

Building Resilient Cities

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Urban growth is projected to increase significantly in the coming decades. 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 per cent of the world's population will live in cities. Accompanying this urbanisation process is a phenomenon referred to as the "urbanisation of poverty". Ravallion (2007) estimates that about one-quarter of the developing world's poor live in urban areas, and this percentage is expected to increase to 50 per cent by 2035.

Cities will thus continue to face new and ongoing challenges in creating sufficient employment; enhancing food security; providing essential services such as housing, potable water, sanitation, basic health services and education; planning and maintaining green spaces; and managing urban wastes and wastewater. Many innovations are already taking place in urban areas to respond to these challenges. In the past few issues of the UA-Magazine we have highlighted the multiple functions of urban agriculture: the role it can play in increasing food security, income and employment generation; building communities and sustainable environments; and in relief and rehabilitation. In this issue, we explore urban agriculture and its role in developing urban resilience.

Disturbances, threats, and shocks

Cities are socio-ecological systems that can, as a result of rapid social, economic or environmental changes, disasters or conflicts, slip into a state of chaos (Tidball and Krasny, 2006). Long-term urban sustainability is challenged by a number of worldwide trends, such as rising food and fuel prices, climate change and increasing scarcity of water. Unstable macro-economic and political situations or natural disasters aggravate these disturbances. Prioritising investments in cities can help to mitigate the impacts of such disturbances in the short run and reduce risks in future. Well-targeted programmes, including those involving urban agriculture, can play an important role in cushioning the impacts for the urban poor during difficult times (Baker, 2008).

Food prices have increased sharply in recent years: this has raised serious concerns about food and nutrition, especially with regard to the poor (IFPRI, 2008). Global food prices increased over 80 per cent in the period 2006-2008. Net food-importing countries – such as most countries in Africa – have been hit hardest by these rising prices. Although the prices of main commodities have come down in 2009, the



Urban agriculture fits in the urban social ecological system
 Photo: Mario Gonzalez Novo

prices of most food items are still at least double what they were before this increase, and are anticipated to remain high over the medium term.

High food costs directly hit the household consumption budgets of the poor as they are almost all net consumers. This situation is aggravated by the direct effects of worsening economies and job losses in cities, as well as the indirect effects of reduced remittances and the potential for reduced donor aid. It is estimated that high food and fuel prices alone have increased the number of extremely poor in the world by at least 100 million (World Bank, 2008). Children, women and elderly are among the most vulnerable groups affected. High food and fuel prices resulted in widespread urban social unrest last year in countries as diverse as Haiti, Mexico, Egypt, Morocco, Burkina Faso, Cameroon and Indonesia.

Tackling the complex causes of the food and agriculture crisis requires a comprehensive approach (IFPRI, 2008), at international, national and local levels. Citizens in various countries are voicing concern about their access to food and the vulnerability and sustainability of their agri-food systems (Pollan, 2006). They are increasingly calling for the creation of a regional urban-focused food system (see the articles on pages 34, 41 and 43) and for support to small farmers in rural and urban areas, in order to increase availability and access of food. Among the many examples of programmes focused on the basic food needs of the most vulnerable population is the Garden for Life programme in Nakuru, Kenya, which encourages schools to produce their own food for their school feeding programmes (see page 30).

Climate change, whether experienced in longer-term shifts or in the form of sudden droughts or hurricanes, adds to the challenges faced by cities. It is now recognised as one of the most serious environmental, societal and economic challenges facing the world (IPCC, 2007). Many cities risk becoming “disaster traps” that are vulnerable to, among other problems, severe food supply shortages caused by floods, droughts or frost that reduce agricultural production. The increase of the world’s average temperature will lead to drastic changes in rainfall patterns, with significant increases and more frequent flooding in some areas, and significant decreases and more frequent droughts in others (see the articles on Australia on page 22 and Ecuador on page 25).

Changing rainfall patterns will particularly affect African countries. If farmers continue standard farming practices, productivity could decline between 10 and 25 per cent by 2020 (Herren of the Millennium Institute, at an IFAD meeting in February 2009). Use of different crop varieties, improved production and water management are therefore advised. In UA-Magazine no. 20 we discussed the issue of **growing water** scarcity and innovative solutions to this problem, such as more efficient water use and decentralised reuse of wastewater. The current issue updates research on Hyderabad, while articles on Australia (page 22) and Tunis (page 48) discuss water in the context of climate change. Irrigated agriculture is the main water user in many coun-

Urban agriculture can support human and social resilience

Photo: Urban Harvest



Cities and climate change: responding to the urgent agenda

The 5th Urban Research Symposium to be held in Marseille in June 2009 aims at pushing forward the research agenda on climate change from a city’s perspective. The symposium is structured around five broad research clusters that represent the most relevant issues related to climate change faced by cities and periurban areas.

