban agriculture of which 200 million were full-time farmers. According to the same source, 80% of families in Libreville (Gabon), 68% of urban dwellers in six Tanzanian cities, 45% in Lusaka (Zambia), 37% in Maputo (Mozambique), 36% in Ouagadougou (Burkina Faso) and 35% in Yaoundé (Cameroon) are involved in urban agriculture.

Not only do household farms produce goods through family labour, but numerous other people are employed in the farming, marketing and processing activities.

Table 2 summarises data on **employment generated in urban agriculture** in a number of cities.

**Table 2: Contribution of urban agriculture production to urban employment**

City	Urban producers
Accra, Ghana (Sonou, 2001; Armar-Klemesu & Maxwell, 2000)	13.6% of all households in 16 city areas are farming including 700 commercial farmers (1997)
Dakar, Senegal (Mbaye & Moustier, 2000)	3000 family vegetable farms (14000 jobs) of which 1250 fully commercial (9000 jobs); 250 poultry units (1996)
Dar es Salaam, Tanzania (Sawio 1998)	15–20% of all families in 2 city areas have a home garden; urban agriculture forms at least 60% of the informal sector and was the second largest urban employer (20%) in 1997
Kumasi, Ghana (Dreschel et al., 2000; Poynte & Fielding, 2000)	1470 registered farms and 30,000 unregistered farmers; 500 cattle owners; 100 registered poultry farms (+ 200 unregistered)
Kampala, Uganda (International Potato Centre, 2007)	35% of the households are engaged in urban agriculture
Nairobi, Kenya (Foeken & Mwangi, 2000)	150 000 households (30% of population); Agriculture provided (in 1993) the highest self-employment earnings among small-scale enterprises
Cienfuegos, Cuba (Socorro, 2003)	In the period between 1995-2003 17,000 jobs were generated; 1.17 % of city GDP
Governador Valladares, Brazil (Lovo & Soares, 2003)	45 % of population practices some form of urban agriculture
Habana, Cuba (Gonzalez & Murphy, 2000)	117,000 direct and 26.000 indirect jobs in urban agriculture
Lima, Peru (IPC, 2007)	20% of the population of Lurigancho-Chosica District of Lima is involved full-time or part-time in agriculture
Shanghai, China (Yi-Zhang & Zhang, 2000)	2.7 million farmers (31.8% of all workers) 2% of city GDP
Beijing, China Liu, 2004	Peri-urban agriculture is absorbing high amounts of migrant labour (between 500,000 and 1 million people)
Manilla, Philippines (IPC, 2007)	120,000 low-income households in the Manila region- depend economically on local jasmine production (including jasmine farmers, garland makers, garland sellers)

Source: Compiled by RUAF Foundation

Poor households involved in urban and peri-urban agriculture benefit economically from their production activities by:

- **Saving on food expenditure.** Since food constitutes a major share of the expenditures of a poor urban household, such savings can be substantial and the cash freed up can be used for other livelihood essentials (water, medicines, rent, schooling and clothing). For example, in Windhoek, Namibia, research found that households involved in urban agriculture saved an average of 60 Namibian dollars a month on food expenditure, which is a significant amount. (Frayne, 2005)
- **Sales of surplus crop and livestock production** to neighbours and local shopkeepers and to local and city markets, supermarkets, school feeding programmes, hospitals, etc.

In addition, poor urban households may benefit from:

- **Production and sales of processed products** (meals, jams, shampoos and other products) on the street, in local restaurants and shops, and other venues.
- **Production and sales of agricultural inputs** (e.g. production of compost or animal feed from collected organic waste; irrigation equipment from recycled materials) and provision of services (e.g. transport, animal health care services).



Vegetables being unloaded at Thiri Mingala Market, Yangon

Photo: George O'Shea

Although the production levels and turnover of individual urban producers in many cases will be small, the high number of urban producers in each city makes their overall contribution to the urban economy highly relevant, generating employment for many poor urban households and providing incomes equivalent to or higher than the official minimum wage (Moustier and Danso, 2006).

Table 3 summarises data from a number of studies regarding **net income generated** in (mainly peri-urban) irrigated open space vegetable production in a number of African and Asian cities, showing that monthly net farm income figures usually range between US\$ 30-70, but can go up to US\$ 200 or more. In the same countries, the minimum monthly wage is in the range of US\$ 20-40 indicating that urban irrigated vegetable production could indeed be a profitable business compared to other urban jobs and also compared to rural vegetable farming. For example in Ghana, irrigated urban vegetable farmers are earning an average annual income that is 2-3 times higher than that of rural farmers (Danso et al, 2003b).

**Table 3 Monthly net income from mixed vegetable farming with irrigation**

City	Typical net monthly income in US\$ per farm	net Income per capita in this country
Accra, Ghana	40-57	27
Bamako, Mali	10-300	24
Bangui, Central African Republic	n.d-320	22
Banjul, Gambia	30- n.d.	26
Bissau, Guinea Bissau	24	12
Brazzaville, Congo	80-270	53
Cotonou, Benin	50- 110	36
Dakar, Senegal	40-250	46
Dar es Salaam, Tanzania	60	24
Kumasi, Ghana (Eriksen-Hamel and Danso, 2009)	35-160	27
Lagos, Nigeria (Ezedinma and Chukuezi, 1999)	53-120	27
Lomé, Togo	30-300	26
Nairobi, Kenya	10-163	33
Niamey, Niger	40	17
Ouagadougou, Burkina Faso	15-90	25
Yaoundé, Cameroon	34-67	53
Ho Chi Minh City, Vietnam (Jansen et al., 1996)	40-125	
Jakarta, Indonesia (Purnomohadi, 2000)	30-50	

Source for data on West and East African countries: Drechsel et al, 2006

Danso et al. (2003a) provide some data on the profitability of urban livestock in and around Kumasi. Cattle-raising within or close to the city is a highly profitable enterprise but only when the herd size falls within 1 to 5 animals. Space requirements, waste disposal and feed availability are major factors to be considered for larger herd sizes. Also raising animals such as pigs, sheep and goats is profitable. Studies in Nairobi have shown the generation of significant incomes in urban livestock keeping, with pig and poultry farming as profitable ventures that guarantee a quick return on capital (Mireri, 2002).

Most poor families rarely have sufficient space for profitable urban animal husbandry within their homesteads. However, many urban producers keep smaller herds/flocks or only smaller animals (guinea-pig, rabbit, guinea fowl, poultry, etc) with low space and input requirements and still generate a good income. For example, in Addis Ababa (Ethiopia), owners of backyard inner city dairy units of even the smallest scale / a large part of which are women / earn above average profits with very low capital input (Tegegne, 2000).

A sizeable proportion of urban middle- and high-income families do have adequate land for commercial livestock keeping. The high start-capital requirements of livestock keeping means that the majority of the urban livestock producers (especially of cattle and of larger herds/flocks) have their livestock enterprises as secondary to other ventures, for example trading or salaried employment, from which the needed capital is derived.

Ornamental plant and/or flower production is another profitable urban agricultural activity that can achieve annual benefits from US\$ 400 up to US\$ 4700 (Nigeria) or US\$ 5000 (Lomé) if sufficient cash is available for labour and the purchase of seeds and seedlings (Kessler, 2002, Ezedinma and Chukuezi, 1999).

Recent work by FAO analysed the importance of urban agriculture for the urban poor from a comparative international perspective, making use of a Rural Income-Generating Activities (RIGA) database, which brought together comparable, nationally- representative household survey data for 15 developing and transition countries'. The results show that the **share of income from agriculture by poor urban households** is highest in Nigeria with over 50% of the income of the urban poorest quintile derived from agriculture, while it is around 20% or somewhat higher in the other three African countries in the sample. Outside Africa the numbers are much lower (Zezza and Tasciotti, 2008).





Horta Comunitária da Casa de Apoio – *community garden part of the Urban and Family Agriculture Support Programme, Contagem (Brazil)*

Photo: Alain Santandreu

Recent studies show that urban horticulture and urban livestock-raising have much **higher growth rates** than rural agriculture and are even comparable to or higher than some other urban economic activities. According to the World Bank (Agricultural Investment Source book), intensive peri-urban horticultural and livestock rearing are extremely fast growing sectors that employ many workers and produce high value-added products that yield reasonable incomes and returns.

Urban agriculture has a **comparative advantage** over rural farming due to its proximity to urban consumers and lower transport and cooling costs, which is particularly important for perishable products (green vegetables, milk, eggs, etc.) and in places where roads and other infrastructure facilities such as refrigeration are poor.

Urban agriculture, to a large extent, makes **productive use of land that is not fit for construction** (flood or earthquake-prone areas, land under power lines and in buffer zones) and adds value to land that might not otherwise have an economic output. It can generate income from temporarily idle land through urban and peri-urban infill, and is compatible with public parks and open space planning. Urban agriculture uses could also compete with alternative land uses. However, questions are still raised regarding the sustainability of urban agriculture in the context of a dynamic urban market with high competition for land, soaring land prices and largely uncontrolled urban growth, if not protected by Municipal laws and programmes and combined with other functions like recreation, water management, urban greening, lowering urban temperature and adaptation to climate change (see the next chapter).

Alongside the economic and employment aspects, urban agriculture can play a role in **the social inclusion of marginalised groups** (the aged without a pension, unemployed youth, persons with disabilities, those afflicted by HIV-AIDS and those impacted by war or disasters, female-headed households etc.) by providing them with an opportunity to feed their families and raise an income, while enhancing self-management and entrepreneurial capacities.

