

# URBAN AGRICULTURE MAGAZINE

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## Cover

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 contributions to the 5<sup>th</sup> Urban Research Symposium on Cities and Climate Change held in Marseille in June 2009.

*Photo Quito by: Isabelle Anguelovski*

# 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](http://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](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>) Corresponding author Alberto.Zezza@fao.org





*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 CO<sub>2</sub> 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, water-front / 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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# Urban Agriculture in Montevideo and Rosario: A response to crisis or a stable component of the urban landscape?

Alain Santandreu  
Alberto Gómez Perazzoli  
Raúl Terrile  
Mariana Ponce

**Urban agriculture has developed into a permanent activity in Rosario, Argentina, and Montevideo, Uruguay (as demonstrated in earlier articles in the UA-Magazine). Urban agriculture is important in feeding cities in times of crisis, but it is currently being promoted by civil society and local government as a way to enhance social inclusion and employment of (especially poor) urban farmers, and thus to transform a challenging situation into new opportunities.**

According to local records, food production has taken place in intra and periurban areas of Montevideo since its founding in 1724. In the 1950s, state programmes were developed to promote intensive vegetable gardening (Blixen, Colnago and Gonzalez, 2006), and since the 1990s, local government has encouraged the production of vegetables, fruits and animals in and around the city. Recent studies have identified a great diversity of production systems, with the yield intended for household consumption as well as for sale (Santandreu *et al.*, 2000; Castro *et al.*, 2006). A similar situation can be seen in Rosario, where urban agriculture activities have been promoted by NGOs since the mid-1980s and by the municipal government since the 1990s. Between 1990 and 1997, at least 2,859 registered family, community and school gardens were producing approximately 1,400 tons of food per year (Lattuada and Lattuca, 1998).

## Times of crisis

During the economic crisis around the turn of the millennium, the role of urban agriculture changed. Thousands of people lost their jobs, and therefore, found themselves without any way to sustain their families. While the impact reached all social strata in both countries, it was strongest among the lower/working and middle classes. For example, in 2001, 61 per cent of the population of Rosario lived in poverty, and over 30 per cent in extreme poverty.



*Huerta en barrio popular*  
Photo: Raul Terrile

Governments and civil society developed a number of responses to this crisis. The national government of Argentina put in place measures like temporary assistance, employment programmes and distribution of food bags or boxes to those groups most hard hit by the crisis. Civil society introduced strategies of self-employment and created solidarity networks based on bartering. In this context, urban agriculture was seen as a productive alternative, and was thus promoted by civil society and backed and supported by local governments. Other stakeholders like NGOs, cooperation agencies and universities also actively participated. In Rosario, the municipal government re-launched its Urban Agriculture Programme, and hundreds of family and community gardens were created in the city.

In both cities, the social movement around urban agriculture was strengthened, since many who took up the activity already had experience in political organisation, social networks, etc. These new urban farmers' networks facilitated innovative strategies for organisation and social participation.

## After the crisis

As the crisis passed the role of urban agriculture changed again. In both cities, poverty and unemployment declined, social policies were strengthened and new strategies of assistance for the least-favoured sectors were developed. For example, in Uruguay, the creation of the Ministry of Social



Development (MIDES) and the implementation of an effective plan allowed for the inclusion of thousands of people in a governmental support programme. Many people who had become full-time urban farmers during the crisis returned to their formal and informal jobs. But those farmers who continued with their urban gardens developed new capacities (efficient production and management, planning, and commercialisation) and their own identity as farmers. While urban agriculture lost its mass-movement quality, it became established as a permanent activity in the two cities. During the crisis, urban agriculture played an important role, contributing to food security, strengthening the social networks of low-income sectors and encouraging the social participation of thousands of people. After the crisis, urban agriculture became a less widespread activity but one with a better capacity to incorporate new issues of interest, new players and new strategies of political and social participation.

### New issues

The thousands of people who developed urban gardens during the crisis years were mainly motivated by the desire to gain access to food and savings. More recently, urban farmers identified new reasons to continue, like consistent access to fresh and high-quality food (free from agro-toxins), income generation, community solidarity and building skills and self-esteem, but also the opportunity to influence public policy. In Montevideo the local government is promoting agriculture through the primary schools, in order to build local capacities and incorporate urban agriculture in education. In Rosario, the members of the Network of Urban Gardeners (*Huerteros*) were supported by the Municipal Urban Agriculture Programme in their development of two collective agribusinesses. They now sell their products at weekly farmers' markets and deliver bags of produce to homes and to supermarkets.

### New stakeholders

During the crisis, new players became interested in urban agriculture. Local governments developed or strengthened the municipal urban agriculture programmes and the universities and NGOs provided technical assistance to urban farmers. In Montevideo, the University of the Republic created its Food Production and Community Organization Programme (PPAOC), while local government and various NGOs intensified their support of community and school gardens. Private companies also began to mobilise resources for urban agriculture, often through foundations engaged in Corporate Social Responsibility. In Rosario, the Rosario Foundation, which is sponsored by a group of local private enterprises, finances the implementation of multi-functional productive spaces, like garden parks which are linked to the municipal Urban Agriculture Programme and the Network of *Huerteros*. In this way, urban producers have established their identity and legitimised their social and political space in sustainable urban development.

### New strategies

In the crisis period, innovative forms of social participation and organisation emerged that went beyond the networking of farmers. In Rosario, the urban farmers, consumers and the



*Bandejas de la agroindustria social Rosario*

Photo: Raul Terrile

local government organised a common forum: Sustainable Urban Agriculture for the Community Network.

It would seem that urban agriculture has become a permanent activity – although perhaps less widespread – now that the deepest moments of crisis have passed. Its role is now more to promote local development and the economic and social inclusion of those who practice it. The multiple benefits of urban agriculture have spread to a wide spectrum of the population, and it has helped to transform abandoned lots and spaces into productive gardens and renewed neighbourhoods. More importantly, it has helped 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, and thus increasing resilience of these the cities and their inhabitants.

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# Interview with Crispim Moreira

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*The Brazilian Ministry of "Social Development and the Combat against Hunger" (MDS) has been implementing national urban and periurban agriculture activities, as part of the national Zero Hunger Campaign. Dr. Crispim Moreira, the National Secretary of Food Security and Nutrition, tells us about the origin of this effort and the progress being made.*

## How did combating hunger become a national policy priority?

Food insecurity has long been a political issue. It was first put on the political agenda by Josue de Castro with his book "The Geography of Hunger", published in the late 1950s. Betinho de Souza later published the "Hunger Map", which showed that in the early 1990s more than 42 million people in Brazil were food insecure. In January 2003, in the first year of his administration, President Lula declared that fighting hunger would be a priority of his government, and he created the "Special Ministry of Food Security and the Combat against Hunger" (MESA), which later became the "Ministry of Social Development and the Combat against Hunger" (MDS), whose main aim is to implement programmes to guarantee the human right of access to healthy food and food sovereignty for the entire population.

The main government programme is called "Zero Hunger" (Fome Zero), which links the different policies and programmes of 17 ministries to promote access to food, agricultural production for household consumption, job creation and public participation. Some important components of the programme are the Bolsa Família (for those with a monthly income less than R\$100), the Programme de Aquisição de Alimentos da Agricultura Familiar (under which a guaranteed amount of produce is bought from producers), Programa Nacional de Alimentação Escolar (school feeding), Programa de Cisternas (rainwater harvesting); food banks and the Urban Agriculture Programme (for more details, see [www.mds.gov.br](http://www.mds.gov.br)).

## Why promote urban agriculture?

The Brazilian government developed the National Policy on Urban and Periurban Agriculture for two main reasons.

First, approximately 40 per cent of the Brazilian population (out of a total of 188,098,127 according to the 2006 census) lives in metropolitan areas, and many of these households are in a situation of food insecurity. A study conducted by the Brazilian government in 2006 with support from FAO, IPES and REDE found that in 11 metropolitan areas (located in all five Brazilian regions; North, Northeast, South, Southeast and Centre-West) more than 600 agricultural initiatives were being carried out both with and without the support of local, state and federal governments.

Second, due to the pressure of the above-mentioned political publications and other social movements, and the government's active participation in national conferences on food

security and nutrition held in the years 2004-2008, urban agriculture has been included as an important political strategy to combat hunger and promote food security.

At the Second National Food and Nutritional Security Conference held in Fortaleza in July 2007, urban agriculture was accepted as a strategic element of the national FNS policy prepared by the Federal Government and the National Council on Food and Nutritional Security (CONSEA). Methods of participatory strategic planning were applied to define the strategies and priorities of this national programme, which is being implemented in partnership with NGOs, local governments and state-owned enterprises.

## How is the programme implemented?

Since July 2004, the Federal Government, through the MDS, has developed the foundation of the national policy. The General Coordination Office for urban and periurban agriculture has been created, with an annual budget of about USD 6 million. In 2008 the organisations involved in the programme initiated an operational network of Urban and Periurban Agriculture Support Centres (CAAUP), which have now been set up in 14 metropolitan regions of the country. These centres provide free and high-quality public services to urban and periurban farmers, including training to managers and technical assistance and support for agro-ecological (micro-)enterprises. Many stakeholders, both from civil society and the public sector, are involved in the implementation of the programme, which in the period 2003-2008 directly assisted over 100,000 households with technical assistance, education and other resources.

The continuation of this public system is guaranteed by the linkage to the MDS and a budget allocated under the Budgeting Act. The government will continuously seek the input and active participation of the urban and periurban producers, their organisations and other stakeholders in the formulation and adaptation of food security policies, guidelines and priorities in Brazil.

*Crispim Moreira at the World Urban Forum in Nanjing, 2008*  
Photo: Hans Peter Reinders





# Promoting Access to Food in Contagem, Brazil

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José Antônio Ribeiro  
Marilda Quintino Magalhães

**The municipality of Contagem in the State of Minas Gerais, despite being known as an industrial centre, has an enormous potential to develop urban agriculture. The current administration recognises this, and supports the development of agriculture as an important strategy for consolidating its Municipal Food and Nutritional Security Policy.**

Since the 1950s Contagem has developed into one of the cities in Brazil with the largest number of industries. Several neighbourhoods grew in an unorganised way around these industries, due to the influx of migrants looking for jobs and better living conditions. Contagem is an amazing mosaic of landscapes, with densely occupied industrial areas, residential neighbourhoods, and “urban vacuums”: remnant areas and formerly rural lands which still contain pastures occupied by cattle, horses, goats and extensive marsh areas. To build a more sustainable city, it is important to recover and strengthen urban and family agriculture in the municipality.

Community gardens developed on public and private institutional areas allow people living in conditions of food insecurity to produce and access healthy food. Moreover, they contribute to building strong cities and to local development. One of the successful experiences in Contagem is the community garden of the Support Centre (*Horta Comuni-*

*tária da Casa de Apoio*). This community garden is part of the Urban and Family Agriculture Support Programme, run by the Coordination Office of Food and Nutritional Security and Supply (CSANA), which is part of the Municipal Secretariat of Social Development of the municipality of Contagem.

The Urban and Family Agriculture Support Programme was supported by RUAF through its Cities Farming for the Future Programme in 2007-2008. This project aimed at “improving the conditions of families living with food and nutritional insecurity and social risks, through the implementation of a collective space for the production of fruits, vegetables and inputs using agro-ecological methods, through participatory management and community organisation.

## Lessons learned

Approximately a year and a half after the start of the community garden project, the results are quite visible. Its success demonstrates that collaboration between public authorities and civil society organisations in promoting social inclusion is important in local development.

## Culture of participation

At the Support Centre a “garden group” has been set up, consisting of twelve organised families. The diverse group is made up of young and elderly people (mostly women), who are involved in social programmes. In regular meetings, planning, crop management and overall administration are discussed and a culture of participation is created that extends to other community, decision-making and training

*The Support Center has agro-ecological production areas as well as learning and training areas*

Photo: Alain Santandreu





*Horta Comunitária da Casa de Apoio – community garden part of the Urban and Family Agriculture Support Programme*  
Photo: Alain Santandreu

forums. In this way, the experience with agriculture encourages a change in the way that participants perceive the place they live in, both individually and collectively, and how they view possible changes.