- *Science and Indicators of Climate Change and Related Impacts.*
- *Infrastructure, Built Environment, and Energy Efficiency.*
- *Role of Institutions, Governance, and Urban Planning.*
- *Incentive policies, Economics and Finance.*
- *Social Aspects of Climate Change.*

Increasingly, cities are recognised as major players in striving for “carbon-free economic growth”, while they are at the same time helping their populations deal with climate uncertainty and natural disasters. By paying greater attention to building codes, urban transportation, and urban form, cities are expected to contribute increasingly to climate change mitigation, especially in developed countries where cities are the main source of greenhouse gas emissions. In developing countries, the challenge is expected to be mainly on the adaptation front. One of the main entry points for engaging cities on climate change is through disaster risk management, specifically through policies and incentives that are in the pecuniary interest of cities.

The poorest sections of society are most vulnerable to climate change impacts and extreme events because they lack adaptive capacity and resilience. These groups bear the greatest risk while having contributed the least to the problem. This raises difficult questions regarding equity and financing for adaptation, such as how cities in low-income countries with already limited resources can protect their most vulnerable populations and obtain financial resources to invest in adaptation measures. There is increasing urgency to get cities involved, not only in a political context but also in contributing to cutting-edge research at the city scale, defining practical solutions for urban and periurban areas, and working with decision makers to ensure that this research is translated into local policy options.

The symposium is unique because it looks at cities and periurban areas as complex interlinked systems. Households and firms interact and benefit from the close proximity, exchange of ideas, and agglomeration economies typical of urban settings. Economic development occurs most prominently in cities, which provide local interaction, supplier support and critical mass. Cities are interconnected systems and sectors in which policies in one sector impact and interact with other sectors.

Urban agriculture can play a critical role in helping the world’s urban poor by providing a practical solution to the food crisis in the shorter term, and by providing a climate change adaptation mechanism in the longer term. This issue of the UA-Magazine includes selected contributions to the symposium that deal with urban agriculture. At the symposium, a session on “*Managing the Urban Space: Urban Agriculture*” will cover research in several cities on how urban agriculture can enhance adaptation, contribute to food security in a changing climate, and be a factor in climate-optimised urban development. *For more information about the symposium see www.urs2009.net/index.html (also on page 54).*

tries, especially in arid and semi-arid zones like Tunisia. Along with more efficient agricultural water use, the productive use of recycled urban wastewater and the use of rainwater have been identified as sustainable ways to produce food for Tunisia's growing cities.

Smallholders and subsistence farmers will also be severely affected because they have less **capacity to adapt**, which will increase the risk of famine. Climate change is expected to put 49 million additional people at risk of hunger by 2020, and 132 million by 2050 (www.ifad.org). In sub-Saharan Africa, an additional 17 to 50 million people could be undernourished in the second half of the century because of climate change. A May 2009 Global Humanitarian Forum warned that climate change is already "seriously affecting" 325 million people. Almost two-thirds of the world's population is classed as "vulnerable" to climate change, while 500 million are at "extreme risk." An OXFAM report warns that this could overwhelm the world's current humanitarian aid capacity and calls for increased investment to reduce risk.

A two-pronged approach of mitigation and adaptation is being called for. **Mitigation** refers to limiting the effects of climate change through measures to significantly reduce greenhouse gas emissions. Mitigation is particularly important in the cities of developed countries where high levels of income are unfortunately associated with high levels of greenhouse gas emissions (see also the article on page 22). Cities are the magnets of consumption and their "food-print" accounts for the bulk of greenhouse gas emissions. The current food system in many industrialised countries uses over four times more energy in the process of getting food from the farm to the plate than is used in the farming practice itself (Heinberg and Bomford, 2009). Many cities in Europe and North America have initiated activities to enhance the sustainability of their food systems, including the development of urban agriculture (Toronto, Vancouver, Chicago and London are good examples).