#### Note

1) [http://www.fao.org/es/ESA/riga/english/index\\_en.htm](http://www.fao.org/es/ESA/riga/english/index_en.htm)

# 4. THE IMPORTANCE OF URBAN AND PERI-URBAN AGRICULTURE FOR CLIMATE CHANGE ADAPTATION, SUSTAINABLE WATER MANAGEMENT AND BUILDING RESILIENT CITIES

## UPA and climate change adaptation

Urban and Peri-urban Agriculture (UPA) is getting increasing recognition as an important strategy for climate change adaptation (taking steps to minimise the predicted impacts of climate change) and to a lesser extent mitigation (reduction of greenhouse gas emissions).

The World Meteorological Organization (WMO) suggested more urban and indoor farming as a response to ongoing climate change and as a way to build more resilient cities<sup>1</sup>. The Asian Cities Climate Change Resilience Network (ACCCRN), in which a large number of international organisations cooperate in order to develop adequate strategies and action plans for city adaptation to climate change including Rockefeller Foundation and ICLEI, has included urban and peri-urban agriculture as an important strategy to build resilient cities, defined as cities that are able to respond to, resist and recover from changing climate conditions (Rumbaitis del Rio, 2009).

The International Tripartite Conference “*Urban challenges and Poverty Reduction in African, Caribbean and Pacific Countries*” organised by UN Habitat with EC and ACP countries, 8-10 June 2009, Nairobi, identified urban agriculture, including (agro-) forestry, as having a high potential to improve the urban environment and climate change adaptation (UN Habitat, 2009).

UPA helps cities to become more resilient by:

- a. **Reducing the vulnerability of the most vulnerable urban groups** and strengthening community-based adaptive management by:
  - **Diversifying urban food sources**, enhancing access of the urban poor to nutritious food, reducing the dependency on imported foods and making the city less vulnerable to periods of low food supply from the rural areas due to floods, droughts or other natural or human made disasters;

- **Diversifying income opportunities of the urban poor** and functioning as a **safety net** in times of economic crisis;
- **Being a source of innovation and learning** about new strategies/ technologies for high land and water efficient food production.

- b. **Maintaining green open spaces and enhancing vegetation cover in the city with important adaptive (and some mitigation) benefits:**

- Reduction of the heat island effect by providing shade and enhanced evapo-transpiration (and thus more cooling, less smog);
- Less floods and reduced impacts of high rainfall by storage of excess water, increased water interception, increased infiltration in green open spaces and more flood zones kept free from construction through UPA; reduction of rapid storm water runoff and less floods downstream and more replenishment of ground water;
- Improvement of water quality by natural cleaning in low lying agricultural areas (e.g. natural or constructed wetlands, aquaculture in maturation ponds etc.)
- Capturing CO<sub>2</sub> and dust (and thus contributing to mitigating the global warming effect of the city) through urban (agro-)forestry
- Preventing landslides by (agro-)forestry on steep slopes (and preventing building on such sites)
- Maintaining biodiversity in the city and thus protecting a wider base of plant (and animal) genetic diversity (Santandreu et al, 2002). Often in the larger cities one finds many more species of indigenous vegetables than in rural areas or smaller towns, due to the diverse tastes of its residents from all over the country. It has also been associated with preserving rare and threatened varieties of fruit, vegetables, herbs and flowers. In addition, it can provide a habitat and refuge for many invertebrates and bird species.

c. **Decentralised (safe) reuse of wastewater and composted organic waste in urban and peri-urban agriculture that will help to:**

- Adapt to drought by facilitating year-round production, making (safe) use of reliable waste water flow and nutrients in water and organic waste;
- Reduce the competition for fresh water between agriculture, domestic and industrial uses;
- Lower the depletion of certain minerals (e.g. phosphorus) by making productive use of the nutrients in wastewater and organic wastes ;

Wastewater, excreta and urban organic waste are an accessible source of plant nutrients, such as phosphorus, nitrogen and potassium. The amount of nutrients in urban wastewater and organic waste is substantial (but can vary considerably, e.g. in wastewater: 16–62kg total nitrogen, 4–24kg phosphorus, 2–69kg potassium, 18–208kg calcium, 9–110kg magnesium, and 27–182kg sodium per 1,000 m<sup>3</sup>) and its economic value is sizeable (Manzoor et al, 2007). The world's resources of readily available phosphorus are limited and will run out in 25 years (Rosemarin, 2004). Nutrient recycling will reduce the need for artificial fertilisers and the energy needed for producing it.

- Reducing landfill volumes and thus methane emission.



Wastewater irrigation in periurban Hanoi  
Photo: Montagnero

d. **Reducing energy use and green house gas emissions**

by producing fresh food close to the city (less energy used in transport, cooling, storage, processing and packaging) and enabling synergic and cyclical processes between urban domestic and industrial sectors and agriculture (e.g. use of excess heat, cooling water or CO<sub>2</sub> from industry in green houses); urban food production also contributes to reduction of the ecological food(t) print of the city (the energy and water needed to produce and transport the food consumed by a city).

However, urban agriculture, if not properly managed, may also have some negative impacts on the urban environment, e.g. soil erosion may occur and - if high amounts of fertilisers and pesticides are used over an extended period - under certain conditions ground water may be polluted with residues of agrochemicals. Ecological farming practices are highly recommended in urban and peri-urban agriculture to prevent such negative effects.

**UPA and sustainable water, waste and nutrient management**

It seems obvious to view wastewater as a major source of irrigation water supply in urban and peri-urban horticulture, (agro-)forestry and aquaculture<sup>2</sup>:

- Productive (safe) use of wastewater in urban agriculture will help to **reduce the demand for freshwater** supply and mitigate the stress on water resources;
- Local reuse of wastewater will **reduce the discharge of wastewater into rivers, canals and other surface water sources and thus diminish their pollution;**
- **Reuse of wastewater can help reducing the mining of finite phosphorus reserves and the energy expended to create artificial fertilisers;**
- The use of urban wastewater in (peri-) urban agriculture **generates fresh nutritious food for nearby city populations, at lower costs, as well as income for the urban producers involved.**

As competition for water in densely populated zones intensifies, producers close to cities make increasingly use of low quality water for irrigation in agriculture and aquaculture (either treated waste water, wastewater diluted in rivers or other water bodies and untreated wastewater). Wastewater provides the poor urban and peri-urban producer with a regular supply of irrigation water as well as nutrients (replacing expensive industrial fertilisers). A study by IWMI of 53 cities in the developing world revealed that in four out of five cities surveyed wastewater is used (treated, raw or diluted) in urban and peri-urban agriculture on approx 0.4 million ha involving a farmer population of 1.1 million with 4.5 million family dependants.

The total number of farmers worldwide irrigating their plots with treated, partially treated or untreated wastewater is estimated at 200 million farming on at least 20 million hectares (Raschid-Sally and Jayakody, n.d.). Though the actual physical areas under cultivation may be small, some crops are grown at least 10 times a year. Data from a detailed city study in Accra shows that about 200,000 urban dwellers benefit everyday from vegetables grown on just 100 ha of land (Amoah, 2007). Wastewater irrigation serves a quarter of all vegetables production in Pakistan, and, in most parts of Sub-Saharan Africa, urban



and peri-urban farming irrigated with polluted water sources contributes 60-100% of the perishable vegetables needed in most cities. Domestic wastewater is often used for producing rice and fish. In India, as well as in many other countries, it is also used to grow fodder for livestock, and thus contributes to thriving small-scale enterprises based on providing milk to city dwellers (IWMI, 2007). The WHO expects that *“urban agriculture, with urban wastewater as a common resource, will play a more important role in supplying food for the cities”*. They indicate that a city of 1 million people would produce enough wastewater to irrigate approximately 1500-3500 ha. of land in a semi-arid country (WHO, 2006).

However, wastewater use is still not clearly incorporated into national or local policy in most countries. The fear of health impacts, increasing supply instead of managing demand and, occasionally, cultural factors influence the lack of clear policies in support of safe water reuse. The common point of view of researchers, decision-makers, and service providers is that the use of untreated wastewater is unacceptable and that important benefits can be obtained only when the water is appropriately treated. This approach has resulted in a marginalisation of poor wastewater farmers while the assumption that ‘safe = fully treated wastewater’, is - as discussed below - in many cases an illusion.

The presence of bacteria, viruses and parasites in untreated wastewater that is used for irrigation can undoubtedly pose health risks to farmers and communities who are in prolonged contact with it, and to consumers of produce irrigated with such wastewater. These

health risks can be greatly reduced by treating the wastewater before it is used in agriculture. Excellent technologies have been developed to treat wastewater to produce water of drinking quality. However, these technologies are prohibitively expensive for many cities in developing countries. A further disadvantage is that conventional treatment methods remove the nutrients in wastewater, thus reducing the economic benefits to its users.

The last two decades have seen a strong move towards **alternative decentralised and low-cost wastewater treatment** that allow reuse of wastewater and nutrients or even include aquaculture or agriculture as part of the wastewater treatment process. Stabilisation ponds are used extensively in mid-income countries, especially in the Middle East. Other technologies have and are being developed that allow decentralised and low-cost treatment (and reuse of wastewater and nutrients) close to the source (cluster approach, constructed wetlands, up-flow anaerobic sludge reactors etc. see UNEP 1997 for an overview). However, very low-income countries cannot be expected to provide wastewater treatment facilities of appropriate quality to even a small percentage of the population in the foreseeable future. The adoption of an integrated and multiple or productive approach to water development and the use of alternative decentralised wastewater treatment technologies needs to be supported strongly with views to enhancing coverage while enabling productive reuse of the wastewater.