The community garden at the Support Center has agro-ecological production areas, as well as a learning and training area. Participating farmers share the things that they learn with other families in the region. They have created a network through which they can exchange knowledge and experiences, but also roots, seeds and other resources. Already 30 other families have started their own little family gardens with the help of this network. Moreover, a large proportion of the residents of Nova Contagem came from the countryside with local agricultural knowledge that can be enhanced and shared through urban agriculture. This activity is thus an important strategy for integration and survival in the city, as well as for reducing social vulnerability.

#### *Partnerships*

The community garden collaborates with the Members of the *Pastoral da Criança*, a social action organisation of the National Conference of Bishops of Brazil, which is very active at the local level, act as facilitators and encourage the population to participate in activities that promote health and food security. Because they are trusted in the community, they have a positive influence on decision-making. The RUAF project was developed with the “Support Center for Children in Need of Contagem”, a civil society organisation which, among other activities, supports the Community Kitchen in Nova Contagem, one of the regions with the highest rates of poverty, social vulnerability and food insecurity within the municipality.

#### *Healthier diets and increased income*

Through weekly visits to the community garden, technical follow-up is carried out by the CSANA team with the support of EMATER<sup>1</sup>, which is part of the agreement with the municipality of Contagem. During these visits, the garden group meets, exchanges experiences, discusses and plans activities, and undertakes joint agricultural activities. Everything

produced by the garden is shared by the participants and the surplus is sold, which generates a small fund used for daily expenses.

Other garden groups in the city are also looking at this opportunity to generate direct revenues, which allows families to save on food purchases and consume healthier products. Farmers also frequently claim that participating in agricultural activities has a therapeutic effect, not only because of the contact with the land and the plants, but also because of collective practices.

#### *Optimising the use of local resources*

The urban gardens in Contagem are located on empty areas and lots that, if they were to remain vacant, would become disposal sites for waste and debris, and places where disease vectors, such as rats and insects, can freely reproduce. The Support Centre encourages community members to change their habits with respect to waste management, and, although still present to some extent in the gardens, there is much less waste than before.

Organic waste from the Community Kitchen in Nova Contagem, which serves around 300 people per day, is collected daily and transformed into a high-quality fertiliser through composting. In exchange, the group offers the kitchen a portion of the produce, creating a cycle that integrates the production of healthy food, waste reduction and resource optimisation.

Through the introduction of new species and varieties in the gardens, the former waste dumps are now showing increased biodiversity. One of the challenges of the gardens is the high cost of clean water. Therefore, rooftop rainwater collection facilities were installed, with a storage capacity of 20,000 litres. Although not enough for all the crops, the water is used in the gardens during the dry season. It also helps to reduce costs, as well as minimise the impact of floods during the rainy season.

## **Conclusion**

The Support Centre’s initiatives are part of the Municipal Food and Nutritional Security Policy of Contagem, and contribute, together with other initiatives in the city, to creating a sustainable and resistant city.

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#### **Notes**

- 1) Technical Assistance and Rural Extension Company of the State of Minas Gerais.

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# An Update from New Orleans

Martin Bailkey

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**Of all American cities, present-day New Orleans best exemplifies the concept of resilience in its ongoing struggle to recover its position as the urban centre of the central Gulf Coast region, and as a city of national significance in tourism, shipping and biomedicine. Two trips to the city in autumn 2008, more than three years after 80 per cent of the city was under water and the entire population had to flee for weeks or months, convinced the author (a New Orleans native) that much that was once considered “normal” has returned.**

Streets and expressways were clogged with traffic, popular restaurants had long been reopened, the major annual festivals had returned stronger than ever. And schools in the city of New Orleans itself, many reopened under the independent, charter school model (in which a new school is created and managed independently of a local school district, but under a state-granted charter), have shown marked improvements in student performance over schools run under the pre-storm (pre-Katrina) model. Although local politics again display the dysfunctional character that characterised the pre-K city, many residents are heartened by improvements in other aspects of urban life.

Resilience in New Orleans is commonly marked by comparisons of post-K counts of various social and economic indices with corresponding pre-K numbers. Few of these indices are at or above what they were before the storm in mid-2005. The city's food system, along with its medical infrastructure, has been especially slow to rebound. This is particularly true of the most evident representative of any US city's food system – full-service supermarkets. In spring 2008, 18 full-service markets (down from the pre-K number of 38) served an average of 18,000 residents per store; the national average in the US being 8,800.<sup>2</sup>

In this context, it would seem that urban agriculture advocates and practitioners would see a unique opportunity to establish urban farming as a critical part of a rebuilt food infrastructure. But urban agriculture has not necessarily been the sole focus of the activist organisations – working outside of government – that started envisioning a new food system for New Orleans in late 2005. An early leadership role was assumed by the New Orleans Food and Farm Network (NOFFN), a small non-profit organisation formed not long before Katrina. By early 2006, NOFFN had created the NOLA Food Map Project, an attempt to help the residents of particularly hard-hit neighbourhoods simply access food – whether from grocery stores, farmers' markets, reopened restaurants or emergency food providers. At this point, urban gardening



*Back yard Villere View*  
Photo: Brennan Dougherty

sites were inactive, either because gardeners had not returned to New Orleans or because of contaminated soils. Later, in spring 2007, a consortium of stakeholders began meeting to study food access issues in the city. No one in this group directly represented urban agriculture and community gardens, and the subsequent March 2008 report offered recommendations to city government related to food retailing, but not inner-city food production. This reflected a primary focus on food retailing as a mechanism to support both food security and commercial economic revitalisation in the most distressed neighbourhoods.

It did not take long, however, for a growing urban agricultural scene to become evident in neighbourhoods all across New Orleans. This occurred not through any focused government renewal policy, but through the energy of numerous individuals and grassroots organisations seizing on urban agriculture as a tool of empowerment and community self-determination – in a context of slower progress in areas involving governmental intervention; for example, the return of public services like libraries. Through the following examples, organisations are channelling community interest in urban farming into several new projects.

NOFFN, for example, now incorporates urban agriculture into its leadership role by building the production capacity of urban farmers and gardeners. It directs them to practical resources such as compost, conducts a series of well-attended public workshops on various urban farming topics, and has promoted the attendance of urban growers at community meetings where locals seek input into the city's post-K master plan. NOFFN staff member Pam Broom reports that NOFFN is further extending its reach by partnering with other organisations involved in the city's recovery, such as the Make It Right Foundation, founded by actor Brad Pitt to build sustainably designed homes in the Lower Ninth Ward. Now that houses are being completed and more are on the way, Foundation representatives are looking for other approaches to promote a sustainable recovery, and have identified urban



*Macon Fry pulls up a bunch of beautiful red radishes at Gathering Tree*  
Photo: Brennan Dougherty

gardens as an important dimension of a green, socially vital neighbourhood.

The focus of much of NOFFN's current efforts is the 0.5-hectare Hollygrove Growers Market and Farm, now well on its way to becoming an outlet for fresh food to the residents of this partially restored neighbourhood, as well as becoming a centre for urban agriculture education and practice. Amidst a collection of growing and composting spaces sits a new "Green Grocery," the headquarters of a 175-member neighbourhood buying club that will pool the resources of its members into a single market for food grown by small farmers in New Orleans and the rich farmlands outside of the city.

In New Orleans East, the MQVN (Mary Queen of Vietnam) Community Development Corporation is creating an ambitious farm and market project amidst New Orleans's active community of Vietnamese refugees. The Vietnamese were among the first to return to New Orleans post-K, quickly and independently re-establishing a self-sufficient system of urban agriculture based on growing traditional fruits and vegetables in residential yards and along protection levees. To encourage economic development around food production, the Viet Village Urban Farm is transforming 11 hectares of undeveloped land at the community's edge into small garden plots, commercial farming plots, a livestock farm, and structures to house weekly markets and special festivals for the region's Asian refugees.

The Viet Village site plan, jointly developed by the MQVN CDC, the Tulane University City Center outreach program (also a Hollygrove Farm partner) and the Louisiana State University Department of Landscape Architecture, contains a number of innovative practices, including bioswales to address the ongoing drainage issues across a site that was once wetland. According to Project Manager Peter Nguyen, once the neces-

sary permits are issued fundraising will begin with the intent of completing the farm and gardens by 2012, and the market structure a year or so later.

New Orleans is a city characterised by strong neighbourhood identity. Some neighbourhoods were devastated by the 2005 flooding. Others, such as those on high ground along the Mississippi River, were untouched by floodwaters. Thus, signs of resilience are not evenly spread across New Orleans. One can gauge overall resilience at a city-wide scale, but it is perhaps more accurate to assess the resiliency of New Orleans at the scale of individual neighbourhoods – the scale at which active, grassroots, non-governmental organisations are restoring homes and businesses. The new urban agriculture projects in Hollygrove and New Orleans East are part of this larger movement of neighbourhood self-determination.

Also evident within New Orleans neighbourhoods is the resumption of the more traditional role of community gardens in New Orleans. Parkway Partners, a local NGO and the city's long-time provider of community gardens, currently manages 29 garden sites across New Orleans. While this number is low compared to the number of such gardens in comparably sized US cities, Parkway Partners Executive Director Jean Fahr considers this a legitimate accomplishment in the city's overall renewal. She proudly notes that each garden has a waiting list, and is of "superior quality" – a testament to both the new value placed on gardening in post-K New Orleans, and to the fact that a number of gardeners are new, post-K New Orleanians with significant gardening experience.

Parkway Partners' Garden Coordinator, Macon Fry, himself a veteran local gardener, sees an abundance of new energy and ideas among the city's new urban farmers, but also wishes that his organisation had adequate resources to dedicate to this renewal. His concerns are echoed by others – with govern-



ment money earmarked for large-scale infrastructure and building projects, the high level of dedication to the incremental rebuilding of New Orleans on the part of individuals and small community organisations is not matched by the amount of available funding from private and philanthropic sources.

Along with community gardeners, the independent city farmer also has an important role to play in the return of urban agriculture to New Orleans neighbourhoods. In 2008, on a vacant 280 sq. metre corner lot in the city's Mid-City neighbourhood, NOFFN Program Director Marilyn Yank created, in her spare time, the Little Sparrow Farm. After determining that this corner lot which is located three blocks from her home and was formerly used primarily for drug dealing, was largely free of contaminants, Yank planted a variety of vegetables and edible ornamentals, bordered by a flowering fence. Pedestrians became interested and learned more about the garden from an explanatory sign Yank set up on the corner, and she began selling her vegetables to neighbours on Sunday mornings. The Ruby Slipper Café is conveniently located across the street, and it began purchasing whatever was appropriate to its menu.

When asked what motivated her to create Little Sparrow Farm, Yank quickly explains that she sees herself as part of "something bigger", an example for others to follow. And true to her hope, other entrepreneurs around town are creating a network of individual farms and gardens, accompanied by the slower development of an infrastructure centred on technical assistance, soil assessment and remediation, and wide availability of manufactured organic compost.

Perhaps the most interesting entrepreneurial example is the Lower Ninth Ward Urban Farming Coalition, which continues its efforts to act on the opportunity presented by the hundreds of vacant land parcels not likely to be developed in the foreseeable future. Neighbourhood landowners, many of them elderly, typically lack the resources to build on their properties and are unwilling to sell to speculators, but are open to leasing the sites to a community organisation at little or no cost. Recently, a 615 sq. metre site on North Villere Street, once the site of a "double shotgun" home characteristic of older New Orleans neighbourhoods, was acquired by the Urban Farming Coalition to establish the first in what Coalition member Brennan Dougherty envisions as a linked network of food production sites scattered among homes. The community-supported agriculture model, where stakeholders pay a farmer upfront for a season's worth of food, and which normally involves one or perhaps two farms, is being adapted by the Coalition to multiple Ninth Ward residential properties. A lease has just been established for a second site, and the Coalition has verbal agreements for eight others. Dougherty also hopes to join NOFFN in partnering with the Make It Right Foundation to create food-producing gardens across the Lower Ninth Ward.