Adaptation involves taking steps to minimise the predicted impacts of climate change. Highly localised adaptation is particularly relevant for low-income countries exposed to the consequences of rising sea levels (i.e., coastal cities), flooding or droughts. Adaptation also means ensuring that actions to reduce climate change risks are integrated into the everyday practices of urban planning, land use regulation, water management and infrastructure investment.

It is especially the rural poor who face high risks from climate change, but the increasing concentration of the poor in cities has resulted in a similarly high level of vulnerability.

World Urban Forum

The RUAF Foundation, together with the Food and Agriculture Organization of the United Nations, the International Development Research Centre, Urban Harvest, the Chinese Urban Agriculture Association and the Nanjing Agriculture and Forestry Bureau, organised a session called "**Urban and Periurban Agriculture for Resilient Cities (Green, Productive and Socially Inclusive)**" during the World Urban Forum of UN Habitat from 3 to 7 November 2008 in Nanjing, China. Proceedings have been finalised and are available at the RUAF website. Lessons learned were summarised as:

- The need for a regulatory framework on urban agriculture that facilitates the development of safe and healthy urban agriculture.
- The importance of integrating urban agriculture into the planning of the city of tomorrow.
- The importance of action-based and action-oriented policies, and (thus) of a participatory, multi-stakeholder approach to policy making.
- The importance of linking municipal policies to central government policies.
- The need to build capacity on urban agriculture and related issues, by integrating it into the curricula of schools, technical colleges, and universities.

Managing the urban space
Photo: Mario González Novo



For instance, over 50 per cent of Mumbai's inhabitants live in slums, many of which are located on reclaimed swamplands prone to weather shocks. In 2005, widespread flooding in the city caused the deaths of around 900 people, most of whom were killed by landslides and building collapses. In the USA, climate-related challenges are disproportionately borne by low-income people of colour, creating an environmental justice problem of unprecedented scope (Hoerner et al., 2008). The international aid community underlines the need to integrate disaster risk mitigation and reduction, and climate change adaptation within food aid and emergency responses. The rehabilitation of food systems must address the vulnerability of people and cities to food insecurity.

Resilient cities

As illustrated above, there is a growing awareness that the combined effects of climate change, peak oil, the recent food crisis, rapid urbanisation and continued population growth have the potential to undermine the resilience of our cities and ultimately render the current food system unsustainable. Increasingly the importance of resilience and the strong connection between resilience and the sustainability of socio-ecological systems is recognised. Resilience is a measure of a household, city or nation's ability to absorb shocks and stresses. One could say that resilience is the opposite of vulnerability.

As socio-ecological systems, resilient cities are characterised by increased self-reliance and their capacity to manage or bounce back from stress or disastrous events. A resilient city can be imagined to have intensively developed transit centres and corridors that provide multiple transportation modes, enabling all city dwellers to walk, bicycle, take buses or use rail or electric cars to travel to work, shopping and leisure activities. All development incorporates renewable energy sources (solar, wind, biofuels) to the greatest extent



Farming on open spaces in Accra though is mainly commercial.
Photo: René van Veenhuizen

Urban farming and household food security

A recent IWMI survey of 120 households engaged in backyard gardening in Kumasi and Accra showed that 3-10 per cent gain some temporary commercial advantage from this practice while 90-97 per cent use the gardens only for subsistence farming. The contribution of backyards to household food security has been estimated in terms of the saved cost on food expenditures and direct income from sales. Due to the subsistence character of the gardens, the cash income was not noteworthy, while the annually saved cost varied in general between 1 and 5 per cent of the overall food expenditures, with the higher values (up to 10 per cent) being found among the lower wealth classes.

This confirms the result reported ten years ago by Maxwell et al. (2000) in their Accra study that even households largely dependent on agriculture for their livelihood got only about 7-8 per cent of their total food from their own production. However, although the numbers appear low, all households valued the contribution highly. They considered the supplementary food supply and corresponding reduction in household expenditures to be significant. One reason for the discrepancy between the quantitative survey and household perception is that every saving counts, even if it is small. Another reason is that the majority of produced crops are heavy food items (plantain and tubers), which constitute the main part of the local diet. The survey showed that typical backyards in Accra produced between 44-146 kg of cassava and 26-104 kg of plantain per year. Although these crops represent only a small part of the overall annual food expenditures, they constitute a significant weight share (20-50 per cent) of the annual household consumption of these two commodities; and this is a significant benefit in terms of avoided head load, at least for women.