But the use of wastewater does not need to be restricted to fully treated wastewater. Where only partial or no wastewater treatment is available, health risks of productive reuse of waste water can be reduced through **complementary health risk reduction measures** as explained in the new WHO guidelines for safe use of excreta and wastewater (WHO 2006). The new guidelines assist decision-makers to plan how to achieve the required levels of pathogen reduction by choosing and combining a number of different health risk reduction measures and entry points for action along the “farm to fork” pathway, depending on what is feasible locally. The new WHO guidelines should be extensively applied as they allow for incremental and adaptive change (in contrast to the earlier strict water quality thresholds). This is a cost-effective and realistic approach for reducing health and environmental risks in low-income countries (see IWMI Policy Water Briefing # 17 for a good overview of this low cost risk reduction strategy and recommended measures; IWMI, 2007).

The main entry points for better waste management and nutrient recycling are the urban households where most losses occur. In particular, **reduced septic tank overflow and the comprehensive and timely collection and treat-**



Wastewater irrigation in periurban Hanoi  
Photo: Montagnero





*Waste co-composting with manure in Kahawa Soweto in Nairobi*  
Photo: Urban Harvest

**ment (e.g. co-composting) of excreta** would significantly reduce the urban environmental impact and provide a substantial amount of nutrients. Solid human excreta contain an average of 19 kg C/p/yr, 0.8 kg N/p/yr, 0.3 kg P/p/yr and 0.5 kg K/p/yr (Drangert, 1998).

Lowor Tettey (2008) calculated that if the urine of people in Accra that now use toilets would be collected, it would yield 1064 tons of nitrogen, 70.93 tons of phosphorous and 294.4 tons of potassium annually, which would exceed Accra urban agriculture total demand for these nutrients. Drechsel et al. (2007) calculated that the nutrient value of the uncollected solid waste in Kumasi would be sufficient to pay the service costs of solid waste management for the whole city (US\$180,000 per month). Moreover, about 80% of this amount is spent on waste collection and transportation to disposal sites, which could be drastically reduced through composting for the additional benefit of the farming community.

**Diverting solid organic waste from landfills by composting** is one of the simplest ways to **prevent emissions of methane** (a green house gas) and to **reduce the pollution of groundwater due to leachates** from the landfill. Recovering methane from landfills has proven to be only partially successful because up to 60% of the methane generated escapes through leakage. It is clearly much better to prevent organic waste coming into landfills. The composted organic solid wastes generated by a city contain large amounts of **nutrients** (nitrogen, phosphorus, potassium and others) that can be used for soil improvement and fertilisation (World Bank, 1997a).

Fresh waste from vegetable markets, restaurants and hotels, as well as food processing industries, is regularly used as a source of **feed for urban livestock** (Allison et al. 1998). Organic waste could also be used as a **source of energy**, either by incineration in electricity-producing plants, or by capturing methane from composting sites for biogas or by making briquettes for household use.

A growing number of producers also receive fresh loads of municipal organic wastes, which they incorporate into the soil to prevent diminishing N-contents and odours (Lardinois and van de Klundert, 1993).

#### Note

- 1) "UN Agency calls for urban agriculture" WMO press release December 7, 2007
- 2) Of course under application of the new WHO guidelines (WHO 2006) to reduce associated health risks. See IWMI, 2007 for a clear and practical overview

# 5. THE WAY FORWARD: BUILDING MORE RESILIENT AND FOOD SECURE CITIES THROUGH URBAN AND PERI-URBAN AGRICULTURE

From the evidence discussed above it can be safely concluded that urban and peri-urban agriculture can play an important role in responding to a range of challenges faced by developing countries in building more resilient cities. The size and urgency of these challenges require innovative solutions, and the promotion of safe, sustainable and multi-functional urban and peri-urban agriculture is certainly a key one.

Government authorities should adopt a rights-based and participatory approach to food security and recognise the interdependence and synergy between basic human rights such as food, water, health and education in order to complement market forces which often fail to enhance the welfare of the marginalised, poor and hungry people.

Governmental policies at national and local level are needed that create the proper framework conditions for optimal development of urban and peri-urban agriculture.

Such policies will build on the recognition that:

- a. Urban and Peri-urban Agriculture is an integral part of the urban socio-economic and ecological system: it is a reality that grows when cities grow; UPA is a dynamic -although largely informal - economic sector that quickly adapts to changing urban conditions and demands and - if some basic conditions are met - constitutes an important potential contribution to local economic growth involving large numbers of the urban poor.
- b. UPA constitutes an important safety net for the urban poor in times of economic or food crises.
- c. UPA has an important role to play in strategies that seek to address key urban challenges such as rising urban poverty and food insecurity, fresh water scarcity, adaptation to climate change and growing urban waste disposal problems.
- d. A number of health and environmental risks associated to UPA must be properly addressed. Seeking simply to restrict urban agriculture has proven to be an ineffective strategy in conditions of increasing urban poverty. Pro-active policies that seek to optimise

the benefits of urban agriculture, whilst reducing the associated public health and environmental hazards of UPA (which arise when UPA is improperly managed or not optimally located) are needed.

- e. Support to UPA should go beyond periods of crisis and be made a component of more comprehensive strategies to build sustainable and resilient cities that are socially inclusive, food secure, productive and environmentally healthy.

Building on the considerations above, the following recommendations can be made at different levels.

## International level

1. **To set up an international multi-stakeholder platform for dialogue on cities, food and agriculture**, involving international organisations, national and regional representatives, experts on urban food and agricultural issues from various knowledge centres, bilateral donors and representatives of civil society groups.

The international platform will:

- Act as a **high level advisory panel to UN FAO and UN Habitat**
- Facilitate information exchange and coordination between various international organisations and actors
- Facilitate monitoring, documentation and systematisation of experiences gained in policies and programmes that seek to develop sustainable, safe and equitable urban food systems and strengthened urban-rural linkages
- Stimulate increased international financial and technical support for urban agriculture and act as a broker between southern initiatives in need of technical or financial support and southern or northern partners able to deliver such support.

2. **To take stock of and to systematise the various policies, programmes and laws and regulations on urban food security and agriculture** that cities and countries around the world have developed, or are developing, and **to develop decision making and planning tools**

**for policy makers at national and local level** regarding the planning and development of sustainable and equitable urban food production (horticulture, live-stock raising, aquaculture, agro-forestry), processing and distribution systems.

### **3. To support the development of national and local policies and programmes on UPA to:**

- Provide support (capacity development, technical assistance etc.) to national and local governments regarding the development of national and local policies and programmes on urban agriculture (in collaboration with municipalities, civil society and private actors) and related institutional, operational and financial mechanisms needed to implement such policies and programmes.
- Promote inclusion of urban food production and distribution into food security and poverty reduction strategies and into sector policies and programmes (agriculture, social housing/slum upgrading, water and sanitation, social and economic policy, climate change adaptation in urban areas).
- To encourage local financing of urban agriculture by inclusion in existing financial mechanisms or by promoting innovative forms of financing.
- To emphasise the need for cross-sector and cross-disciplinary approaches and multi-stakeholder processes, involving governmental, municipal, private and civic actors, applying an integrated approach.

### **4. To increase investment in urban agriculture projects and programmes initiated by national and local governments and to establish a Fund/facility for co-financing of small-scale urban agriculture projects by civil society actors** (preferably in coordination with local government) in order to strengthen the role of civil society organisations (urban farmer organisations, local NGOs and CBOs that assist small-scale urban producers and small-scale agro-food enterprises) and enhanced public – private cooperation in the development of planning and development of sustainable urban food systems.

### **5. To support inclusion of urban agriculture into the agenda of national research, extension and educational programmes by:**

- Assisting universities and technical colleges to integrate urban food production and distribution into their curricula;
- Training researchers and educators in technical, socio-economic, health, environmental, institutional and legal aspects of urban agriculture;
- Providing support for formulation and implemen-

tation of (action and policy oriented) adapted research on key issues in cooperation with local stakeholders in urban agriculture;

- Stimulating inter-city and inter-country exchanges on key themes.

Important areas for action and policy oriented research on urban and peri-urban agriculture are:

- (1) Better monitoring and analysis of the contributions of UPA to the local economy, social inclusion and poverty alleviation, urban food security and nutrition, urban environmental management and adaptation to climate change as well as the effects of alternative policies regarding urban agriculture
- (2) Better understanding of the trade-offs between urban/peri-urban agriculture and other land uses in cities and effective ways to maintain open productive green spaces in the built up city
- (3) (participatory) research on safe and sustainable agricultural practices for small scale space confined urban and peri-urban agriculture
- (4) innovative research on building sustainable urban food systems with short value chains and equitable power of all chain actors
- (5) pathways used to adopt international policy guidelines at national and local levels and analysis of social and cultural factors influencing the position of UPA in municipal and national policy making;

### **6. To support inclusion of urban agriculture in urban monitoring indicators**

Promote inclusion of urban food production and distribution indicators in the Global Urban Observatory, the monitoring of the MDGs, and in standard surveys on urban poverty and urban food security.

## **National level**

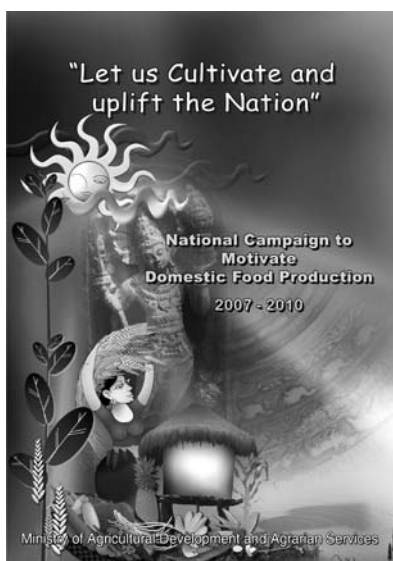
Urban and peri-urban agriculture should be **integrated in national policies, such as agricultural policy, national food security and poverty reduction strategies, national SCP (sustainable consumption and production), Agenda 21 plans etc.** Several developing countries have already taken such initiatives (see box), but in many other countries new initiatives are needed. Local initiatives on urban and peri-urban agriculture are often constrained by restrictions in mandates and in national legislation. This makes local actors hesitant to develop more pro-active policies and programmes due to lack of financial and technical support from the national level.