Any city is a complicated web of interactive systems: ecology, economy, transport, education, public health, recreation, food, etc. Each of these was severely stressed in New Orleans

in 2005, and they have recovered at different rates over the past four years. This article has attempted to describe the role of urban agriculture in the rebuilding of the city's food system. Along with new or returning grocery stores, farmers' markets and the traditional vending of fruits, vegetables and seafood from small trucks parked on major avenues, the population is now also served by newly restored community gardens and urban farms and will soon, advocates hope, have access to an infrastructure of training, markets and composting sites. Certain local obstacles to urban agriculture practice – limited access to land, the need to raise needed funds to start and maintain projects, contaminated land, and limited availability of compost – are not endemic to New Orleans. But the opportunity exists for the city to become a national model for an increased role of urban agriculture alongside other distribution mechanisms for locally produced food. Urban farming

## “Urban farming is strengthening the New Orleans food system”

is strengthening the New Orleans food system and creating in the process a healthier, more sustainable community. But the future of New Orleans remains dependent on the reliability of the network of protection levees and barriers now being strengthened by the US Army Corps of Engineers, and the restoration of Louisiana's coastal wetlands. Urban agriculture is not a means of protecting New Orleans from further catastrophe. But it is part of a larger blueprint for rebuilding and renewal.

City government has been slow to create a supportive environment for urban farming, such as allowing farmers access to the city's land bank of properties. Not surprisingly, therefore, ever since rebuilding began in the autumn of 2005 urban agriculture practitioners and advocates have not waited for municipal actions to proceed. They understand that the availability of needed philanthropic grants dedicated to renewal will lessen as time goes on, and that even a small grant to start an urban farm can be leveraged into multiple community benefits. As long as some funds are available – along with land and compost – the 12-month growing season in New Orleans promises to yield a rich harvest of fruits and vegetables to nourish the city's rebirth.

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### Notes

- 1) In this article "New Orleans" refers to the city itself – Orleans Parish – and not the other five metropolitan parishes (counties) in the area. These incurred much less damage from Hurricane Katrina.
- 2) "Building Healthy Communities: Expanding Access to Fresh Food Retail," a report of the New Orleans Food Policy Advisory Committee, March 2008.

# Resilient Chinese Cities: Examples from Beijing and Shanghai

**Resilience is a dynamic process. City resilience refers to the ability of a city to adapt or adjust to changing situations or recover from economic, social or ecological disturbances. The current high rate of urbanisation in China creates many such disturbances. Urban agriculture plays a role in enhancing the resilience of China's growing cities.**

China is urbanising rapidly. By 2006, 44 per cent of the Chinese population lived in cities, and this level will rapidly reach 60 per cent in the next 20 years (Department of Development Strategy and Regional Economy). Many changes will take place in this period, during which China will continue along its current path of industrialisation and transformation into an information society. A number of disturbances can be expected to occur during this process of rapid urbanisation. These can be economic disturbances (worsened by the current financial crisis), such as increased food prices and the growing income gap between rural and urban inhabitants; social disturbances, especially for emerging vulnerable groups such as youth, migrants or the elderly in Chinese cities; or ecological disturbances, like ecological deterioration and water shortages.

## Increasing vulnerability

Urbanisation results in a growing disparity between urban and rural areas. According to a report of the National Statistics Bureau (2009), the available income of urban and rural citizens in 2007 was respectively 2020 and 727 US dollars. And this gap continues to increase (Population and Labour, 2008).

As elsewhere, the prices of food have been increasing rapidly in China in the past few years. General food prices increased by 14.3 per cent in 2008 (according to the National Statistics Bureau, 2009). The price of meat increased by 21.7 per cent, oil by 25.7 per cent, vegetables by 10.7 per cent and fruit by 9 per cent.

Many migrants move to the city from smaller cities or from rural areas to find a better job. As many of them cannot find a job directly in the city, they stay in periurban areas and practice agriculture (see UA-Magazine no. 18). According to Zhang (2006), around 62 per cent of migrants stayed in periurban areas in the period 1996-2000. There is also a gender difference, since most urban migrants are men; women are often left behind in the rural areas with the double task of looking after and supporting their families.

Urban sprawl endangers the environment; and without proper legislation or zoning, farmland, green spaces, forest

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*Village farming in Minhang district*  
Photo: René van Veenhuizen

areas and water bodies are rapidly taken over by construction. The statistics from the Ministry of Land and Resources show that the area of farmland in China decreased by 218,666 ha in 2008. This decrease of green areas threatens ecological biodiversity. For example, fewer than 10 types of natural plants can be found in the densely built areas in Beijing, and fewer than 50 types of plants grow in urban parks, while in parks in the periurban areas 287 types of plants can be found (Li, 2005).

As density in urban areas increases, urban open spaces become more scarce. This increases the vulnerability of people because a disease in a high-density urban area, for example, will spread rapidly if there are no buffer areas to contain it.

## The role of urban agriculture

Urban agriculture plays a role in enhancing the resilience of Chinese cities. This will be illustrated by selected examples from Beijing and Shanghai.

Periurban agriculture plays a crucial role in the supply of fresh food to Beijing citizens. In 2002, the self-sufficiency rate with respect to vegetables was 55 per cent in Beijing and 50 per cent in Shanghai. As a consequence, the transport distances are kept short, which also reduces the cost of food. The prices of vegetables transported to Beijing from the southern part of China are high due to the high oil price. In addition, the reduction of transport reduces the CO<sub>2</sub> emission.



When disasters occur, this self-sufficiency of supply in fresh food can be very important. In addition, urban open spaces like farmland can be used in emergencies as temporary settlement sites. For instance, during the SARS epidemic in Beijing, in 2003, hospitals were temporarily located in peri-urban areas, where the patients were provided with fresh and safe food. Similarly, after the Sichuan earthquake in 2008, most large-scale temporary tents were located in peri-urban farmlands.

Mushroom products produced in the Fangshan (urban) district of Beijing account for 56 per cent of the city's total output. The production process includes agricultural waste recycling, and brings profit to the farmers. For example, in 2007, in Miaoergang village, the net profit earned by mushroom producers in one year was RMB10.44 million, and the net income per capita in that district reached RMB10,595, or USD 1,552, while the average annual income per capita in periurban Beijing is RMB 9,559 or USD 1,400.

In 2005, there were about 3.6 million migrants in Beijing. Of these migrants, over 600,000 (17 per cent) were engaged in activities directly related to urban agriculture. These agriculture-related jobs are attractive since many migrants are experienced farmers, and by using improved techniques, such as greenhouses, these migrant farmers can earn more than they could have at home. This allows them to still contribute to rural family income (Zhang, 2006). In Manzu town in Huairou district, women are involved in strawberry, vegetable and mushroom farming and agro-tourism activities, which are all practised close to their homes, so that they can combine these activities with other tasks. Women in Manzu town generated RMB 7,000 (USD 1,025) per year in this way.

In Shanghai, Minhang district, the Pengdu Water Museum has been developed at a water conservation area of the Huangpu River. This area is a water intake, contributing 70 per cent of Shanghai's water supply. The museum covers 140 ha. Before 2003, the location was used as a waste dump, there were some pig and duck farms, and the water was seriously polluted. As from 2003, the village farmers redeveloped the area into an ecological park and water museum, while at the same time protecting the river. The amount of solid waste and pollution discharged to the Huangpu River has substantially been reduced and the water quality of the Huangpu River has regained its grade three status (which means that it can be directly used as a drinkwater source). In addition, it attracts people from Shanghai and other cities (about 300,000 visitors per year, according to an interview with the manager of the park), who buy produce from the farmers. The Museum, has become a new model of multi-functional (and eco-friendly) agricultural production.

### A new urban development approach

These examples from Beijing and Shanghai show that urban agriculture already plays an important role in building resilient cities in China, and these practices are integrated in urban development. For instance, Chongming Island in Shanghai, which covers an area of 1,400 km<sup>2</sup> and has a popu-



*Pengdu Water Museum Park, Shanghai*

Photo: Wang Yan

lation of 700,000, is the district with the most forest cover area in Shanghai (18 per cent). Unlike in other periurban areas, which are still heavily industrialised, urban agriculture dominates the economic structure of the island. As the backyard of the Shanghai metropolis, the island has been developed as an eco-island with agriculture, green tourism and ecological housing. In 2004, the number of tourists reached around 772,000 (Tourism statistics report, 2005).

This is a successful example of periurban town development, and this approach is being replicated in other cities in China, such as in mountainous areas in Beijing and in island reclamations along the Songhua River in Harbin.

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- Ministry of Land and Resources P.R.C., [www.mlr.gov.cn](http://www.mlr.gov.cn)
- [http://www.stdaily.com/gb/stdaily/2007-08/23/content\\_711202.htm](http://www.stdaily.com/gb/stdaily/2007-08/23/content_711202.htm)

# Adapting to Climate Change and Building Urban Resilience in Australia

Kirsten Larsen  
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**Increasing urban production of perishable foods can increase diversity in the food system, adding new products, producers, techniques and systems that will resist different threats and meet different needs. As Australia continues to struggle with water scarcity and increasing climate extremes, food production in and around its cities can contribute to healthy and resilient communities.**

The majority of Australian cities have some level of permanent water restrictions, and under climate change, South East Australia (home to Adelaide, Melbourne and Sydney) is predicted to have even less rainfall, higher evaporation (due to higher temperatures) and more unpredictable and extreme weather events. There were significant agricultural losses in the bushfires and heatwaves of early 2009, and continuation of the worst drought on record has seen the near depletion of Australia's most significant irrigation system and "food bowl" - the Murray Darling Basin.

Australians also reflect the current worldwide trend towards urban living, with two thirds of the population living in state capital cities. Rapid low-density population growth in Melbourne continues to drive urban sprawl over highly productive agricultural land. Australians have a very large environmental impact – we have the third highest per capita water consumption amongst OECD countries and the highest per capita emissions of greenhouse gases globally. Fewer than 7.5 per cent of inhabitants in the south-eastern state of Victoria meet the Healthy Eating Guidelines for fruit and vegetable consumption (DHS, 2006), contributing to significant health problems such as heart disease and stroke.

Australia now imports more fruits and vegetables than we export, and while access to imported food is an essential component of a resilient food system, continuing degradation of domestic supply capacity increases vulnerability to future shock. We have already seen the impact of local environmental factors on food prices, with the increasing cost of critical foods like fruits and vegetables exacerbating food insecurity in vulnerable communities.

Changes to how we produce our food, particularly urban production of fruits and vegetables, offer significant opportunities for reduced environmental impact (particularly

through the reduction of greenhouse emissions and the use of wastewater) and increased resilience in Australian cities as we adapt to climate change.

## Food-sensitive urban design

Australia plays a key role in world food supplies, as a key exporter of agricultural commodities (we are the second largest exporter of beef, consistently one of the top five for wheat, and contribute about 13 per cent of global dairy exports). However, environmental and resource pressures are already constraining increased food production. Recent drought conditions resulted in less than half the average wheat yield (contributing in part to record global grain prices) and substantial reductions in Victorian horticultural production (50 per cent reduction in tomatoes and 10 per cent reductions in apples and potatoes; ABARE, 2008 and ABS, 2008). There is an expectation that agricultural systems must continually produce more exportable commodities to feed more people, but doing so in a sustainable way requires choices about: what foods we choose to produce, how (and where) we produce them, how we make the most of the resources we have, how they are distributed and how much is wasted.

Food-sensitive urban design is a new approach to urban development that takes food provision and access into account right from the outset in designing urban settlements. The forthcoming design of new precincts and developments in and around Melbourne's outer suburbs, and retrofit of existing urban areas to adapt to climate change, provides opportunities for a new approach that recognises the critical contribution of integrated food production to resilient urban settlements.

The concept of water-sensitive urban design is also gaining significant traction within Australian urban developments as the need to improve urban water management is critical.



Westwyck multifunctional communal space  
Photo: Fiona Barker Reid



Extending this approach to include food is opening up dialogue and opportunities for the active design of food production and access in urban spaces. This can include: resources and infrastructure for production and processing, distribution, jobs, amenity and public space, and community health and wellbeing.

*Food-sensitive urban design contributes to urban sustainability and provides the conditions for attractive, living environments through integration of urban planning and design with the production, distribution of and equitable access to healthy food. This means:*

- *Trying to make use of urban productive capacity and resources to provide secure, healthy and sustainable food;*
- *Optimising synergies between food, energy, water and nutrients; and*
- *Reducing the need to transport food (hence water and energy) by producing it closer to where it will be eaten.*

### Resilient people and communities

Resilient cities of the future will have the ability to provide food to their inhabitants in the face of shock and change, and will have the capacity to reorganise and create new solutions as operating conditions change either gradually or suddenly. These cities will have a diversity of food sources, and processing and distribution systems, with sufficient redundancy within the systems to withstand substantial shocks.