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Note: *All data refer to "households with backyards" as we tried to study the contribution of the gardens at household level. As not all households have backyards, the data cannot be generalised for every household.*

possible. Suburbs are regenerated and greened through participatory community design (see for instance the articles on pages 37 and 43). Urban agriculture is promoted as a more permanent feature in sustainable city planning. Greater amounts of carbon are sequestered in green growing spaces, while urban forest and green roofs help reduce urban temperatures (Newman et al., 2008).

Most academic research in this area focuses on (1) environ-



Food production at Roman Ridge, Accra

Photo: René van Veenhuizen

mental resilience, (2) economic resilience, and (3) social resilience, in that order, with social resilience receiving scant attention. Tidball and Krasny (2006) contend that approaches that integrate natural, human, social, financial and physical capital in cities, and that encompass diversity, self-organisation, and adaptive learning and management, play a key role in developing urban (community) resilience. They call for policy makers and researchers to actively involve community members in integrating urban agriculture, greening, local biodiversity monitoring and other similar activities that build urban resilience.

The role of urban agriculture

If fundamental climate change mitigation and adaptation goals are to be met, agriculture needs to be included in the strategies to be developed (IFPRI, 2009). Innovations in urban agriculture can play an important role in mitigating the impacts of climate change, and are also an effective tool for adaptation. Urban agriculture itself is characterised by innovation and adaptation to specific urban needs. These innovations include micro-gardens, which can provide an emergency food source in the context of disaster risk management; green rooftops, which represent a built environment adaptation to climate change impacts; planting of trees, which serve as green “lungs” contributing to improved air quality; and rainwater harvesting systems, which can help lessen the effects of flooding.

Urban agriculture can keep environmentally sensitive and dangerous urban lands from being used for illegal residential development (see the article on page 49). It mitigates the adverse effects on the urban poor of financial and food crises through job creation; offers opportunities for small-scale income generation; increases food security and enables self-sufficiency; and improves nutrition and health. The World Meteorological Organization has suggested that more urban farming should take place as a response to the ongoing climate change and as a way to build more resilient cities (WMO press release December 7, 2007).

Increasing food security

By growing food and raising livestock, the urban poor can improve their access to nutritious food and enhance the

Does urban agriculture enhance dietary diversity?

Recent work by FAO analysed the importance of urban agriculture for the urban poor and food insecure from a comparative international perspective. The analysis used the Rural Income-generating Activities (RIGA) database, which brings together comparable, nationally representative household survey data for 15 developing or transition countries (http://www.fao.org/es/ESA/riga/english/index_en.htm for details).

The results show that concerning the shares of income from agricultural activities there is a stark contrast between the African countries and other regions. Nigeria stands out with over 50 per cent of the income of the urban poorest quintile originating in agriculture, while this rate was in the order of 20 per cent or somewhat higher in the other three African countries in the sample. Outside Africa the numbers are much lower.

Concerning dietary diversity, which was measured based on 13 food groups, and builds on the conceptual links between household food security and participation in urban agriculture, it was found that – after controlling for other factors – engagement in farming in urban areas corresponds with greater dietary diversity (in 10 out of 15 countries).

The results provide a fairly robust confirmation of earlier suggestions of city case studies, nutritional surveys, and qualitative and anecdotal observations, that engagement in farming by urban households can allow them to consume better, more nutritious diets.

Text based on: Zezza, Alberto and Luca Tasciotti. 2008. *Does Urban Agriculture Enhance Dietary Diversity? Empirical Evidence from a Sample of Developing Countries*. Food and Agriculture Organization (FAO). Draft (available at <ftp://ftp.fao.org/docrep/fao/011/aj304e/aj304e.pdf>)
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Combining food, education and leisure, Grant Park in Chicago
Photo: Bert Lof

nutritional quality of their diets. For many cities, urban agriculture provides a major share of perishable products like leafy vegetables, poultry and dairy products (van Veenhuizen, 2007). Moreover, household food expenses are reduced, since poor urban households spend 60-80 per cent of their household budgets on food, while additional income is generated through the sale of products. In Zimbabwe, national food insecurity increased from 24 per cent in November 2006 to 33 per cent in January 2009. Urban agriculture provided food for the most vulnerable populations in and around cities like Harare and Bulawayo (see UA-Magazine no. 21).