### Integration of urban and peri-urban agriculture into national policies

- Cuba has developed a comprehensive policy to support highly productive - and mainly ecological - urban and peri-urban agriculture. This started off as a crisis measure (oil crisis) but has become a crucial component of its national agriculture and food security policies.
- Brazil developed an urban agriculture programme as part of its "Hunger Zero" policy
- Sierra Leone included UPA in its "Operation Feed the Nation"
- Ghana included UPA in the national food and agriculture sector development policy (FASDEP II)
- Sri Lanka integrated urban food production in its National Campaign to Motivate Domestic Food Production 2007-2010
- China has UPA as a central component in the "New Countryside" policy

In countries where such initiatives have not been taken yet, it is recommended to undertake a **scoping exercise** to review past research, ongoing and new initiatives, needs and opportunities, potential actors at all levels as a basis for selecting priority areas, setting targets and defining policy measures and actions required. An important step will be the **creation of an institutional home for urban agriculture**. Conventionally, sector policies have been defined under the assumption that agriculture refers to the rural sphere. As a consequence, urban and peri-urban agriculture often does not receive appropriate attention and support from the agricultural institutions nor from the urban authorities. In most countries, the Ministry of Agriculture seems the best equipped to take a coordinating role on urban and peri-urban agriculture. Experiences to date reveal that **close cooperation with other Ministries**

is also required (Health, Social Development, Economic Development, Lands) and that these ministries have to play an active role in the design and realisation of UPA-related programmes - either as part of their own sector policy or as inputs to the agricultural policy or programme.



*Campaign National Campaign to Motivate Domestic Food Production*

Important issues to be given attention in national policies on urban food production and consumption are the following:

- **Remove unjustified restrictions on urban and peri-urban agriculture in national laws and regulations** to be replaced by evidence-based new policies and regulations (for example basing regulations regarding the reuse of wastewater and excreta in agriculture on the 2006 WHO guidelines replacing the ones based on strict water quality norms).
- **Promote close cooperation between municipal authorities and civil society actors (urban producers, local NGOs, CBOs, entrepreneurs, universities) in the design and implementation of municipal policies and programmes on urban food production and consumption** and provide technical assistance to the crafting and implementation thereof. The experiences gained by the 20 major cities that participated in the RUAF Cities Farming for the Future programme (2004-2008) with the establishment of Multi-stakeholder Forums on Urban Agriculture and the development and implementation of a City Strategic Agenda on Urban Agriculture are of high value in this respect (see: [www.ruaf.org/citypages](http://www.ruaf.org/citypages)). The Brazilian Government is setting up 12 UPA Training and Support centres, one in each main metropolitan area, in order to assist the municipal authorities and local stakeholders in the design of effective policies and programmes on UPA.
- **Make available funds for the (co-)financing of local urban agriculture programmes**, preferably involving local authorities as well as civil society actors and private commercial actors: provide loans for more market-oriented urban producers and subsidised inputs or grants to engage the very poor in urban food production activities, as well as encourage other financing institutions to do the same (e.g. by providing guarantees to credit institutions willing to provide credit to small urban producers).
- **Include issues related to urban and peri-urban agriculture into the national agricultural research agenda and agricultural extension programmes, as well as into the national educational system** (universities, colleges), giving due attention to specific technology development and training & education needs related to urban and peri-urban agriculture, livestock, aquaculture and forestry. Urban agriculture is performed under specific conditions that require technologies and organisational and marketing models different to those used in the rural agricultural context. Most available agricultural technologies need adaptation for use in these conditions whilst new technologies have to be developed to respond to specific urban needs (e.g. space-confined production methods, non-soil production technologies for use on roofs and in cellars; development of safe and economic practices for productive



use of wastewater). For example, the national urban agriculture programme in Cuba undertakes extensive practical research to develop technologies suited to urban conditions, like agro-ecological production methods that do not harm the urban environment and the development of varieties adapted to urban conditions.

- **Link the “urban food security” agenda with agendas related to climate change adaptation, disasters risk and effects reduction and urban environment.** This would be done by promoting maintenance of green, open, productive and multifunctional spaces in and around the city (and multi-centric or cluster cities), rather than a concentric spread of the city; promoting a shift from centralised “end-of-pipe” treatment and disposal systems to decentralised and flexible treatment of wastewater and composting of solid organic waste, and allowing productive reuse in urban agriculture nearby; awareness raising among national and local government officials on the new WHO guidelines on the agricultural use of urban wastewater and excreta and application of these at local level. Controlling (industrial) pollution of urban land, water and air (which is threatening the safety of urban food production and consumption) should be intensified and separation and treatment of industrial and hospital waste and wastewater at the source strongly encouraged.
- **Intensify data collection and analysis on the impacts of urban and peri-urban food production and the effectiveness of various policy measures and action strategies** to support UPA and enhance urban food security.

## City level

Cities are quickly becoming the principal spaces for planning and implementation of strategies that aim to eradicate hunger and poverty.

*“Local governments should show a clear commitment to the development of urban agriculture, mobilizing existing local resources, integrating urban agriculture in the municipal structure, expanding it nationwide, and allotting funds from the municipal budgets for carrying out urban agriculture activities.” Quito Declaration, signed by 40 cities. Quito, Ecuador. April 2000.*

There is a growing awareness of the need for city and local authorities (regional, metropolitan, municipal and other local government institutions directly concerned with urban development) to play a proactive and coordinating role in alleviating urban food insecurity, as confirmed by various declarations (see [www.RUAF.org](http://www.RUAF.org)).

A growing number of cities have thus removed unnecessary legal restrictions on UPA and established facilitating

and guiding policies on urban and peri-urban agriculture.

Urban authorities, with support of national institutions, can substantially contribute to the development of safe and sustainable urban agriculture by:

### 1. **Creating an enabling policy environment for the development of sustainable and equitable urban food systems**

Cities are urged to develop an Urban Food Policy and Programme, complementing national agricultural and food security policies that often do not take into account the specific regional and local needs and conditions and/or do not respond to the specific urban challenges. The issue of urban food security is too important to be left to national policy makers and requires integration into municipal social, economic, land-use, housing and environmental policies.

An urban food policy should be based on a systematic multi-actor assessment of the actual food system in the metropolitan or city region and an integrated and comprehensive plan on how to strengthen the urban food system, looking into regional/local food production and other supply chains, distribution (effective, equitable), health, economic and environmental and resilience aspects.

The development and implementation of such a policy and programme requires the participation of a multiplicity of public institutions, private commercial actors (processors, distributors, retailers), civil society organisations (urban and peri-urban producers, consumer organisations, community-based organisations) and universities that are currently operating independently, without mechanisms for coordination and cooperation regarding the urban food system. The lack of collaboration and multi stakeholder approach has led not only to conflict and unnecessary duplication of efforts but also to the complete neglect of developing effective, equitable, sustainable and resilient urban food systems.

Improving access to food for the urban poor in a sustainable manner necessitates an understanding of urban food needs, the constraints to the development of a sustainable urban food system, and a concerted approach to solutions as well as the sharing of institutional responsibilities. Strengthening the metropolitan agricultural system and reducing the dependence on food supply from distant sources and especially imports would be a main strategy.

Formal acceptance of urban/peri-urban agriculture as a

legitimate use of urban land would be a first and crucial step towards effective regulation and facilitation of sustainable urban and peri-urban agriculture development). Existing policies and by-laws regarding UPA will have to be reviewed in order to identify and remove unsubstantiated legal restrictions for UPA and to integrate more adequate measures to effectively stimulate and regulate the development of sustainable urban and periurban agriculture.

In order to enable the development of such policies, municipal authorities could select the department that will act as the lead agency and establish an inter-departmental committee on urban food production and consumption. This committee could then invite relevant local actors to take part in a multi-stakeholder platform or “food council” on urban food production and consumption that will jointly analyse the presence, role, problems and development perspectives of urban food production, distribution and consumption issues in the city-region and coordinate the process of interactive formulation of a municipal policy and programme.

Inclusion of urban agriculture in the municipal budget is crucial for the functioning of the coordination department, inter-departmental working group and multi stakeholder platforms on urban agriculture, as well as for the financing of any programme activities.

The box below shows some examples of related municipal initiatives.

### Creating an enabling institutional environment for urban agriculture

- The Municipality of Villa Maria del Triunfo (part of metropolitan Lima, Peru) recently created a sub-department on urban agriculture under the Department of Economic Development and reviewed and updated the Municipal by-laws on urban agriculture.
- In 2001, the city of Rosario (Argentina) set up its Secretariat of Social Promotion responsible for the coordination of the new Municipal Urban Agriculture Programme.
- In Bulawayo, Zimbabwe, an Interdepartmental Committee on Urban Agriculture was established (including the Departments of Town planning, Health, Finance, and others) to coordinate their activities in this field and to review existing by-laws and to develop a Municipal Policy on Urban Agriculture.
- In Kampala, an inter-departmental working group developed new municipal regulations on urban agriculture and livestock through a process of intensive consultation with all relevant stakeholders.
- In greater Amman, an Urban Food Supply and Distribution Policy was formulated involving a large

number of institutions and private actors (source: Sami Sunna, 2001).