Resilient cities will also be dependent upon the resilience of the people who live within them. As the world grapples with the current economic crisis and the reality of climate change, it is clear that human mental and emotional resilience is already severely strained. Mental, behavioural and social health problems are an increasing health burden in all parts of the world and both poverty and food insecurity contribute to physical and mental health problems, particularly in children.

“Resilient cities have the ability to provide food in the face of shock and change”

As people become aware of the enormity of the challenges posed by climate change and peak oil, despair and disempowerment can be a natural response. However, the rapid rise in both home food production and participation in community food innovations suggest that active involvement in individual and community food production may provide a means of re-empowerment. Food production and exchange is emerging as a tangible, positive and enjoyable activity that people can do for themselves and their communities in the face of seemingly insurmountable challenges.

CERES (Centre for Education and Research in Environmental



CERES commercial garden beds  
Photo: Serenity Hill

Strategies) is a long-standing example of the integration of community education and food production within Melbourne's urban environment. Set on 4.5 hectares of land, it is the most visited community environmental centre in Australia, and plays a critical role in both educating about sustainability and pioneering innovations that work within the city bounds. CERES has now successfully established a working urban farm in the heart of a densely populated residential area, and achieved organic certification despite being established on an old landfill site. It also manages an adjacent section of land for food production and runs a market of its own (supplemented with additional external produce) twice a week. In addition to the farm and market (which employ 4 people full-time and another 22 part-time), CERES commercial operations include an organic seedling propagation centre, a nursery specialising in bush foods (indigenous food-producing species) and other permaculture plants, and an organic café (60 per cent of whose produce is grown at CERES). With a continuing commitment to creative community food solutions, CERES has also been a partner in establishing a range of social enterprises, including a mushroom farm and a catering business, which are now becoming established commercially. A new aquaponics operation uses nutrients from fish production to grow greens for the market. Seventy-five per cent of CERES' income is generated by these and other enterprises.

Many Melbourne suburbs contain well-established fruit trees, which often produce far more than the current residents require. This has led to new arrangements for exchanging surpluses. The first Urban Orchard (at CERES) now has 140 households as members, who exchange surplus fruit and vegetables weekly at the market. This model has now been taken up and adapted across Melbourne, with at least three more groups operating regularly.

'Permablitz' emerged in Melbourne in 2006, initially as a small group of people helping each other to 'make-over' suburban gardens for food production using the principles of permaculture. This model of volunteerism – contribute to the work in three other gardens and you earn support for your own – has rapidly expanded to include workshops, lunches and social activities. The model itself has now been

successfully replicated in other Australian cities and internationally (including in Uganda).

### Resilient water systems

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Food grown in urban areas can make use of appropriately managed greywater, as well as rainwater and stormwater that currently run off impervious surfaces and return to the ocean. A recent study of water availability and use in the City of Melbourne found that more than 80 per cent of Melbourne's current water needs could be met with the rain that falls on the city (if it was captured) and that approximately 12 per cent of all water is used to irrigate open spaces and private gardens. A conservative redistribution of some of this water to food production could produce between AU\$5.7 and AU\$29.4 million of fruits and vegetables (2001 and 2005 prices, respectively, and reflective of average and best practice water use efficiency).

Urban effluent is a widely under-utilised resource that could contribute significant quantities of water for agricultural production. Wastewater can be treated in small, decentralised systems, appropriate for inner-urban use, or in more traditional treatment plants on the urban periphery. In Melbourne 23 per cent of wastewater is recycled, of which more than 30 per cent is used for off-site agricultural production, while a number of small regional centres recycle all of their effluent for local agriculture. There are issues with reusing wastewater for food production, but with focused



Conversion of inner-urban Melbourne front garden to food production  
Photo: Kirsten Larsen

research, development and appropriate management, Victoria's 448 GL/year of effluent could be a valuable resource for food production.

Westwyck is an eco-housing complex in inner-city Melbourne that incorporates on-site water collection (rainwater), water treatment of both grey- and blackwater, and water reuse in the garden and within the residences (for toilet flushing, clothes washing and showering). A communal vegetable garden is a focal point of the shared space and provides an opportunity for residents to participate, learn and propagate and consume fresh produce. Elsewhere in Melbourne, a new project is under development by a local water authority that will install urine separated toilets to 25 homes, with the urine provided as a valuable fertiliser for local horticultural production.

### Conclusion

Maintaining capacity (land, resources and skills) for food production and provision in and around urban centres is a

### Barriers to urban food production

*There are barriers to Melbourne's urban food production that will need to be overcome. These relate largely to skill levels and institutional systems (restrictions on outdoor watering, centralised water infrastructure and control, planning conventions and widespread but poorly mapped land contamination). Overcoming these barriers will be central to unlocking the potential of the physical resources within city bounds.*

critical part of a resilient food system. Production of a significant proportion of fruits, vegetables, eggs and even some dairy within urban areas could reduce reliance on long supply chains, make use of resources in urban areas, and potentially reduce price exposure for these essentials in a healthy diet.

A range of scales should be implemented for urban food production systems, from current large-scale periurban vegetable production, to small, intensive areas within the city. We need to re-think the food production landscape to include rooftop production, hydroponics, aeroponics, aquaculture and possibly even vertical farms. Australia has a strong history of agricultural research and these skills are needed to design food systems that are feasible, sustainable and productive.

Urban food production represents a rare convergence of available resources, community interest, scientific knowledge and enterprise and knowledge export opportunities. It is not "the solution" to the problems we face in the food system, but it has the potential to help, while contributing to urban landscapes, making use of available renewable resources, reducing greenhouse emissions and increasing resilience of food systems, communities and cities themselves as we adapt to climate change.

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#### Useful websites

- <http://www.ceres.org.au/index1024x768.htm>  
<http://www.permablitz.net/>  
<http://www.westwyck.com/>



# Building the Resilience of Vulnerable Communities in Quito: Adapting local food systems to climate change

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Isabelle Anguelovski

**Marginalized urban communities living in informal settlements or on fragile hillsides and slopes in Quito, Ecuador, are the most vulnerable to the impacts of climate change, as they are highly exposed to frequent floods and landslides, droughts, food scarcity and uncertain food supply chains. This is particularly true as many of these communities depend on urban agriculture to secure sustainable livelihoods and achieve food security.**

Drawing on interviews in Quito with municipal departments, public officials, NGO staff, and local inhabitants, as well as official documents and reports, this article discusses whether the municipality of Quito is ready to adapt existing local food systems to the impacts of climate change and strengthen relevant policies and programmes.

## Climate change in Quito

With its geographic position and mountainous topography, Ecuador is highly vulnerable to climatic changes, especially in the area of water resources and conservation (Primera Comunicación Nacional, Quito, 2000). Cities such as Quito are already experiencing higher average and extreme temperatures<sup>1</sup>, a decrease in overall rainfall, but also more frequent extreme rain events, which cause landslides and mudslides (Dirección Metropolitana Ambiental y Fondo Ambiental, 2008). The melting of tropical glaciers and destruction of páramos – neotropical ecosystems in the Northern Andes which regulate hydrological systems – will also exacerbate the environmental and socio-economic costs of climate change. In the mid-term, this greater vulnerability to climate risks will worsen the problems of water governance in Ecuador and exacerbate conflicts over water resources (The Government of Ecuador *et al.*, 2008). The most vulnerable sector is agricultural production, mostly due to severe flooding and droughts affecting banana, corn, soy, and rice plantations in the lower Andes, Amazon, and coastal region (Primera Comunicación Nacional, 2000).

In Quito, the majority of poor, indigenous and migrant inhabitants living on the hillsides and slopes are practicing urban agriculture to improve their nutrition and have access to additional sources of income. In the 1980s and 1990s,

when Andean indigenous populations migrated to Quito, families established their houses and shelters on the 64 hillsides and ravines surrounding the city and often resorted to small-scale urban agriculture – growing corn and potato and raising guinea pigs and chickens – as a safety valve and social buffer.

## Supporting urban farmers

Urban agriculture in the Metropolitan District of Quito is officially supported by the programme AGRUPAR<sup>2</sup>, which was created in 2002 within CONQUITO, the metropolitan corporation for economic development. AGRUPAR agronomists provide seeds and seedlings, conduct technical training on agricultural production and commercialisation, and strengthen the management skills and micro-enterprises of urban farmers. However, AGRUPAR does not provide official land titles. It is the responsibility of the growers themselves to secure land and plots by engaging in direct negotiation with municipal staff and obtaining a lease to legalise their practices.

AGRUPAR supports two types of production units in urban and periurban areas: 1) *huertos demostrativos* (demonstrative community gardens) on communal land or on land that the municipality rents out for a minimal price to growers, and which receive an organic certification by AGRUPAR and 2) *réplicas familiares* (family duplicates) on individually owned land, when families are interested in applying the *huerto demostrativo* model to their plots of land. AGRUPAR's production is sold either in the neighbourhood, in "bio-ferias" (farmers' markets), or through a system of *canastas* – baskets of produce delivered weekly to consumers. A third type of production unit, which is not officially part of AGRUPAR but was developed by AGRUPAR families, consists of a small area of land in residents' backyards usually



Photos: Marielle Dubbeling.

converted into corn and potato fields. Here, families use part of the harvest for self-consumption and sell surpluses in local shops.

Two other types of urban agriculture projects exist in Quito, but they are not sponsored by AGRUPAR. First, communities in the less densely populated areas in the hills and páramos are engaged in periurban agriculture. Some of these projects are supported by the Environmental Fund within Quito's Environmental Office. Sponsored projects tend to prioritise environmental goals, such as sustainable resource management and fragile ecosystem protection, over socio-economic development. Second, a large number of low-income families in the Southern districts (i.e., Valle de los Chillos) and Northeastern districts (Las Delicias) grow produce independently in their backyards or on land they have occupied, but for which they have not received formal title.

In reality, urban agriculture is not officially recognised within the urban districts of Quito, and is only official and legal within the periurban districts. Even though the Territorial Planning Office "tolerates" urban food production, local farmers are faced with the risks of expulsion or termination of their leases. Overall, the systems most vulnerable to climate change are those located on the fragile hillsides and slopes around the city, or in periurban areas located at higher altitudes (above 3,500 m).

### Adaptation to climate change

Changes in climatic patterns have already been affecting urban farmers in Quito. Frequent droughts and extreme weather events, resulting in intense rain and floods, are forcing families to grow more resistant crops and improve soil conservation. For instance, families who were used to only cultivating corn and potatoes must diversify their production and plant Andean crops that have greater nutritional value, higher soil protection potential, and lower water needs, such as quinoa, oca, apio or chago. In addition, urban farmers are learning to protect the fragile natural resources and environmental quality in Quito, especially those families living close to the páramos or using water from streams that originate in the glaciers around Quito.

In this spirit, the Environmental Fund has allocated small grants to environmental NGOs helping local farming communities improve the conservation and sustainable management of the páramos ecosystems and the degraded areas around the city (i.e., in the semi-arid Andean ecosystems of the Volcan Ilaló), while improving their productivity and diversifying their crops. For instance, the Environmental Fund is supporting the NGO Ecopar in its work to create an agro-ecological farm in the periurban area of Lloa, which will secure the livelihoods of isolated poor families through organic production, create a micro-enterprise of product commercialisation, and protect fragile soils against the use of chemical pesticides and fertilisers.

Since the lack of affordable land and housing in the city centre has forced indigenous and migrant populations to establish their shelter in the slopes and hills around Quito

*Quito receives part of its potable water from the Antisana Glacier, whose size decreased 7 to 8 times faster in the 1990s than in previous decades – the Antisana shrank by 23 per cent between 1993 and 2005 (Franco et al., 2000; Cáceres et al., 2005).*

and since many of them depend on urban agriculture land to meet their food needs, tackling climate adaptation will require thinking and re-thinking structural development planning in the city. This means evaluating current land-use decisions, improving housing and economic opportunities for poorer populations, and improving the coordination of municipal agencies working on climate change in the city.