Food production can be promoted in and around homes, by applying “low-space, no-space” technologies in front- and backyards or on rooftops, on windows sills, fences, etc. Urban agriculture can also support the sustainable management of green open spaces, water bodies and risk-prone land and other land not suitable for construction, e.g., flood zones, earthquake-prone zones, buffer zones (see page 20), steep slopes (page 25), roadsides, river banks and water harvesting areas (while at the same time impeding flooding and erosion) by applying well-adapted production techniques and optimising productive and multi-functional land use (e.g., “productive parks”). For example, a growing number of

Casablanca’s citizens combine buying fresh vegetables from small farmers with picnicking in a field (see article on page 27).

Emergency food supply

Urban agriculture can also ensure food availability during times of natural disasters, when transportation and communication links may be disrupted, or in the event that supplies are cut off due to armed conflicts or high fuel prices. This may be of increased importance as cities, and their poorer residents in particular, are affected by various climate change impacts. In Sierra Leone, the residents of Freetown are still well aware of the importance of local farming (see UA-Magazine no. 21), as many of them would have starved during the decade-long civil war if the city had not become a breadbasket for itself. Recent research (Forkuor and Cofie, forthcoming) confirms that agricultural lands increased during the war.

Employment and income generation

Employment and income-generating activities related to urban agriculture can include commercial food and ornamental plant production, development of small agro-food industries, marketing of agricultural products, input supply, and waste recycling enterprises. Such micro-enterprises may be initiated by the producers themselves or by other non-farming families and groups, especially by young unemployed persons in the same area. For example, in Vancouver, the Richmond Farm School will soon be preparing a new generation of urban farmers to engage in and lead urban agriculture enterprises, including production, processing, adding value, distribution, marketing and sales (see page 41). And in Charlottesville (see page 39), institutions are looking for opportunities to source a higher proportion of their food needs locally, which enables the creation of micro-enterprises to meet this demand.

Maintaining green areas and buffer zones

Urban agriculture can also help to improve the environment and increase green buffers. Green spaces contribute to economic and energy savings, by improving the microclimate in a city (urban vegetation can have a significant cooling effect due to direct shading and increases in evapo-transpiration, and can reduce the energy consumption of buildings). Green spaces also help control storm water flows (by increasing infiltration).

To create and maintain riparian buffers, especially given possible changes in river water tables, several cities have decided to protect the flood zone from urbanisation and maintain it as an attractive multifunctional area for (peri) urban agriculture, nature and recreation. Examples include Rosario, Argentina, Zwolle (in the Netherlands), and Shanghai, China (page 20). Cities whose flood zones cannot be sufficiently protected from legal or illegal housing development often suffer the consequences through flooding – as is the case in Pikine-Dakar, which failed to protect the Niayes Valley for agricultural production.



Changing climate increases the risk of flooding

Photo: Marielle Dubbeling

Preserving biodiversity

Without proper legislation or zoning, construction will rapidly take over urban farmland, green spaces, forest areas and water bodies. The loss of green space threatens ecological biodiversity (see the articles on Beijing and Hyderabad on pages 20 and 45). For example, in Beijing fewer than 10 types of natural plants were found in densely built areas, and fewer than 50 types of plants in urban parks, while in periurban parks, 287 types of plants were counted (see page 19). Maintaining (urban) agricultural biodiversity and thus protecting a wider base of plant and animal genetic diversity are important strategies for both rural and urban farmers to adapt to changes in climate.

Reducing the ecological footprint

Cities are including urban agriculture in their mitigation strategies, reducing their ecological foot- (and food-) prints and CO₂ emissions, since urban agriculture uses less energy than conventional production (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 production of animal feed, use of excess heat of industry in greenhouses). Locally grown and prepared food can reduce fuel use ("food miles") and make it easier to identify and support environmentally benign food production methods (see articles in this issue on pages 22, 34, 39 and 41). Locally grown produce is also less likely to be associated with the greenhouse gas caused by recent land conversion. Seasonal food need not be imported, does not require energy-intensive conditions such as heated greenhouses, and reduces the likelihood of energy-intensive methods of storage and transport such as refrigeration and air-freighting. Urban producers are thus in a unique position to provide consumers fresh foods with low carbon footprints. Verifiable systems to sequester carbon and receive carbon credits for farmers are essential. Forms of labelling may eventually also be developed.