- Multi-stakeholder Platforms on UPA have been established in various cities in the last few years, in which Municipal departments, NGOs, farmer groups, private enterprises, financial institutions, community organisations and universities collaborate in the development of policies and programmes on urban agriculture and urban food security, often with the support of RUA Foundation or FAO. Outstanding examples are Belo Horizonte (Brazil), Villa María del Triunfo (Peru), Bogota (Colombia), Kinshasa (DR Congo), Kampala (Uganda) Bulawayo (Zimbabwe), Accra (Ghana), Gampaha (Sri Lanka) and Amman (Jordan).

### 2. Integration of UPA in urban development and land use plans

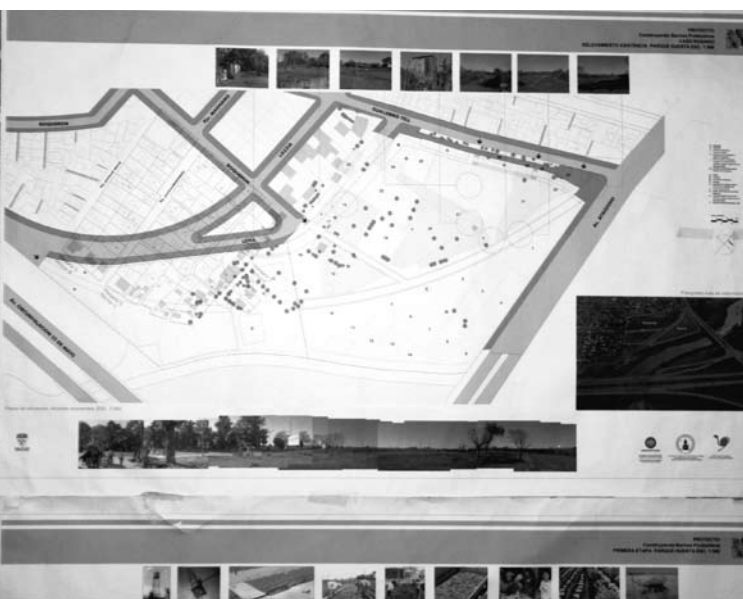
Increased access of the urban poor to land and water, and especially enhanced security of agricultural land use, needs to be given specific attention as they are enabling factors for the development of UPA. To this end, the integration of UPA into urban development and master plans, urban land use and zoning plans, as well as active maintenance of the protected agricultural zones against the land hunger of other urban interest groups is crucial. In most cities, there is no real shortage of land, but there is lack of pro-active management policies regarding use of land for food security and sustainable urbanisation. In most cities, large quantities of vacant land suitable for urban agriculture can be found through UPS and participatory mapping. In six cities in the LAC Region, the percentage of vacant land ranges from under 5% in San Salvador to nearly 44% in Rio de Janeiro (source IPES-RUAF, 2008).

Since land is a valuable resource, combinations of different forms of land use, known as multi functional land use may be required, for example by combining agricultural land use with recreational, water management / flood protection or other functions.

### Integration of UPA in land use and development plans

- Ndola, Zambia included UPA in its Strategic Development Plan 2005-2015;
- Amman integrated UPA in its Master Plan;
- Bobo Dioulasso, Burkina Faso, integrated UPA in its Schéma Directeur d'Aménagement et d'Urbanisme as a main component of park development and the peri-urban green belt
- Bogota, Colombia integrated UPA in its Economic, Social and Environmental Plan 2008-2012
- Dar es Salaam (Tanzania), Dakar (Senegal), Maputo (Mozambique); Pretoria (South Africa), Kathmandu

(Nepal), Accra (Ghana), Sana'a (Yemen), and Beijing (China) are other examples of cities that have demarcated zones for agriculture as a permanent form of land use, to boost local food production and income generation, often in combination with the desire to keep flood plains, steep slopes and areas under power lines free from construction, to create buffer zones between conflicting land use forms, to increase water storage and infiltration, and other multiple functions.



Identification, mapping and analysis of both productive and vacant land (Rosario, Argentina)  
Photo: Joanna Wilbers

In addition, various cities have taken innovative measures to enhance access of the urban poor to land including, for example:

- *Integration of UPA in social housing and slum upgrading programmes* by including space for home gardens or community gardens, street trees for shade and fruits, “productive parks”, as in the Villa Viva and Drenurbes housing schemes in Belo Horizonte, Brazil.
- *Making municipal land available to groups of urban poor households* through medium-term lease arrangements or providing occupancy licenses to the urban poor producing informally on municipal land (under the condition that they adopt safe and sustainable production practices) as in Governador Valadares (Brazil) and Cagayan d’Oro (the Philippines). Municipal land that is provided might be land that is earmarked for other uses but not yet in use as such, land that is not fit for construction e.g. flood zones, land under power lines, or buffer zones and land reserves for future use. Such land is given on short- or medium-term lease arrangements to organised groups of urban poor for gardening purposes (multi-annual purposive specific leaseholds or occupancy licenses). Often these

contracts with farmers include conditions regarding land, crop and waste management practices and include certain restrictions.

- *Establishing fiscal and tax incentives* for land owners who lease out vacant private land to groups of urban poor people willing to produce on this land (Rosario, Argentina).

Furthermore, it is important for cities to enhance land use security of urban producers. A great deal of urban producers enjoy very limited or no tenure security. City authorities are in most cases ill equipped to provide legal status to these producers and the process of regularisation is imbued with politics and even with national government involvement with law making taking years in most cases. As a result, the insecurity of urban producers continues and the (informal) land market remains vulnerable to speculators with more capital, criminal gangs and others. However, cities can address the issue of tenure by acknowledging the legal status of these communities through other methods: tacit approval of occupancy, to allow urban farmers some measure of security through providing “**identity cards**”, “**interim rights**”, “**temporary leases**” or “**occupancy licenses**” specifying that the land is being occupied with the consent of the local government. A limited acceptance by government can influence the status of urban farmers in two ways. First, it encourages a sense of security that will lead to self-help improvements and, secondly, it allows urban farmers to access credit and to use their land occupancy as collateral for small loans, thus overcoming the barrier of not having formal “property”.

### 3. Establishment of a Municipal Food Programme

Many cities have started municipal programmes to support the development of safe urban food production and consumption, often with a pro-poor focus. Such programmes can be directed to:

- **Actual urban and peri-urban small scale producers** and existing community gardens, seeking to enhance their productivity, increase safety of food production, strengthen their organisation and facilitate marketing and enterprise development. Such programmes are often led by the Agricultural Department, or the UPA unit of the Economic Department.
- **Specific marginalised and vulnerable urban groups** (very poor, female-headed households, HIV-affected households, elderly people without pension, unemployed youth, people with a handicap) that may engage in urban agriculture for provision of food and generation of some additional income. Programmes directed at these groups are often led by the Social or Community Development or the Health Department. For example, Belo Horizonte included urban agriculture in its social

assistance programmes (like Bolsa Familia) as an alternative income-generating activity. Mexico City launched a backyard and urban agriculture programme to help families keep their food costs down and produce more staple food (corn).

Experiences gained to date show that such programmes are more effective when the municipality cooperates closely with other organisations (farmer organisations, NGOs, universities, private enterprises, local financial institutions, governmental organisations) to implement them, and the programmes are based on and respond to local initiatives and needs.

Many cities have limited authority over land and water use planning and rights, health regulations, their mandate may not include agriculture, or their technical and financial capacities may be limited. This shows the need for adequate national support, especially to small- and middle-sized cities, although municipalities that are part of a larger metropolis may encounter the same problems.

Besides enhancing and securing access to land and water and composted urban wastes, municipal programmes may focus on:

- **Strengthening the organisation of urban producers and their capacities** to design and implement projects to improve their food and marketing systems and to actively participate in local planning activities (see FAO 2007 a resource book on strengthening urban producers' organisations). In Rosario, Argentina, the Municipal Urban Agriculture Programme supported the establishment of an Urban Producers Network and helped producers establish working relations with various governmental and non-governmental organisations. In Beijing, in peri-urban communities, new agricultural cooperatives, often closely linked to village-level management, have been created to facilitate innovative urban agricultural production and marketing projects.

*Abalimi / Harvest of Hope staff packing vegetable boxes, Cape Town*  
Photo: Femke Hoekstra





- **Providing training and technical assistance to urban producer groups** and supporting them in implementing their production and marketing activities and/or encouraging/enabling local NGOs, CBOs, universities and colleges to do the same. Important topics for training are ecological farming practices, proper management of health risks, farm development (e.g. intensification and diversification), enterprise management and marketing. RUAF Foundation is conducting “training of trainers” workshops for local governments, NGOs, universities that want to support and strengthen urban producer groups and enhance their capacity to analyse urban markets, to design and implement “from Seed to Table” initiatives and to engage in processing and marketing activities for selected “most promising” agricultural products.
- **Support for infrastructure development** (e.g. storage spaces, packaging sheds, green houses etc.) and **access to equipment and inputs** (e.g. irrigation equipment, quality seed/seedlings/young stock, at cost or subsidised prices). The City of Cape Town for example transferred an old industrial site and building to Abalimi - an NGO that supports 3000 urban producers - which was converted into a packaging shed for green vegetables, a demonstration ground for ecological production technologies and a training centre.
- **Enhancing access to and efficient use of irrigation water** by delivering a minimum amount of fresh water free of charge to community gardens in slum areas (Cape Town, South Africa), by providing treated wastewater and training on its use to poor producers operating in a peri-urban scheme (Bulawayo, Zimbabwe), by promoting systems for rainwater collection and storage (Mexico City), by constructing wells and establishing localised water-efficient irrigation systems like drip irrigation (see the thematic issue of Urban Agriculture Magazine # 21 on this topic, RUAF Foundation, 2008).
- **Facilitating marketing of food products including direct marketing.** Municipalities may facilitate marketing initiatives of poor urban and peri-urban farmers by providing access to existing city markets, by assisting them in the creation of farmers’ markets (infrastructure development, licenses, control of product quality), and by authorising food box schemes and/or supporting the establishment of “green labels” for ecologically grown and safe urban food. For example, Brasilia D.F. is furthering the integration of small food production with local food processing and marketing. The municipality of Governador Valadares has created new sales and distribution centres as well as farmers markets in the city and is buying agricultural products from urban farmer groups to supply schools, community kitchens, hospitals and other service organisations.
- **Promotion of multi-functional land use.** Under certain conditions urban farming can be combined with other compatible forms of land use. Farmers may provide recreational services to urban citizens, receive youth groups to provide ecological education, act as co-managers of parks, etc. In Bangkok (Thailand) aquaculture in urban or peri-urban lakes or ponds is combined with recreational activities such as angling, boating, or eating at a fish restaurant. In Calcutta, the maintenance of wetlands, agriculture and aquaculture are combined with wastewater treatment and reuse. The Municipality of Beijing supports the development of peri-urban agro-tourism and Pretoria, South Africa, entered into a partnership with producers to manage municipal open green spaces (saving the municipality considerable maintenance costs) by combining community gardening with other functions (e.g. park maintenance, recreational services).
- **Assistance to re-allocation of urban producers who are poorly located** (and therefore may cause serious health and/or environmental risks due). For example, in Jakarta, Indonesia, 275 dairy cattle farmers with over 5,500 cows have been relocated from the inner city (where they caused disease and waste problems) to a peri-urban area. Cape Town, South Africa, is planning a similar move creating new livestock kraals in the peri-urban area for intra-urban herd owners.