Adapting urban food systems to climate change impacts also requires decision-makers, planners, municipal corporations, and NGOs to engage in large-scale concerted efforts to improve the protection of river, groundwater, and aquifer resources in Quito, increase the efficiency of water and irrigation systems, and address sensitive issues such as land tenure and growth policies.

Today, a main challenge in the further development of sustainable and equitable local food systems in Quito is the integration of climate adaptation into the reality of decision-making processes of all relevant municipal departments. Short-term economic interests, large-scale development projects, and abrupt political decisions are still marginalising environmental and social considerations. Even if urban agriculture in Quito is supported by projects within AGRUPAR and the Environmental Fund, local agencies lack the concrete tools, networking and coordination capacity, as well political power, to make climate change adaptation and urban agriculture a long-term strategy in Quito.

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#### Notes

- 1) Between 1939 and 1998, the Andean region saw an increase in average temperatures of 0.11°C per decade against a global increase of 0.06°C per decade (The Government of Ecuador, UNDP, and Ministry of Environment, 2008).
- 2) <http://www.conquito.org.ec/agrupar/>

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# Sustainable Development of Megacities of Tomorrow: Green infrastructures for Casablanca, Morocco

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**The programme “Sustainable Development of Future Megacities” (2008-2013), of the German Federal Ministry of Education and Research (BMBF), focuses on energy- and climate-efficient structures in urban growth centres. One of the research projects investigates to what extent urban agriculture can make a relevant contribution to building a resilient city, and does this in Casablanca, Morocco.**

This inter- and transdisciplinary project titled “UAC – Urban Agriculture as an integrative factor of climate-optimised urban development, Casablanca, Morocco” is executed jointly by researchers and practitioners from Morocco and Germany and is managed by TU Berlin.

*The topics of the BMBF programme have been defined by the participating cities and relate to their specific practical needs: housing and construction; nutrition and urban agriculture; public health and quality of life; urban planning and governance; energy supply and consumption; mobility and transport; water supply, waste treatment and environmental management.*

## Casablanca

The Grand Casablanca region consists of the core city of Casablanca (Préfecture Casablanca), the provinces Nouaceur and Mediouna, and the prefecture Mohammedia. It is the largest urbanised region in the Kingdom of Morocco, with 3.6 million inhabitants (according to the official 2004 census), representing 12.1 per cent of the country's total population. Unofficial estimates are now as high as 6 million inhabitants, due to numerous informal settlements and recent migration flows. The population of the region is very young; one third of the inhabitants are younger than 15 years. In 2008, the Human Development Index (HDI) ranked Morocco 127th out of 179 countries.

Casablanca is in the midst of rapid and uncontrolled transformation and modernisation, which is increasing the gap between the rich and the poor, and straining the provision of housing and technical infrastructure, especially transport. Industries and residential areas are reshaping the periurban

region and there is high land pressure on existing land-owners and farmers.

## The project

The UAC research project is exploring the role of urban agriculture in climate-optimised and sustainable urban development. Urban agriculture is understood as every form of formal or informal agricultural production within the city, and the project places the social, economic and environmental dimensions of agriculture, urban development and climate change together in a newly developed framework, under the heading of governance.

## Urban agriculture and megacity development

The UAC project seeks to include the provision of open spaces in the integrated and sustainable urban growth in megacities. Urban agriculture is a strategy that could offer a way to integrate green infrastructures into the megacities of tomorrow. Only recently has attention been focused on urban agriculture in spatial and urban development activities (Viljoen et al., 2005). Major factors to consider are the optimal use of land and the distribution of land under informal development.

In the Casablanca region urban growth tends to absorb agricultural land completely, and agriculture is treated as a form of land use that does not belong in a modern city. In reality, however, the dynamic development process leads to new hybrid forms of rural and urban space, and results in reciprocal urban-rural linkages (Herrle et al., 2006). An underlying hypothesis is that these urban-rural linkages contain the

*Casablanca food market*  
Photo: Silvia Martina Han



potential for improved livelihoods in combination with spatial integration: to form climate-optimised, multifunctional urban and open space structures. For instance, urban agricultural land could be developed to contribute to the reduction of CO<sub>2</sub> emissions, regional products and markets, risk management, recreational space and income-generating activities. In this way, urban farmers could become providers of open space in a new urban setting – the “rurban” environment.

Although an important livelihood strategy, agriculture is an economically “weaker” form of land use in urban development, and therefore often exposed to manifold spatial or temporal restrictions. Urban agriculture can only coexist in the long term and in a qualitatively meaningful manner with other, economically stronger, types of land use when synergies exist or are created. So the question is to what extent urban agriculture can contribute specific services to the city, and vice versa to what extent the city needs urban agriculture. In other words, to what extent can urban demand for agricultural products and services contribute to the stabilisation and improvement of living conditions in urban-rural areas and thereby to a reduction of poverty within the local population.

The starting points for the development of these synergies that have been identified so far in Casablanca are:

- Sustainable food production
- Recreation, the production of beautiful landscapes and the conservation of natural heritage
- Integration of agriculture in the industrial water supply and treatment systems
- Transformation of informal settlements with open space green infrastructures (see pilot project 2).

### Multifunctional urban spatial systems

The project further investigates whether polycentric structures will facilitate the mentioned sustainable multifunctional urban and recreational structures. We consider the specific spatial development of megacities – in contrast to concentric growth patterns – as “polycentric dynamics” including different but parallel developments. Between the very rapidly developing growth centres are corridors with different development dynamics (rural islands can become central key spaces for productive urban landscapes). Model approaches for multifunctional spatial systems include urban agriculture, based on its ecological, economic and cultural functions. In sub-areas urban agriculture can serve various short or long-term objectives, ranging from “intermediate use of potential construction land” to “sustainable long-term rural islands” in the urban region.

The agricultural areas around Casablanca are already popular destinations. Especially in spring, a growing number of Casablanca’s citizens are enticed to combine buying fresh vegetables from small farmers with having a picnic in a field. (See photo.)

The project is focusing specifically on the following two topics:

1. Integrated disposal and productive cycles in new settle-

ment units, including water purification and recycling.

2. The development of multifunctional productive landscapes as a modern alternative to 19<sup>th</sup> century public parks and woods.

### Action research

Because of megacity dynamics, production in urban spaces can no longer occur by planning in the traditional sense. Instead, the process requires multiple strategy approaches and linking top-down with bottom-up strategies, as well as the development and introduction of tailor-made technologies, e.g. urban habitat based on closed water and matter circuits, decentralised management systems, short-distance applications, and special education and communication strategies. The research framework therefore has three research layers, integrated by a series of cross-cutting issues dealing with service activities (capacity building, communication), implementation support (strategies, the action plan) and synthesis activities (joint learning, scientific exploitation of results, up-scaling assessment).

At *macro level* a set of guiding principles will be developed on the role urban agriculture could/should play within a climate-optimised urban development process. This includes the development of preliminary scenarios concerning the future of urban Casablanca over the next 15-30 years.

At *meso level* climate-optimised modules of multifunctional spatial systems will be developed derived from research on resource-efficient cycles in settlement structures and on settlement-related landscape functions.

At *micro level*, action research in pilot projects will generate extended scientific knowledge and concrete ready-to-use applications. Four pilot projects are the heart of the UAC project, which specify the synergy potentials between city and agriculture, focus on a central urban function (such as

*The following pilot projects started in June 2008 and will run for five years:*

- 1) *Industry and urban agriculture, Aéroport Airport Mohammed V / Province of Nouaceur: Re-use of waste-water for agricultural purposes and improving the aesthetic dimension of industrial plants.*
- 2) *Informal settlement and urban agriculture, village and school in Ouled Ahmed / Province of Nouaceur: Installation of a green school garden to improve children’s nutritional status and to teach them more about the opportunities to grow agricultural products in urban settings.*
- 3) *Periurban tourism and urban agriculture, Oued El Maleh valley in Chellalatte / Prefecture of Mohammedia: Synergies between agricultural production and short- distance recreation and tourism, conservation of periurban multiple open spaces and natural heritage.*
- 4) *Healthy food production and urban agriculture, Pedagogical organic farm in Dar Bouazza / Province of Nouaceur: Developing an “organic culture / healthy lifestyle” approach towards modern food production, economic-solidarity partnership between food producers and urban consumers.*





*Organic Moroccan mint*  
Photo: Silvia Martin Han

production, housing, recreation and nutrition) and are executed by interdisciplinary mixed German and Moroccan teams.

The institutions included in these pilot projects are German and Moroccan universities, Moroccan schools, the City Planning Authority for the Casablanca Region, the Regional Agriculture Authority for the Casablanca Region,

the Regional Environment and Spatial Planning Authority for the Casablanca Region, German and Moroccan private companies and organisations, and Moroccan NGOs.

### Initial conclusions

Regional urban systems like mega-urban regions, city regions and urban development corridors, which can be national or transnational, are a new urban spatial reality in Africa. These systems need the attention of African authorities and go well beyond traditional and territorially confined urban administration and governance.

Urban development corridors provide a potential for guiding population pressures away from Casablanca, Morocco's largest urban region. Rural islands in the city and further potential spaces for productive multifunctional landscapes can also be created. Improvement of such urban-rural linkages is fundamental for the development and design of a new "rurban" environment, which is based on the provision of open space for the creation of innovative green infrastructures. Spatial synergetic interventions can become a social and economic policy tool that addresses urban and rural poverty through the geographical dispersion of industry and trade.

Research and development cooperation can become innovative and crucial in tackling complex global problems, like urbanisation and climate change. However, we still do not know enough about the processes of space creation in rapidly growing urban centres. This is why we need a broad vision which can be communicated and discussed with local stakeholders and the broader society. Project-based events, e.g. Vision Verte Casablanca (VIVE CASA), roundtable meetings and future workshops, are therefore part of the UAC research programme. These events should be carried out together with partners and alliances in development cooperation (e.g. GTZ German Development Cooperation) and others, in order to concentrate on tasks and initiatives which can only be implemented through joint action, especially in the fields of knowledge sharing, network management, capacity building, empowerment and ownership.

The UAC project has increased awareness on the topics of urban agriculture and climate change among project stake-

holders and the general public in Morocco. The issues have also been successfully discussed and anchored in numerous different policy fields, scientific forums and civil society initiatives on the regional, national and international level. The multidimensionality of urban agriculture is an important factor in this process.

Urban agriculture is regarded as a fruitful strategy for spatial development in Casablanca, and has been integrated into the statutory regional land-use plan for Grand Casablanca ("Schéma directeur d'aménagement urbain, SDAU") that passed in December 2008. The same applies to the new planning concepts for the city of Meknès and in the "Initiative Nationale pour le Développement Humain, INDH", the national Moroccan initiative targeting projects and measures to combat poverty.

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#### For more information:

[www.uac-m.org](http://www.uac-m.org) (UAC research project website)  
[www.emerging-megacities.de](http://www.emerging-megacities.de) (BMBF Future Megacities research programme website)  
[www.rdh50.ma](http://www.rdh50.ma) (Human development in Morocco)  
[www.unhabitat.org](http://www.unhabitat.org) (United Nations Human Settlement Programme)

# Coping with Increasing Food Prices in Nakuru, Kenya: Urban school farming as a way to make school lunches affordable

Dick Foeken  
Samuel O. Owuor  
Alice M. Mwangi

**School feeding is common in Africa and widely recognised as beneficial for both the physical and mental development of the children. However, mainly due to the sharp increase of food prices, many parents are no longer able to pay for their children's lunches. This is where school farming comes in as a means to lower the cost of producing meals and thus make the schools more resilient against market forces.**

From a survey among 116 primary and secondary schools in Nakuru town (2006), school feeding appeared to be very common: 85 per cent of the schools had some kind of school feeding programme, in most cases consisting of the provision of lunch to pupils. However, in most schools, primary schools in particular, only pupils whose parents were able to pay were eligible for the school's lunch programme.