Community building and adaptive learning

In addition to its contributions to environmental and economic resilience, urban agriculture also strongly supports social (human) resilience. Community gardens and urban

farms can become places of adaptive learning and civic engagement, as people of different ages, ethnicities, races and income levels come together to grow food, learn new gardening skills, encounter new foods or engage in problem-solving and collective action for the benefit of the garden and the gardeners.

Development should increase people's learning capacities and ability to influence local government action and reduce their vulnerability. In Argentina (see page 12) during the crisis period, innovative forms of social participation and organisation emerged that went beyond the networking of farmers. This helped to raise the self-esteem and participation of the urban farmers, who are now considered to be (new) urban stakeholders, capable of influencing local public policies. Also the *PlantAção* project in Brazil (see page 32) shows how urban agriculture can be an important means in reducing social vulnerability. The benefits go beyond simply providing food. Urban agriculture also provides occupation, work, income, increased self-esteem, and may contribute to improved governance.

What needs to be done

Our understanding of the nature and extent of urban agriculture's role is still plagued by a *lack of good-quality*, reliable data. While studies based on survey data do exist for several major cities, much of the evidence is still qualitative, if not anecdotal. To build a persuasive case for urban agriculture at the local government level, we need to *quantify* the benefits: its outputs, its economic yields, its contributions to local economic development (e.g., job creation), its environmental benefits (e.g., carbon sequestration), and so on. Analysis of existing data should look at the socio-economic characteristics of households, and gender and age-disaggregated data should be taken into account. Data should also be collected on the coping mechanisms of the urban poor with respect to climate change impacts. It should be focussed at a micro level and on adaptive responses to climate change by households involved in urban agriculture. Finally, the collected

Photo: RUAF Ibadan





Producing different types of lettuce for the market in Chicago

Photo: René van Veenhuizen

data should capture the citywide environmental adaptations that mitigate heat-island effects, reduce the effects of flooding, etc.

Research and capacity building activities are also needed to help urban producers understand and adapt to food security and food safety vulnerabilities arising from climate change and climate variability. Farmers are already adapting to climate change by using different crop varieties, rotating crops, reviewing irrigation techniques, using water more efficiently, reducing water loss, and making changes in the calendar of farm operations (sowing, harvesting, etc). Farmers also need better information on climate risks and workable adaptive solutions. Farmers' local innovation capacity should be stimulated and location-specific adaptation practices and technologies identified and promoted, so that responses to future stresses can be faster, more efficient and more effective. In Quito, for example, families have started to grow more drought-resistant crops that have greater nutritional value, higher soil protection potential and lower water needs, such as quinoa, oca, apio or chago (see article on page 25).

Regardless of their size, location, or relative economic health, cities should have resilience as a primary concern and **preserve agricultural and vacant land**. Around many cities, periurban agriculture is threatened by sprawl, yet this land may be most needed for regional food production along with more intra-urban agricultural production (Newman *et al.*, 2008). Land-use planning that avoids using high-risk areas for housing, while protecting the areas for green and agricultural functions is important (Satterthwaite, 2008). Identification, definition and activation of green fields, vacant lots and spaces for urban agriculture purposes should

be a coherent spatial device to spur participation in managing environmentally and socially more sustainable urban growth (see the article on London on page 37). These productive and green spaces could be the structuring element around which the city and neighbourhood develops. In Lisbon (see page 49), the *Green Plan* defines a citywide strategy for interweaving green spaces with the built environment, including the consolidation of areas already occupied by urban agriculture as well as its expansion to other suitable lands. In Massachusetts (USA), innovative arrangements of land using community land trusts have been agreed with farmers and residents (Harper, 2009).

Participatory planning, design and management of open spaces that integrate local food production should involve architects, landscape architects, urban planners, urban inhabitants and urban agriculture practitioners. The Carrot City exhibit in Toronto, discussed on page 43, shows how increasing interest in growing food within the city is changing urban design and built form.

Urban agriculture is often overlooked, underestimated, (because) under-reported. The gap between anecdotal evidence and effective implementation constrains the positive impacts that urban agriculture can have on urban livelihoods, resource use and the environment. The World Bank, in collaboration with RUAF, IDRC, FAO and other partners, will be launching new efforts, including compiling and analysing data, to demonstrate and enhance urban agriculture's contribution to increasing cities' resilience to the impacts of climate change.