#### 4. Inclusion of urban agriculture in local climate change adaptation and disaster risk reduction strategies

The World Meteorological Organization (WMO, 2007) suggested more urban and indoor farming as a response to climate change and a way to build more resilient cities. Various cities are already including urban agriculture as part of their strategies to reduce their ecological footprint, knowing that urban agriculture has lower energy use (less transport, less cooling, more fresh products sold directly to consumers) and enables cyclical processes and effective use of wastes (use of urban organic wastes as compost or as raw materials for production of animal feed, use of excess heat of industry in green houses etc.). Urban and peri-urban agriculture also contributes to keeping flood plains and wetlands free from construction, enabling storing and infiltration of excess storm water.

In order to strengthen climate change adaptation in urban areas, city governments may take measures that include:

- **Protecting and stimulating sustainable urban and peri-urban agriculture in flood zones and wetlands and on steep slopes** in order to prevent construction in such areas and to reduce run-off.

- **Preferential food procurement from family- and community-based farms located within the city** (for government canteens, school feeding programmes, etc) and facilitating direct marketing of fresh and ecologically produced food from regional sources (less packaging and cooling, more nutritious).
- **Involvement of urban poor producers in the maintenance of open green spaces in the city area (green-belts, or green “fingers”, parks and other open spaces) and promotion of agro-forestry** in order to reduce the urban heat islands effect and to enhance biodiversity and landscape management.
- **Facilitating safe reuse of urban wastewater and organic waste in order to reduce waste disposal into open water systems, reduce fresh water use, recycle nutrients, and reduce emissions of methane from waste dumps.** In this context a shift to decentralised and low-cost treatment of wastewater allowing the reuse of wastewater and nutrients close to the source (stabilisation ponds, cluster approach, constructed wetlands, a/o) should be strongly supported together with decentralised collection and (co-)composting of organic waste and excreta. Health risks related to the use of untreated waste water and polluted streams for production has to be reduced through complementary health risk reduction measures as explained in the new WHO guidelines for safe use of excreta and wastewater (WHO, 2006). Urban wastewater can be recycled for irrigation/fertilisation of horticultural crops, i.e. floriculture and fruit crops as well as for irrigation of forest plantations to fight desertification, providing fuel wood<sup>1</sup>, and turning steep slopes and low-lying lands into urban ‘green lungs’, that can also be used as recreational areas while creating flood buffers for neighbouring housing areas.

Interesting experiences in planning and implementation of such urban agriculture-related adaptation measures to climate change are being gained by the climate change programme for Asian cities of the Rockefeller Foundation (Rumbaitis del Rio, 2009).

Investments in climate adaptation must be focused on low-income groups (who often live in the most vulnerable areas) and fully involve them in plans to reduce flooding

and other risks, also as part of slum upgrading programmes (Reid and Satterthwaite, 2007).

Climate change adaptation through urban agriculture links enhancing urban resilience with better living environments, food security and income of the urban poor and, most importantly, enhances the adaptive management capacity of the urban poor.

The IASC Task Force on Meeting Humanitarian Challenges in Urban Areas (IASC, 2009) recommended that in the aftermath of **humanitarian crises**, support programmes should focus on the revival and diversification of livelihoods for the most vulnerable groups rather than seeing food distribution as their main intervention. They should aim at stimulating various forms of urban agriculture and related community-based agro-enterprises - like compost making, food processing, transport, marketing and home-based manufacturing of tools - by providing tools, seeds, access to land and essential services like training and organisational support as part of residential arrangements.

### Final remarks

Effects of the recent food and economic crisis, the growing energy and water crisis and climate change are felt strongly by an increasing number of urban poor people. Adequate responses are urgently needed. Urban and peri-urban agriculture can play an important role in responding to these challenges, especially if it is made part of a comprehensive approach to sustainable urban development characterised by an emphasis on multi-stakeholder involvement, decentralised and flexible approaches, participatory planning and management of spaces and services, pro-poor focus and optimal use of all locally available resources, including wastes.

#### Note

- 1) In many cities attempts to decrease pressure on wood energy (fuel wood and charcoal) by subsidizing gas or electric technologies have not succeeded. For many regions, such as in Africa, wood energy is forecast to continue being the main source of energy for cooking and heating for the majority of the population.

# REFERENCES

- American Meteorological Society. *Heat islands*. Glossary of Meteorology, second edition, June 2000.
- Amoah, P., P. Drechsel, R.C. Abaidoo and M. Henseler. *Irrigated urban vegetable production in Ghana: Microbiological contamination in farms and markets and associated consumer risk groups*. *Journal of Water and Health* 5(3): 455–466, 2007.
- Argenti Olivio, Food for the cities: food supply and distribution policies to reduce urban food security. FAO Food for the Cities working paper, FAO, Rome, 2000.
- Armar-Klimesu M. and D. Maxwell, D. *Urban agriculture as an assist strategy, supplementing income and diets. A case study of Accra*. In: Bakker, N. et al. (eds.) *Growing cities, growing food: Urban agriculture on the policy agenda*. A reader on urban agriculture, DSE, Feldafing, 2000, pp 183-205.
- Baker, Judy, *Impacts of Financial, Food and Fuel Crisis on the Urban Poor.* *Directions in Urban Development*, In: *Directions in Urban Development*, Urban Development Unit, World Bank, December 2008.
- Boischio, Ana, Alison Clegg, & Dali Mwagore (eds.) *Health Risks and Benefits of Urban and Peri-Urban Agriculture and Livestock in Sub-Saharan Africa*, Urban Poverty and Environment Series Report #1, IDRC, Ottawa 2007.
- Buechler, S., Devi, M.G., Raschid-Sally, L. *Livelihoods and Wastewater Irrigated Agriculture Along the Musi River in Hyderabad City, Andhra Pradesh, India*. *Urban Agriculture Magazine* # 8, 2002.
- Cofie, O. et al. *Contribution of Urban and Peri-urban Agriculture to Food Security in Sub-Saharan Africa*. Paper presented at the Africa session of 3rd World Water Forum, Kyoto, 17<sup>th</sup> March 2003.
- Cornish, G.A. and Lawrence, P. *Informal Irrigation in periurban areas: A summary of findings and recommendations*. Report OD 144. HR Wallingford, UK, 2001.
- Commission on Climate Change and Development, *Closing the gaps: Disaster risk reduction and adaptation to climate change in developing countries*. Ministry of Foreign Affairs, Sweden, 2009.
- Cudjoe, G., C. Breisinger, X. Diao, *Local Impacts of a Global Crisis: Food Prices Transmission and Poverty Impacts in Ghana*. IFPRI Discussion Paper 00842, December 2008.
- Danso, G., Keraita, B, and Afrane, Y. *Farming systems in urban agriculture in Accra, Ghana*. International Water Management Institute, Accra, 2002.
- Danso, G., P. Drechsel, S.S. Akinbolu and L.A. Gyiele. *Review of studies and literature on the profitability and sustainability of urban and peri-urban agriculture*. Final Report submitted to FAO-Rome, IWMI, Accra, 2003.
- Diop, F. *Farming systems in urban agriculture in four cities*. IWMI, Accra, 2002.
- Drangert, J.O. *Fighting the Urine Blindness to Provide More Sanitation Options*. *Water South Africa*, Vol. 24, No. 2, April 1998.
- Drechsel Pay, Sophie Graefe, Moise Sonou and Olofunke O. Cofie, *Informal irrigation in Urban West Africa: an Overview*, IWMI research report 102, IWMI (with RUAFA, FAO and Urban Harvest), Colombo, 2006.
- Drechsel, Pay, Sophie Graefe and Michael Fink *Rural-Urban Food, Nutrient and Virtual Water Flows in Selected West African Cities*, IWMI Research report 115, Colombo, 2007.
- Eriksen-Hamel N.S and G. Danso. *Urban compost: a socio-economic and agronomic evaluation in Kumasi, Ghana*, In: M Redwood (ed.) *Agriculture in urban planning, Generating livelihoods and food security*. Earthscan, London, 2009.
- Etzold, B. (2008): *Street Food in the Megacity Dhaka: How can we conceptualize its role within the mega-urban food system?* In: Bohle, H.-G., Warner, K. (eds.): *Megacities: Resilience and Social Vulnerability*. UNU-EHS, Bonn, 2008 pp 30-43.
- Ezedinma, C. and C. Chukuezi, *A comparative land analysis of urban agriculture enterprises in Lagos and Port Harcourt, Nigeria*. *Environment and Urbanization*, 11(2): 135-144. IIED, London, 1999.
- Foeken, Dick and Alice Mboganie Mwangi. 2000. *Increasing food security through urban farming in Nairobi*. In: Bakker, N., M. Dubbeling, S. Guendel, U. Sabel Koschella, H. de Zeeuw (eds.). *Growing Cities, Growing Food, Urban Agriculture on the Policy Agenda*. DSE, Feldafing, 2000 pp 303–328.
- Foeken D. *To Subsidise My Income: Urban farming in an East African Town*. Brill, Leiden, 2006.
- Frayne, B. *Survival of the poorest: migration and food security in Namibia*. In: Mougeot L.J.A. (Ed.) *AGROPOLIS: the social, political and environmental dimensions of urban agriculture*. Earthscan, London, 2005, 31-50.
- Gockowski J., Nelly N. Soua Mboo, Elong, P. David, O. *Livelihoods study of Urban Agriculturalists in Yaoundé*. In: Nolte, C. (ed.) *Urban Harvest Pilot Site Yaoundé Final Report*, 2004.
- Gonzalez Novo, M. and C. Murphy, *Urban agriculture in the City of Havana: a popular response to a crisis*. In: Bakker, N. et al. (eds.) *Growing cities, growing food: Urban agriculture on the policy agenda*. DSE, Feldafing, 2000. 329-347.
- Hardoy, Jorge E , Diana Mitlin and David Satterthwaite, *Environmental Problems in an Urbanizing World: Finding Solutions for Cities in Africa, Asia and Latin*