School farming appeared to be quite common as well, especially crop cultivation: over half (56 per cent) of the schools grew crops, predominantly in the schools' compounds. Plot

sizes ranged from 0.1 to about 5 acres – the average being 0.8 acres – on which a variety of crops were cultivated. In about 80 per cent of the schools practicing crop cultivation, the produce was partly or wholly meant for the school's feeding programme. In a few schools, the production of common food crops like kale, beans, maize and cabbage was sufficient for the school's lunch programme for a period of two to six months. However, this applied to a minority of the schools only.

The two most frequently mentioned benefits of crop cultivation were that it helps improve the school's feeding programme and that the school saves money that would otherwise be spent on food. These are the two major elements of the *Gardens for Life* project (see Box). Yet, only six of the 116 respondents had heard about this programme. Two schools appeared to participate in the project, but had actually sold all the produce in 2006 (the donation of computers being the only benefit so far).

## Challenges

In an internal memo in 2007, the Municipal Educational Officer of Nakuru urged public primary schools to find a way to provide all pupils with lunch to avoid a situation in which some pupils go hungry during the lunch break. For most primary schools, this was a difficult and challenging task. And in the intervening two years since the memo was issued, this task has become even more problematic due to the steep and rapid rise in food prices, resulting in an increasing number of parents who are no longer able to afford school lunches for their children. As said, this is where school farming comes in. Yet, a number of fundamental conditions have to be met:

- **Sufficient land.** Even though the compounds of some schools in Nakuru were indeed (too) small for a crop garden, the data suggested that for most schools the availability of land did not have to be a major constraint to start or expand crop cultivation. The example of Nyandarua Boarding Primary School in Nyahururu (see Box) shows that even a plot as small as an acre can be very rewarding in terms of yield, feeding capacity and money savings.
- **Sufficient water.** Nakuru has a relatively dry climate, so most schools face problems with watering their crops. Not every school has its own borehole (only four schools in the

*The well-tended crop garden at Baharini Primary School, Nakuru*  
Photo: Dick Foeken, 2007





## The Gardens for Life project

*With rising food costs, some schools in Kenya have started to combine their school feeding programme with school farming, i.e. using what they produce in their gardens in the feeding programme. This is mainly happening at schools with enough land to cultivate crops and keep animals. Some initiatives are encouraging the combination of school feeding with school farming, for example the Gardens for Life project run by the Kenya Youth Education and Community Development Programme (the programme is also active in India and the UK). It aims to promote agriculture in primary schools (following its exclusion from the curriculum in 2000) as a way of equipping children with practical skills in farming and to encourage schools to grow crops for school lunches and thus improve pupils' nutritional levels and reduce costs. The farming techniques taught are as far as possible organic and innovative, with new highly nutritional crops being introduced.*

*The results of a pilot project in 20 public schools in three districts (Nakuru, Laikipia and Nyandarua) have been promising so far. Nyandarua Boarding Primary School (750 pupils) in Nyahururu town saved Ksh. 200,000 (approx.*

*US\$ 2,800) on lunches in 2004 and had introduced carrots, spinach and courgettes as daily supplements to the usual diet of maize, beans and potatoes. Very few chemicals were used and natural methods were employed instead to control pests and diseases. The one-acre plot was even producing a surplus of vegetables that were being sold to neighbouring communities as "chemical-free" food. Munyaka Secondary in Laikipia District, which is known as a "slum school", has seen a 3 per cent increase in enrolment since the introduction of the Gardens for Life project. The school introduced radishes, garlic, onions and beetroot, all known for their high vitamin content, and the health of the students improved due to the better quality of the meals being offered. Students from poor families that were unable to afford school fees have benefited from the introduction of the work-for-fees programme, whereby students work on the school's plot to raise money to cover their fees and can then stay at school to complete their education.*

*Source: [www.edennet.org](http://www.edennet.org) and Daily Nation (2005): "Schools in novel farm project" (<http://www.nationmedia.com/dailynation/printpage.asp?newsid=46980>)*

survey did), but catching rainwater and storing it in tanks – as was practised by 20 schools surveyed – shows that this problem can be solved as well.

- **Professional support.** The sudden disappearance of a local NGO called SENVINET (which focused on school farming and other environmental issues) created a vacuum in terms of professional assistance. The role of the extension officers from the Ministry of Agriculture (MoA) has been marginal, judging by the fact that only two respondents said that their schools had received assistance from MoA extension officers in 2005.
- **Leadership.** School farming is usually the responsibility of one teacher, which means that the success of the school's farming activities is not only dependent on factors such as land, water and support, but also on individual qualities like a teacher's organisational skill, enthusiasm, dedication, etc. One of the public primary schools in Nakuru did very well in terms of school farming in 2006, producing kale, cabbage and maize for its lunch programme. However, in the course of 2006 (i.e. after the survey) the teacher in charge of farming activities was transferred to another school. It took some time before another teacher could be found to take over these responsibilities and the garden was noticeably neglected during the first half of 2007.

In summary, school feeding – and in particular the provision of school lunches – is high on the development agenda<sup>1</sup> (and linked to three of the Millennium Development Goals). In Nakuru, a few schools managed to provide all pupils with a lunch on a daily basis at an affordable price. These schools have been able to reach a relatively high degree of self-sufficiency in their feeding programmes through their school farming activities, thus compensating for the otherwise very

high costs that would be involved if all ingredients had to be bought. These schools, as well as the Gardens for Life project, can serve as good examples for others regarding school farming.

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### Note

- 1 See for instance the school feeding programme of the World Food Programme ([http://www.wfp.org/food\\_aid/school\\_feeding/WFPApproach\\_INTRO.asp?section=12&sub\\_section=3](http://www.wfp.org/food_aid/school_feeding/WFPApproach_INTRO.asp?section=12&sub_section=3)) and the US\$ 212m Ghana school feeding programme (Government of Ghana 2006). See also <http://www.sign-schoolfeeding.org/default.aspx?guid=a962aa37-223f-4dd4-9270-318cc907ba73&live=true&print=true>

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# The Role of Urban Agriculture in the Re-socialisation of Homeless People: An experience in Juiz De Fora, Brazil

Camille Lanzarotti Nolasco  
Raquel Ferreira Simiqueli  
Vicente Paulo dos Santos Pinto'

**Very few projects in Brazil include activities focused on re-socialising homeless citizens so that they can re-enter society, through job training for example. However, in the city of Juiz de Fora, state of Minas Gerais, Brazil, a project run by the municipality is showing good results in helping people living on the streets return to society as productive individuals, by means of urban agriculture.**

Cities can contain almost all wonders and horrors that humanity can produce. In Brazilian cities, extreme poverty and abandonment lead some people to become residents of the streets. As a result of the economic crisis in the past decades, there are people in the streets of our cities who have no contact with their families and no access to shelter, food, clothing or any form of municipal assistance. Several of them ultimately contribute to a scene of alcohol and drug abuse, urban violence and environmental degradation (Heckert, 1998). These people often have low self-esteem, and are discriminated against (Mattos and Ferreira, 2004), even by the municipality in many of its social programmes. They are the socially excluded.

*Some participants of the 2008 class receiving practical crop lessons from the project's agronomist.*

Photo: Camille Nolasco



Activities that seek the inclusion of these people focus on enhancing productive skills, offering information and preparing participants for the development of a particular activity, thereby creating opportunities and access to work. A process of change in each person's life is sought by enabling them to be responsible again, build new personal plans and create new social ties.

Juiz de Fora has an estimated population of 500,000 and about 745 homeless people. Most of the homeless are between 41 and 50 years old (only 4 per cent are younger than 20 years old), African descendents, male, single, from Juiz de Fora or other nearby cities, and have been living on the street for more than six years. In 2006, the municipal government's Social Policy Bureau started a horticulture training project aimed at assisting these adult homeless citizens, who are socially vulnerable due to extreme poverty, violence, lack of work, and other psycho-social factors. Other projects of this type mostly target children or adolescents.

The Plant-Ação Project was developed in partnership with the Agricultural and Food Supply Bureau and with the INTECOOP (Technology Incubator of Popular Cooperatives of the University), and is coordinated by AMAC (Associação Municipal de Apoio Comunitário- Municipal Association of Community Support - a foundation that works with the Social Policy Bureau on projects related directly to the community). A maximum of thirty participants attend the project's classes each year, which run for eight months, five days per week. These participants are residents of the street who already sought help and have been registered by the municipality. Enrollment is available to all the registered homeless, but a selection process takes place through interviews conducted by psychologists and social workers of AMAC to assess which candidates have a genuine desire to participate and learn, and are physically and psychologically capable of engaging in the course.

The project occupies an area of 600 m<sup>2</sup> at the Santa Cândida Farm, located in the urban area of Juiz de Fora and administered by the Agriculture Bureau of the municipality. Every day, the participants gather after a joint breakfast and go to the farm, where they receive theoretical and practical lessons on crops and farming techniques, and where they work the





Participants working the beds.  
Photos: Camille Nolasco



One participant proudly showing his harvest.



View of the PlantAção crops in Santa Cândida Farm and the nearby neighborhood "Jardim Cachoeira".

beds (prepare, plant, harvest and maintain). They produce pumpkin, sweet potato, beetroot, chayote, string bean, yam, carrot, green cabbage, rocket, chive, cabbage, lettuce and water-cress. They are assisted by an agronomist, two social educators, a social worker and a psychologist. Snacks and lunch are offered at the farm. In the afternoon transport is again provided back to the city centre. The participants sell the harvest in the vicinity of the farm and at a street fair on Saturdays. The money raised goes to a fund that is divided between the participants at graduation. The participants receive a monthly scholarship of R\$150 (US\$ 74\*) to participate. Attention is focused not only on production and reintegration, but also on issues such as preservation of the environment, notions of citizenship, healthy eating habits and other values that people easily lose when living on the street. Throughout the course, participants receive psychological support and are encouraged in their reintegration into society. One of the goals is to help each participant build a new life plan and create goals for the future that can be achieved one at a time. At the end of the course, they are further supported by AMAC in finding employment in productive areas of the municipality, or at farms and gardening businesses in the urban area.

The full yearly cycle of a group of 30 persons costs about US\$ 29,500 (or about US\$ 1000 per person per year). This includes the stipends/scholarships, and is fully paid by the municipality.

The first class, in 2007, achieved good results. Four of the participants got a regular job after graduation. All of the participants gained self-esteem, and most of them put a stop to their alcohol and drug abuse, returned to their families, found housing with their own resources and regained the concept of citizenship. The 2008 class had 20 participants, three of whom got a regular job.

The PlantAção project shows that urban agriculture can be an important means of reducing social vulnerability. The benefits go beyond simply providing food. It promotes food security, but also provides an occupation, work, income, increased self-esteem, and above all, citizenship to those who once had nothing.

Unfortunately, due to the local government's lack of funds, and lack of interest in investing in homeless people, the

municipality does not intend to expand the programme. There is therefore a need to show the positive results to the municipality and other agencies.

There is no coherent policy in Brazil to promote urban agriculture as a form of rehabilitation of marginalised people and administrators are often not interested, which prevents the development of these projects.

To strengthen the resilience of the Brazilian cities the Federal Government has included urban agriculture in its "Fome Zero" programme ("Zero Hunger" also see page 13). The Fome Zero guarantees access to financial aid for municipal projects, but the local governments have to submit their projects to receive this financial assistance. The PlantAção project did not have any linkage with the Fome Zero programme, for example. It is up to the cities' local governments to link local initiatives to federal resources as a way to enhance their cities' resilience, such as through urban agriculture projects like PlantAção.

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#### Notes

1) This text is based on a master's dissertation in ecology at the Universidade Federal de Juiz de Fora (UFJF), on the ecological dimension (human and environmental) of urban agriculture in Juiz de Fora: "A Dimensão ecológica da Agricultura Urbana em Juiz de Fora-MG"

\* According to the May 2009 exchange rate of 1 Real = US\$ 2.025.

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# The Role of Urban Agriculture in Building Resilient Cities: Examples of building resilient neighbourhoods in London

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**The concept of resilient cities is increasingly heard today. Whereas in southern countries access to food is a major motivation for people to engage in urban agriculture, in northern cities, such as London, people are driven more by environmental reasons such as the damaging effects of excessive food miles. Regardless of the motivation, urban agriculture is a positive step toward greater resilience.**

In his publication *Growing Better Cities*, Mougeot (2006) presents an ideal situation of urban agriculture integrated in a resilient city. He imagines a city as an ecosystem. The International Development Research Centre (IDRC) listed a number of key aspects of such a self-sufficient city: 1) urban agriculture integrated into urban management (governmental recognition), 2) self-reliance through local food systems (local markets and food security through cooperative of local producers), 3) available green spaces that provide ecological and social benefits to both the rich and the poor and 4) well-established resource recovery, in which waste is reused as bio-compost.