Integrating urban agriculture in slum upgrading or in the design and development of new neighbourhoods will support the development of more food secure and inclusive human settlements. Even in a slum or densely built settlement there is space for and presence of food growing. Urban agriculture can be integrated in lane upgrading by leaving small stretches of soil for growing on either side of the road or by applying vertical growing and container gardening along lanes. Urban agriculture can also be integrated in housing improvements and design. For instance, housing should cover no more than 50 per cent of lot area to provide adequate space for agriculture. Exterior house walls can be used for agriculture and all windows could have a shelf or window box to accommodate container gardens. Fencing could support growing and rooftops can be designed for water harvesting. Furthermore the productive use of public areas (multifunctional parks, roadsides, flood zones, waterfront / canal areas) within slums can also be utilised. Urban agriculture can also be integrated in the sanitation systems of a settlement through wastewater recycling for gardening or organic solid waste recycling for growing vegetables.

More investment in urban agriculture and urban areas is needed. This will require concerted effort and good collaboration between local and national governments and international donor agencies. Initiatives are underway to integrate urban agriculture in national food policies in countries such as Sri Lanka, Brazil (see page 14), Sierra Leone and China.

All cities should have resilience as a primary concern

Urban policy makers can substantially contribute to the development of safe and sustainable urban agriculture by creating a conducive policy environment and formally accepting urban agriculture as a permanent land use rather than a temporary one. They should enhance access to vacant open urban spaces and guarantee secure land tenure for urban agriculture uses. Investment is needed to enhance the productivity and economic viability of urban agriculture by developing more appropriate farming techniques, providing training and technical assistance, and ensuring safe production to mitigate health and sanitation problems potentially caused by wastewater or the use of chemical fertilisers and waste from animals. Support is also needed to strengthen producer organisations and create new funding opportunities for beginning as well as more experienced urban farmers.

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References

Baker, J.L., 2008, Impacts of financial, food and fuel crisis on the urban poor, Directions in urban development, World Bank

Global Humanitarian Forum, 2009, Human Impact Report. Climate Change: The anatomy of a silent crisis

Heinberg, R. and Bomford, M., 2009, The food & farming transition. Toward a post carbon food system. Post Carbon Institute, USA

Hoerner, J. A., and N. Robinson, 2008, A Climate of Change: African Americans, Global Warming, and a Just Climate Policy for the U.S., Environmental Justice and Climate Change Initiative, July, <http://www.ejcc.org/climateofchange.pdf>.

Intergovernmental Panel on Climate Change, 2007, Climate Change 2007: Synthesis Report – Summary for Policymakers, http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

Maxwell, D., C. Levin., M. Armar-Klemesu, M. Ruel, S. Morris, and C. Ahiadeke. Urban Livelihoods, Food and Nutrition Security in Greater Accra. IFPRI Research Report #112. 2000.

Nelson, G.C., 2009, Agriculture and Climate Change: an agenda for negotiation in Copenhagen. IFPRI. Brief 6.

Newman, P., T. Beatley, and H. Boyer, 2008, Resilient Cities: Responding to Peak Oil and Climate Change (Island Press); .

Pollan. M. 2006, The Omnivore's Dilemma: A Natural History of Four Meals, Penguin

Ravallion, M., 2007, How relevant is targeting to the success of an antipoverty program? Policy Research Working Paper Series 4385, The World Bank.

Satterthwaite, D., 2008, Insights Cities and Climate Change. ID 21 Insight No 71, IDS.

Schuemer-Cross, T. and B. Heaven Taylor, 2009, The Right to Survive: The humanitarian challenge in the twenty-first century, Oxfam International

Tidball, K.G. and M. Krasny, 2006, From Risk to Resilience: What Role for Community Greening and Civic Ecology in Cities? In: Environment and Urbanization, September .

World Bank. 2008. Global financial crisis and implications for developing countries, G-20 Finance Ministers Meeting

Websites:

Food Climate Research Network at the Center for Environmental Strategy in the UK: www.fcrcn.org.uk.

SUSTAIN. London, UK web link on Food and Climate Change: <http://www.sustainweb.org/page.php?id=545>.

United Nations Framework Convention on Climate Change <http://www.unfccc.int/documentation/items/2643.php>