- America, Earthscan Publications, London, 2001.
- IASC Task Force on Meeting Humanitarian Challenges on Urban Areas, *Meeting Humanitarian Challenges in Urban Areas; Assessment and Strategy; Draft annotated outline*. Geneva, June 2009.
  - IFAD, *Climate change: building the resilience of poor rural communities*, n/d.
  - IPC, *Impacts of urban agriculture. Highlights of Urban harvest research and development 2003-2006*. Lima, 2007.
  - IMF, *Finance and Development Report*, September 2007.
  - IMF, *World Economic Outlook*, 2009.
  - IWMI, *Recycling realities: managing health risks to make wastewater an asset*, Water Policy Briefing # 17, IWMI-Global Water partnership, 2007.
  - Jacobi, P., Amend J. and Kiango, S. *Urban agriculture in Dar es Salaam: providing for an indispensable part of the diet*. In: Bakker, N. M. Dubbeling, S. Guendel, U. Sabel Koschella, H. de Zeeuw (eds.) *Growing cities, growing food: Urban agriculture on the policy agenda*. DSE, Feldafing, 2000.
  - Jansen, H.G.P., D.J. Midmore, P.T. Binh, S. Valasayya, and C.C. Tru. *Peri-urban vegetable production in Ho Chi Minh City, Vietnam*. Working paper, AVRDC, Bangkok, 1995.
  - Kessler A.. *Farming systems in urban agriculture in four West Africa Cities* IWMI, Accra, 2002.
  - Kethongsas S., Thadavong K. and Moustier, P. *Vegetable marketing in Vientiane*, SUSPER project AVRDC/CIRAD/French MOFA), Hanoi, 2004.
  - Kreinecker P. 2000. *La Paz: Urban Agriculture in Harsh Ecological Conditions*. In: Bakker, N., M. Dubbeling, S. Guendel, U. Sabel Koschella, H. de Zeeuw (eds.). 2000. *Growing Cities, Growing Food, Urban Agriculture on the Policy Agenda*. DSE, Feldafing Germany, 391-412.
  - Laurent 1999 cited by: Moustier P. *Urban horticulture in Africa and Asia* ISHS Acta Horticultura 762.
  - Lenton, T. et al. *Tipping elements in the Earth's climate system*. *Proceedings of the National Academy of Sciences*. 105 (6): 1786–93, 2008.
  - Lotsch, A. *Sensitivity of Cropping Patterns in Africa to Transient Climate Change*. Policy Research Working Paper 4289. World Bank, Washington, 2007.
  - Manzoor et al *Agricultural use of marginal-quality water: Opportunities and challenges*. In: Molden, David (Ed.). *Water for food, water for life: A Comprehensive Assessment of Water Management in Agriculture*. Earthscan, London, UK; IWMI, Colombo, Sri Lanka.
  - Maxwell, Daniel, Patrick Webb, Jennifer Coates and James Wirth *Rethinking Food Security in Humanitarian Response*; Paper Presented to the Rethinking Food Security in Humanitarian Response International Forum, Rome, April 16–18, 2008.
  - Mbaye, Alain and Paule Moustier. *Market-oriented urban agricultural production in Dakar*. In: Bakker, N., M. Dubbeling, S. Guendel, U. Sabel Koschella, H. de Zeeuw (eds.). *Growing Cities, Growing Food, Urban Agriculture on the Policy Agenda*. DSE, Feldafing, 2000, pp 235–256.
  - Mireri, C. *Private Investment in Urban Agriculture in Nairobi, Kenya*. *Urban Agriculture Magazine* no. 7, RUAF Foundation, Leusden, 2002.
  - Mougeot, L.J.A. (Ed.). *AGROPOLIS. The Social, Political and Environmental Dimensions of Urban Agriculture*. Earthscan, London, 2005.
  - Moustier, Paule. 1999. *Complémentarité entre agriculture urbaine et agriculture rurale* In: Olanrewaju B. Smith (ed) *Agriculture urbaine en Afrique de l'Ouest: Une contribution à la sécurité alimentaire et à l'assainissement des villes*, TCA and IDRC, Wageningen/Ottawa, 1999 pp. 41–55.
  - Moustier P. *Assessing the Socio-Economic Impact of urban agriculture*. *Urban Agriculture Magazine* No 5, RUAF Foundation, Leusden, 2001.
  - Moustier, Paule and George Danso. 2006. *Local Economic Development and Marketing of Urban Produced Food*. In: Veenhuizen, R van, *Cities Farming for the Future: Urban Agriculture for Green and Productive Cities*, RUAF Foundation/IDRC/IIRR, Leusden/Los Banos, 2006.
  - Mubarik, A., H. de Bon and P. Moustier. *Promoting the multi-functionality of urban and periurban agriculture in Hanoi*. *Urban Agriculture Magazine* No 15, RUAF Foundation, Leusden, 2005.
  - Mutonodz, C. *The social and economic implications urban agriculture on food security in Harare, Zimbabwe*. In: M Redwood (ed) *Agriculture in urban planning, Generating livelihoods and food security*. Earthscan, 2009.
  - Olajide-Taiwo, L.O, O. Cofie, O.M.O. Odeleye, F.B. Olajide-Taiwo, Y. Olufunmi, O.S. Adebayo, O.O. Alabi, *Effect of capacity building on production of safe and profitable leafy vegetables among farmers in Ibadan city of Nigeria*. Paper presented to the All Africa Horticulture Congress, Nairobi, August 2009.
  - OECD-FAO, *Agricultural Outlook 2006–2015*. Paris, 2006.
  - Poubom, C. and F. Ngundam. *Cameroon*. In: Chweya, J..A. and P.B. Eyzaguirre (eds.) *The Biodiversity of Traditional Leafy Vegetables*. International Plant Genetic Resources Institute, Rome, 1999.
  - Purnomohadi, N. *Jakarta: urban agriculture as an alternative strategy to face the economic crisis*. In: N. Bakker M. Dubbeling, S. Guendel, U. Sabel Koschella, H. de Zeeuw (eds.) *Growing cities, growing food: Urban agriculture on the policy agenda*. DSE, Feldafing, 2000. 453–466.
  - Raschid-Sally Liqa and Priyantha Jayakody *Drivers and characteristics of wastewater agriculture in developing countries – results from a global assessment*, IWMI research report, n.d.
  - Reid Hannah and David Satterthwaite, *Climate change*