*Forest Gardening course, April 2009. Distributing seeds*  
Photo: (Source: London Permaculture 2009) James Taylor



*A Transition Town (or village / city / forest / island) is a community that comes together to respond to the challenges and opportunities of peak oil and climate change and kick off a Transition Initiative. A Transition Initiative seeks to address the question: "For all those aspects of life that this community needs in order to sustain itself and thrive, how do we significantly increase resilience (to mitigate the effects of peak oil) and drastically reduce carbon emissions (to mitigate the effects of climate change)?"*

*This should result in a coordinated range of projects across all areas of life that strives to rebuild the resilience lost as a result of cheap oil and reduce the community's carbon emissions drastically.*

This ideal situation has not yet been fully attained by any city in the world. However, some areas in London have already advanced quite far, especially since the launch of the "Capital Growth" initiative in November 2008, which aims to turn 2,012 pieces of land into green spaces to grow food in the capital city by 2012 as part of the Climate Change Action Plan.

**Transition Town in Brixton (TTB)** seeks to develop a community working together towards local sustainability, and in the wake of peak oil and climate change towards drastically reducing its carbon emissions (see box). Hopkins, founder of TTB in 2000 explains: *"The concept of resilience is central to TT, and is seen as the ability of a system, from individuals to the whole economy, to hold together and maintain their ability to function in the face of change and shocks from the outside."*

The Abundance Project of TTB, which was started in 2007 in the Guinness Trust Estate (off Loughborough Park Road), is a demonstration project on community allotment gardening. Its first products were harvested this year. Residents of the estate have become involved in the project, which is a big achievement for the organisers. All crops have been consumed on site except for some rocket that was donated to a box scheme to be sold.



Even though Brixton is still not much more self sufficient than when the project started, interest and discussions have been generated and the food growing is seen as sensible and beneficial. There is still not enough participation on the estate, but about nine growers have claimed space so far. In addition, over 50 community members engage in all kinds of other activities, such as a green mapping project to identify other green spaces for more agriculture, development of a local currency (the Brixton pound), and the Energy Descent Action Plan to decrease Brixton's energy use. This is the strategic goal for the year 2009. TTB aims to create a local food system that decreases food miles and offers green spaces that will provide ecological and social benefits for the whole community (thus already satisfying two aspects of Mougeot's self-sufficient city).

While TTB is still exploring how to improve local production and consumption, another grassroots organisation, **Growing Communities** in East London, already supports local food production by community members that benefits the local economy. This organisation based in the London borough Hackney involves 25 small-scale local organic producers and provided 450 households with fresh vegetables in 2007. The organisation has an annual turnover at the local market of £600,000 and an organisation turnover of £290,000, thanks to the work of 17 part-time employees and 48 volunteers. In the local community gardens 230 bags of lettuce are produced per week. Other products come from local farms. A survey showed that 89 per cent of members walk or cycle to pick up their bags each week, in order to reduce carbon emissions and food miles.

The organisation offers a weekly farmers' market and vegetable box schemes of products which are produced in the local community gardens and by local farms. Growing Communities also seeks to address the urgent problem of climate change: *"Since food and farming account for at least 30 per cent of worldwide greenhouse gas emissions, the high dependence on fossil fuels needs to be reduced. People need to connect again to the understanding of growing, preparing and cooking food, so that their fragility towards the dependency on the food system can be reduced"* (Brown, 2008). This is why the organisation focuses on ecological production and distribution: *"the distribution should involve environmentally friendly and low carbon resource use, foster the community, promote knowledge and strive to be economically viable and independent"* (Brown, 2008, Growing Food for London Conference).

Even though Growing Communities seeks less extreme adaptation to peak oil than TTB, it shows how people gradually can be convinced to buy locally produced and organic food. Growing Communities aims to produce enough to feed Hackney by 2040, such that the import of European and other global products will be significantly reduced, and urban and periurban food provision increased (Brown's presentation, Growing Food for London Conference, 2008).

The above-mentioned two examples seek to **apply ecological agriculture as an alternative to conventional agricul-**

ture. Permaculture (permanent agriculture) as developed by the Australian ecologist Bill Mollison goes further and seeks to design integrated ecological human habitats and food production systems by learning from the natural regenerative process in nature and by emphasising the synergetic combination of multi-purpose plants to provide sustainable year-round production.

This approach has been applied in **Hornsey Rise in Islington, London**. Alpay Torgout and other members of Naturewise converted empty green space of the Margaret McMillan Day Nursery school into a *Forest Garden* (permaculture), which is designed to be a low-maintenance system. Naturewise focuses on environmental awareness and enabling people to move towards more sustainable lifestyles (Burnett, 2008). The land was designed as an edible landscape based on the seven layers or niches identified by Robert Hart from his observation and replication of the structure of a natural forest (Agroforestry Research Trust, 2009; Burnett, 2008).

## There are many of these examples in London

The main users of the space in Margaret McMillan Nursery are 200 young school children from diverse backgrounds, who use the space on a daily basis. They learn to produce, and are eventually allowed to eat, the fruits and vegetables. The teachers use the garden for education, and some administration staff make compote from the apples and plums or take the fruits and vegetables home. During open days visitors from the neighbourhood and other parts of London come to learn. Two to seven volunteers per month assist in the management of the Forest Garden (Claire White, 2009). The Forest Garden in Hornsey Rise is a model in the city environment that offers medicinal and edible produce and permaculture courses to the community<sup>2</sup>. This and other Forest Gardens in London, including Organiclea and Hackney Edible Forest Garden (a community operation run by volunteers on Hackney Marsh), are all part of a growing network of London permaculturists (Naturewise, 2009).

### Resilient cities

Luc J.A. Mougeot imagined the city of the future as a resilient and self-sufficient city that reaches the stage of 'ecosystem' through an extensive use of urban agriculture. The provided examples show how local initiatives are striving to achieve this ideal, how agriculture benefits the local community through the provision of locally grown fresh food and how it benefits the environment by reducing waste through the promotion of composting. Local initiatives are also tackling the problem of pollution by increasing local biodiversity and reducing transport. However, to make greater strides towards the city of the future, it is necessary to reach more citizens. What is needed is to enhance the understanding of citizens on how to grow diversified, ecological food in a productive way, and assure stable and year-round harvests. It will also be necessary to recognise the potential of the urban spaces

### London's unsustainable Food system

- 2,400,00 tonnes of food are consumed in London each year;
- 29 per cent vegetables and 89 per cent fruits are imported;
- 883,000 tonnes of organic waste are produced per year;
- 11 per cent of total jobs are in the food industry
- 0.04 per cent (3000 people) work in agriculture;
- 13,566 Ha farmland in Greater London (mainly in Lea Valley area);
- 30,000 active allotment holders on 831 Ha of land, of which 111 Ha in inner London;
- 65 City farms in UK of which 8 in London since 1970;
- 77 Community gardens in London;
- 8,400 tonnes of vegetables produced commercially, 7,450 tonnes from allotments and 27 tonnes of honey from bees;

More information :

<http://www.londonfoodstrategy.org.uk/>

available in the city.

Given the fact that Londoners' eating habits produce nearly 19 million tonnes of greenhouse gas emissions<sup>3</sup> per year it is important for a city the size of London to become a more sustainable environment with ecological human habitats and food production systems. The three examples given are part of the bigger picture that includes the Capital Growth campaign and many other emerging initiatives that are working towards reducing harmful emissions, saving money and also throwing away less food. The London's Food Sector - Greenhouse Gas Emissions report estimated that Londoners throw away a third of the food they buy. London's food waste alone results in some 6.3 million tonnes of greenhouse gases a year - more than the entire national output of Iceland.

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Spadework during Forest Gardening Course organised by Naturewise

Photo: James Taylor

#### Note

- 1) The Capital Growth campaign is run by Sustain's London Food Link - a network of organisations and individuals with members as diverse as farmers, food writers, caterers and community food projects (Sustain, 2009).  
By following the link <http://www.projectdirt.com/page/capital-growth> it is easy to discover the locations of suitable land patches and current urban agriculture projects in London, as well as information on the organisations involved.
- 2) Naturewise workshops: Grafting and pruning of apple trees and creating a forest garden; Forest Garden principles and application - redesigning and succession (Naturewise, 2009).
- 3) The first report to examine the impact of what London eats on climate change was commissioned by the Greater London Authority and the London Development Agency, supported by London Food, compiled by Brook Lyndhurst and published in February 2009.

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# The Elephant and the Castle; towards a London Edible Landscape

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Mikey Tomkins

**Many urban agriculture and food-growing projects are currently being adopted by government and regional organisations within the UK<sup>1</sup>, which seek to reconnect people to a sense of place through food-growing. However, authorities seem to have no clear and concise record of the volume of open public space and therefore grossly underestimate the potential of agriculture in the city.**

There is a gap between the government's expressed desire to instigate urban agriculture activities and available knowledge on how urban agriculture could be retro-fitted into urban plans and integrated with current dominant food production and consumption patterns. Urban agriculture also needs to be linked to a reduction of GHG emissions beyond the usual "food miles" discussion.

One of the primary quantitative issues that need to be investigated is how much space is available for urban agriculture within UK cities and how many people it could feed. Such research is complicated by the fact that public space, beyond the municipal park, has an ambiguous function and is often under-recorded by local authorities.

As a first step, a 191 hectare test site was selected in the area locally known as the "Elephant and Castle" in central London<sup>2</sup>. This area is characterised by large-scale housing, shopping and road developments erected in the 1960s, with an average density of 85 persons per ha (the average in London is 69 persons per ha).

Over a 21-day period, all public spaces in the test site were mapped using a seven-stage quantitative methodology. This consisted initially of walking through the area and recording land use on paper maps, and eventually resulted in the creation of a digital map<sup>3</sup>. Other areas, such as private gardens or disused sites were mapped on paper, then cross-referenced using Google Earth software. Both the local authority (Southwark Council) and the regional Greater London Authority (GLA) were then asked to supply data on open public spaces in the same 191 ha site, in the form of digital Geographical Information System files (GIS).

The site visits revealed that slightly over 21 ha of the 191 ha test area consisted of grassed public spaces, with few or no obstacles to access - all of which could support urban agriculture. By comparison, the Southwark Council GIS data



*This photo shows the dominant Elephant and Castle: large scale post-war housing and shopping*  
Photo: Jamie Barra

showed only 14 ha of total open grassed public area within the test site, while the regional GLA GIS data showed an even smaller area of only 5 ha - a difference of 60 per cent. Neither authority could supply data on private gardens. It could be concluded that the further an institution operates from the local scale, the more it relies on remote sensing and the less detail it records.

Potential food-growing plots were distributed empirically throughout the 21 ha of grassed public area, based on the decision not to disturb current patterns of leisure or recreation. As a result, 6 ha of the 21 ha were deemed suitable for food production or 4.5 per cent of the total 191 ha.

In order to assess site yields, a basic unit for vegetable production was designed using yield data from the Royal Horticultural Society's (RHS) research on growing 22 varieties of vegetables for home consumption<sup>4</sup>. From this research, a figure of 31 tonnes per hectare was extrapolated.

At 31 tonnes per hectare, the yield from 21 ha would be 179 tonnes. When this is combined with estimates from other land types within the site (see table), the total figure for potential urban agriculture rises to 9 ha with a combined yield of 267 tonnes.

Based on the neighbourhood population of 16,245 persons and the average UK weekly vegetable consumption of 1,600 g, it can be estimated that the urban agriculture yield of 267 tonnes would provide 26 per cent of the average domestic vegetable requirements for each resident in the test site.