- and cities: why urban agendas are central to adaptation and mitigation. Sustainable Development Opinion*, IIED, UK, 2007.
- Rosemarin, A. In *A Fix: The Precarious Geopolitics of Phosphorous. Down to Earth* June 2004. Centre for Science and Environment. Delhi, pp 27-31.
  - Rosenberg Matt, *Urban heat islands and warm cities*. Available at: [www.geography.about.com](http://www.geography.about.com).
  - Rothenberger, Silke, Christian Zurbrugg, Iftekhar Enayetullah, A. H. Md. Maqsood Sinha, *Decentralised Composting for Cities of Low- and Middle-Income Countries; A Users' Manual*, Waste Concern and Eawag / Sandec, Dhaka/Duebendorf, 2006.
  - Rumbaitis del Rio, Cristina, *Cities Climate Change Resilience and Urban Agriculture*, Powerpoint presentation at Strategic Partnership meeting on Urban Agriculture, IDRC, Marseille, July 2, 2009.
  - Santandreu, A, A. Gómez Perazzoli and M. Dubbeling (2002), *Biodiversity, Poverty and Urban Agriculture, in Latin America, Urban Agriculture Magazine* no. 6 Transition to Ecological Urban Agriculture: A Challenge, RUAF Foundation, The Netherlands, 2002.
  - Satterthwaite, David. 2008, *Insights Cities and Climate Change*. ID 21 Insight No 71, IDS.
  - Scott, C.A., N.I. Faruqui, and L.Raschid-Sally (eds) *Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities*, edited by CABI/IWMI/IDRC, 2004.
  - Scott, C A, Silva-Ochoa, P. Collective action for water harvesting irrigation in the Lerma-Chapala Basin, Mexico. *Water Policy*, 3, pp 555-572, 2001.
  - Sheeran, J. *Testimony to the European Parliament Development Committee*, March 6, 2008, Brussels.
  - SIDA, *Water and Wastewater Management in Large to Medium-sized Urban Centers*, 2000.
  - Smit, J., Ratta, A. & Nasr, J. *Urban agriculture: food, jobs and sustainable cities*. UNDP, New York, 1996.
  - Sunma, Sami, *Urban food supply and distribution: policies and programmes; The case of Greater Amman*, thematic paper 3, FAO, 2001.
  - Tegegne, A., M. Tadesse, A. Yami and Y. Mekasha, *Market-oriented Urban and Peri-urban Dairy Systems. Urban Agriculture Magazine* No 2, RUAF Foundation, Leusden, 2000.
  - Tettey-Lowor, Frederick, *Closing the loop between sanitation and agriculture in Accra, Ghana*, MSc thesis, Accra/Wageningen, 2008.
  - UN, *Comprehensive Framework for Action. High level Task Force on the global Food Crisis*, New York July 2008.
  - UNCHS *State of the World's Cities Report*, New York, 2001.
  - UNCTAD, *The Least Developed Countries Report: Developing Productive Capacity*, 2006.
  - UNDP, *Human Development Report 2006*, New York, 2006.
  - UNEP Vital water graphics, 2<sup>nd</sup> edition, 2008.
  - UNEP *Source book of alternative technologies for fresh-water augmentation in Latin America and the Caribbean*, UNEP-Environmental Technology Centre, Osaka, 1997.
  - UNESCO, *Water for people, water for life*, The United Nations World Water Development Report, France, 2003.
  - UN FAO Trade and Food Security; *Conceptualizing the linkages*. Technical Consultation, 12-12 July 2002, Rome.
  - UN FAO, *The State of Food Security in the World*, Rome, 2004.
  - UN FAO *The urban producer's resource book*. Rome, 2007.
  - UN FAO *State of Food Insecurity in the World 2008: High food prices and food security – threats and opportunities*, Rome, 2008a.
  - UN FAO, *Climate change and food security in Pacific Island countries*. Rome, 2008b.
  - UN FAO *Declaration of the High Level Conference on World Food Security: the challenges of climate change and bio-energy, 27-27 January 2009, Madrid*, Rome, 2009a.
  - UN FAO *Follow-up to the high-level conference on world food security: FAO contribution to the implementation of the comprehensive framework for action*, Document for FAO Council 136<sup>th</sup> session, 15-19 June, Rome 2009b.
  - UN Habitat *State of the World's Cities Report 2006/2007*, Nairobi, 2007.
  - UN Habitat, *International tripartite Conference Urban challenges and Poverty Reduction in African, Caribbean and Pacific Countries, 8-10 June 2009, Nairobi*.
  - UN Population Fund, *State of the World Population; Unleashing the potential of urban growth*, New York, 2007.
  - UN Population Division, 2002 cited in: *WHO Guidelines for the safe use of wastewater, excreta and grey water*, 2006.
  - UN Water and UN FAO, *Coping with Water scarcity*, 2007.
  - UN WMO *UN Agency calls for urban agriculture* WMO press release December 7, 2007.
  - USDA, *Food Security Assessment 2008-2009*, June 2009.
  - Veenhuizen, R. van, G. Danso, *Profitability and Sustainability of Urban Agriculture*. FAO Agricultural management, marketing and finance occasional paper no 19. FAO, Rome, 2007.
  - Von Braun, J. *The World Food Situation: New Driving Forces and Required Actions*. International Food Policy Research Institute, Washington, 2007.
  - World Bank, *World Bank Development Report*, 2000.
  - World Bank, *Agricultural Investment Source book (First update) World Bank- ARD, Washington*, 2007.
  - World Bank, *New evidence on the urbanization of Global Poverty*, April 2007.
  - World Bank, *Rising food prices: Policy options and World Bank response*. [http://siteresources.worldbank.org/NEWS/Resources/risingfoodprices\\_backgroundnote\\_apr08.pdf](http://siteresources.worldbank.org/NEWS/Resources/risingfoodprices_backgroundnote_apr08.pdf).

- World Bank-SD and FAO-FCIT *Urban Agriculture For Sustainable Poverty Alleviation and Food Security*; Background paper by the Secretary General of the UN to the High Level Conference on Food Security, Climate change, and energy – Rome, 3-5 June 2008.
- WHO *Guidelines for the safe use of wastewater, excreta and grey water*, 2006.
- Yi-Zhang, Cai and Zhang Zhangen. 2000. *Shanghai: trends towards specialised and capital-intensive urban agriculture*. In: Bakker, N., M. Dubbeling, S.Guendel, U. Sabel Koschella, H. de Zeeuw (eds.). *Growing Cities, Growing Food, Urban Agriculture on the Policy Agenda*. DSE, Feldafing, 2000, pp 467–476.
- Yeudall, Fiona *Nutritional perspectives in urban and peri-urban agriculture* in: Boischio, Ana, Alison Clegg, & Dali Mwangi (eds.) *Health Risks and Benefits of Urban and Peri-Urban Agriculture and Livestock in Sub-Saharan Africa, Urban Poverty and Environment Series Report #1*, IDRC, Ottawa 2007a.
- Yeudall, F., Sebastian, R., Cole, D. C., Ibrahim, S., Lubowa, A., & Kikafunda, J.. *Food and nutritional security of children of urban farmers in Kampala, Uganda*. *Food and Nutrition Bulletin* 28(2 Suppl.): S237-S246 , 2007b.
- Zezza, Alberto and Luca Tasciotti. 2008. *Empirical Evidence from a Sample of Developing Countries*. FAO, Rome, 2008.

# RUAF Foundation

The RUAF Foundation is an international network of seven regional resource centres and one global resource centre on Urban Agriculture and Food Security. The RUAF network was formed in 1999. In the following years RUAF gradually evolved into an international network of regional resource centres providing training, technical support and policy advice to local and national governments, producer organizations, NGO's and other local stakeholders. In March 2005 the RUAF partners established the RUAF Foundation as their joint administrative body and liaison office.

RUAF focuses its activities mainly in 20 cities, where RUAF closely cooperates with the local government, producer organisations, NGO's, universities and private enterprises.

The RUAF partners share a common vision on the role of urban and peri-urban agriculture (UPA) in urban poverty reduction and enhancing food security a/o and together implement the international RUAF programme.

*The RUAF Foundation aims to contribute to urban poverty reduction and local economic development, enhanced urban food security and to stimulate participatory city governance and improved urban environmental management, by creating enabling conditions for the development of sustainable urban and peri-urban agriculture. They seek to do so by capacity development of local stakeholders in UPA, strengthening local producers' organisations and facilitating the integration of urban agriculture in policies and action programmes of local governments, civic society organisations and private enterprises.*

The RUAF Foundation maintains close working relations with various international organisations and programmes that have taken major initiatives on urban agriculture like with IDRC (Urban Poverty and Environment programme), FAO (Food for the Cities Initiative), CGIAR (Urban Harvest Programme), and UNDP/Habitat (Sustainable Cities Programme). RUAF seeks to support local initiatives and to build partnerships with relevant programmes of international, regional, national and local organisations and networks, and pooling of resources in jointly planned actions.

Main sources of funding for the programmes implemented by the RUAF Foundation are the Dutch Ministry of Foreign Affairs (The Netherlands), the International Development Research Centre (Canada) and the European Union. Other organisations have contributed to specific activities, including CTA, GTZ, SIDA, DSE, FAO, UNDP/UNHABITAT, CGIAR, ACIAR, IWMI, DFID, OXFAM-NOVIB, ICCO, WHH, CARE, ASC, Misereor, a/o

## RUAF PARTNERS



### ETC-Urban Agriculture

Leusden, The Netherlands

Leusden, The Netherlands

Email: ruaf@etcnl.nl;

[www.ruaf.org](http://www.ruaf.org)



### MDPESA

Municipal Development Partnership, Harare, Zimbabwe

*Eastern and Southern Africa*

Email: tmubvami@mdpafrika.org.zw

[www.mdpafrika.org.zw/ua\\_fstt.html](http://www.mdpafrika.org.zw/ua_fstt.html)



### IPES

Promoción del Desarrollo Sostenible, Lima Peru

*Latin America*

Email: au@ipes.org.pe;

[www.ipes.org/au](http://www.ipes.org/au)



### IWMI-India

International Water Management Institute,

Hyderabad, India

*South and South East Asia*

Email: p.amerasinghe@cgiar.org

<http://ruaf-asia.iwmi.org>



### IAGU

Institut Africain de Gestion Urbaine, Dakar, Senegal

*French-speaking West Africa*

Email: moussa@iagu.org;

[www.iagu.org/RUAF](http://www.iagu.org/RUAF)



### IGSNRR

Institute of Geographical Sciences and Natural Resource Research of the Chinese Academy of Sciences

*China*

Email: caijm@igsnr.ac.cn;

[www.cnruaf.com.cn](http://www.cnruaf.com.cn)



### IWMI-Ghana

International Water Management Institute, Accra, Ghana

*English-speaking West Africa*

Email: o.cofie@cgiar.org

<http://ruaf.iwmi.org>



### AUB-ESDU

American University of Beirut

*North Africa and Middle East*

Email: zm13@aub.edu.lb / ziadmoussa@yahoo.com

[www.urbanagriculture-mena.org](http://www.urbanagriculture-mena.org)