Table Land use types, their potential for UA and possible yields

Area Type	Total (ha)	UA as % of Total <sup>1</sup>	UA area (ha)	Potential Yield per (ha) <sup>2</sup>	Total Yield for UA (tonnes)
Public Space	21.39	26.75	5.72	31.28 tonnes	178.99
Private Gardens	11.88	14	1.66	31.28 tonnes	52.05
Allotment	0.39	100	0.39	31.28 tonnes	12.20
Dog Exercise	0.44	14	0.06	31.28 tonnes	1.93
Private Sq	0.32	14	0.05	31.28 tonnes	1.40
Derelict	0.50	100	0.50	31.28 tonnes	15.64
School	0.09	14	0.01	31.28 tonnes	0.40
City Farms	0.52	25	0.13	31.28 tonnes	4.07
<b>TOTAL ha</b>	<b>35.53</b>		<b>8.53</b>		<b>266.63</b>

Calculations on what impact this urban agriculture production would have on CO<sub>2</sub> emissions were based principally on removing the corresponding transport from the food system. To calculate these “food miles”, the 22 varieties of vegetables included in the RHS yield data were bought at the local Tesco supermarket. Using country of origin labelling on each product, a CO<sub>2</sub> emissions calculation was made for a supposed transport mode – lorry, boat, long haul flight (Jones, 2001). This gave an estimated total CO<sub>2</sub> per km for the 267 tonnes of vegetables. The results show that, theoretically, the locally produced vegetables could eliminate 162 tonnes of CO<sub>2</sub> through total localisation<sup>5</sup>.

Although the calculation of food miles is not an exact science and fails to encapsulate the complexities of modern food-delivery systems (Weber and Matthews, 2008), the results demonstrate clearly that urban agriculture can and should be used to reduce the ever-increasing transportation of food, provided that local models are adopted which stress carbon-zero transportation. Urban agriculture could also seamlessly slip into the urban landscape, without dominating current land uses, and help to feed cities.

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Photos: Jamie Barra

“Land can be given a value by translating it into food-energy production”

## Discussion

Within the test site there is noticeably an abundance of highly atomised and undocumented spaces, often with little or no identity<sup>6</sup>. Demonstrated by the disparity between the GIS data obtained from Southwark Council and the GLA, any investigation into productive urban agriculture based on local and region authority GIS data alone would indicate a marked lower potential yield.

Within the food-security debate, a provision of 26 per cent of weekly vegetable requirements represents a significant contribution, especially when considering that this was using only 27 per cent of the total potential space. This figure aligns well with research done in 2000 by Viljoen and Bohn (Viljoen *et al.*, 2005). The results also demonstrate that accurate land quantification can create a critical mass of landscape, which can be given a real value by translating it into food-energy production. The ability of this dormant space to provide a substantial percentage of a primary urban energy need in the form of food should allow for a fuller discussion of food as part of the “essential infrastructure” in cities (Viljoen and Bohn, 2005). Furthermore, the work identifies mapping for urban agriculture as a powerful tool in transforming the discourse of urban planning<sup>7</sup>.

## Note

- 1)For instance, Capital Growth in London ([www.capitalgrowth.org](http://www.capitalgrowth.org)), The National lottery food fund ([www.localfoodgrants.org](http://www.localfoodgrants.org)) and, in 2007, Design of the Times in Middlesbrough ([www.dott07.com](http://www.dott07.com)) are three high-profile examples.
- 2)Two secondary control sites were also selected for mapping: the first, measuring 107 ha, was adjacent to the primary site, while the second 23 ha site was located 1.5 km further South.
- 3)For extensive information on the mapping process see Tomkins, M. 2006: An Edible Urban Landscape available at [www.cityfarmer.org/](http://www.cityfarmer.org/)
- 4)The RHS research was conducted in 1975 on a 10 foot by 30 foot vegetable plot.
- 5)The research also looked at calculating the emissions from petrol lawnmower use.
- 6)Within degrees of magnitude, the two other control sites confirmed the results of the primary site for all results.
- 7)For research into mapping all rooftops in greater London see a thesis by Oscar Rodriguez (available at [www.fcrrn.org.uk/research/library](http://www.fcrrn.org.uk/research/library))

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# Local Food System Develops Resiliency in Charlottesville

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**Institutions across the City of Charlottesville and surrounding Albemarle County, including the Jefferson Area Board for Aging (JABA), the University of Virginia (UVA), public schools, hospitals and restaurants are working to source a higher proportion of their food needs locally.**

These organisations recognise that they can serve an important, catalytic role in moving the region toward a sustainable, resilient food system, thereby strengthening the local and regional economy, and enhancing the health of their respective constituencies, whether students or senior citizens. Their motivations are the same ones driving the national local food movement: fuel price increases and volatility; threat of food supply interruption when relying on sources that are hundreds or thousands of miles away; health concerns regarding industrialised farm output containing pesticides and preservatives; and desire for better-tasting, more nutritious food. Building a viable infrastructure of farm supply and efficient distribution to meet the growing demand for local products also contributes to preserving local farms and job creation. The Piedmont Environmental Council as well as local philanthropic organisations have provided vision, leadership and resources to generate the growing awareness of the benefits of buying food locally.

UVA students and faculty have conducted numerous studies on local food systems, while simultaneously incorporating local food sourcing into their operations. These initiatives and projects have gradually moved the institution in the direction of greater local self-sufficiency. Much of the progressive food agenda has been driven by active student organisations focused on sustainability. Accomplishments include the adoption of a Dining Services Policy favouring the sourcing of local foods from distributors, with a small allowable percentage of increase in cost. Local harvest theme meals have been enormously popular. UVA's Fine Arts Café sources much of its food from local farmers. Students have organised several farmers' markets in the plaza outside the student centre. Students and faculty in the Architecture School's Planning department host a 100-mile Thanksgiving dinner each fall, highlighting dishes with local ingredients, including turkeys from Polyface farm. There has also been much interest in, and work done to minimise food waste.

Another important project at the university has been the development of a vegetable garden. A group of students organised, designed and actively pushed for the creation of

the on-Grounds garden. After protracted discussions and a search for a site, the garden opened in spring, 2009. The food grown will likely make its way to local food banks, and may be featured in UVA dining halls.

Food and food production topics have been incorporated into the curriculum in significant ways. A community food systems class is taught in the Department of Urban and Environmental Planning each year, and student projects help to stimulate local food initiatives. For example, a community food group was formed called "EAT Local". Much community discussion and re-thinking of the local food system has occurred in response to the students' work. A recent course focused on developing benchmarks for evaluating progress in moving the region toward local food sourcing. Local food has become an important subject in other Planning classes, including a Sustainable Communities course. Students helped develop an "Edible Charlottesville" map, a beginning tabulation of the existing and potential food growing sites in the city. UVA Architecture faculty is increasingly interested in local food systems as well. In Spring, 2009, several studio classes centred on designing for food production.

Increasingly we understand local and regional food production, processing and distribution to be an essential form of community infrastructure, and important elements in any healthy community. Food is now seen as a key dimension in place-making, the strengthening of bonds between residents and the landscapes that sustain them. Local food production is also about deepening roots, and enabling food heritage to connect different generations in a community. Research on the challenges and opportunities of local food sourcing lends itself to multi-disciplinary collaboration. UVA's Darden School of Business and an Architecture School team worked together on the *Jefferson Area Board for Aging Community Food System Project*, whose research was funded by the UVA Institute on Aging and JABA.

JABA operates residential facilities and meal provision services for senior members of the Charlottesville community. It serves 3500 meals a week to its clients, and may see that number triple by 2010. Sixty per cent of JABA's "food" clients have incomes below US\$15,000/year. JABA sought innovative ideas to help meet its goal of providing fresh, nutritious meals that improve the health and quality of life not only of its clients, but also of the larger community. The student researchers analysed JABA's local food procurement patterns and processes and made recommendations for expanding local food purchasing by implementing new



*Faculty, staff and students enjoy the Darden Market with local producers.*

Photo: : Susan Wormington

procurement strategies and working more closely with local farmers.

The students examined local supply and demand dynamics for vegetables and fruit, and studied best practices from other U.S. communities active in local food access for seniors. The researchers also mapped out the existing local “food-shed” in the Charlottesville area, including retailers, farmers’ markets and restaurants. They interviewed farmers to determine what pricing, scheduling, and resources would be necessary for them to increase supply to local institutions such as hospitals, senior care centres, schools and restaurants. The research also looked at the benefits of local food freezing and processing, and explored extensions to the growing season through greenhouses. Key findings of the report were that reducing price variability through better management of demand, creating additional distribution infrastructure to get foods from the farm to the table, and advance contracting with farmers are all necessary to build a more robust local food system for JABA and other area institutions. Important financial dimensions were highlighted, such as payment practices, as most institutions pay in 30 days, whereas local farmers need to be paid within two weeks.

The research has not only contributed to JABA’s efforts on behalf of its clientele, but has also focused greater attention on the benefits of local food for community members of all ages. It has encouraged activity that is designed to build a stronger local food production and distribution network for the Charlottesville area. The project has served as a platform for developing a farmers’ market food distribution process for those living in public housing, which includes gleaning surplus product, using food stamps at the market, and creating a local currency to enable low-income persons of all

ages to purchase the vegetables and fruit.

Great opportunities exist for local food businesses to create innovative distribution networks and customer relationships. Since completion of the JABA research study, two Charlottesville entrepreneurs have founded the Local Food Hub, a non-profit organisation designed to support local food producers. They will offer large-volume wholesale purchasing, delivery and consolidation of product, as well as liability insurance. This will simplify the purchasing process for buyers and sellers, and address some of the issues identified in the study.

This year the Darden School of Business also hosted the inaugural meeting of the Virginia Food System Council, a group of over twenty representatives from different parts of Virginia’s food system, including production, distribution and consumption. Darden itself is increasing the amount of local food it purchases, supporting its goal to be a zero waste, carbon neutral enterprise by 2020. The School will continue to make available research opportunities for students interested in food entrepreneurship and local food systems.

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# Beyond Food Security: Urban agriculture as a form of resilience in Vancouver, Canada

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**The more people become sequestered in cities and insulated from ecological engagement, the greater the danger is that they will lose sight of the mounting economic, social and ecological burden that we are imposing on the earth's resources and systems.**

In the context of examining the role of urban agriculture in building resilient cities, our research at the *Institute for Sustainable Horticulture* in British Columbia, Canada, attempts to answer the question: *How can urban and periurban agriculture be tied directly to the economic, social and ecological vitality of our cities?* We believe the answer lies in part in building sustainable bio-regional, agri-food systems, as a necessary pre-condition for creating food sovereignty.

The metropolitan Vancouver region of south-west British Columbia (B.C.), Canada, is an amalgamation of 21 cities and municipal districts, encompassing 282 million ha, including 41,000 ha of farmland, with a population of 2.1 million. Metro Vancouver has a long and rich agricultural heritage and remains an important part of the province's agriculture sector. The region currently generates 25 per cent of B.C.'s gross farm receipts from 14 per cent of its agricultural land base. Smaller, family owned and operated farms still dominate (88 per cent are smaller than 26 ha), but the number of farms has declined by 25 per cent in the last 10 years. The average farmer is 55 years old, and farmland has become prohibitively expensive for those who are interested in starting out.

Efforts to promote the expansion of urban agriculture in this region range in scale from grassroots activism (such as community gardens and farmers' markets), through design parameters (such as green roofs and edible landscaping), to public policy initiatives (such as the City of Vancouver's *Food Policy Council* (Mendes, 2006), *Sustainability Charters* proclaimed by several municipalities, Metro Vancouver's *Regional Growth Strategy*, and the *Agricultural Land Reserve* maintained by the Government of British Columbia). At the same time, however, there is a growing awareness in our region that the combined effects of peak oil/peak water, climate change, rapid urbanisation and continued population growth have the potential to undermine the resilience of our cities, threaten our food security and ultimately not result in a sustainable agri-food system for the Metro



*A vision of the Farmscape Vancouver*  
Photo: Michael Marrapese

Vancouver region. Evidence of the convergence of these forces was felt in 2008 when the overall inflation rate was 1.2 per cent while food costs in general rose 7.3 per cent, cereal products 12.4 per cent and fruits and vegetables a staggering 26.9 per cent.

*The Agricultural Land Reserve (ALR) is a precedent-setting provincial regulation intended to conserve agriculture land and enhance agriculture in British Columbia. For the last 30 years it has been a de facto urban growth boundary, which has resulted in a metropolitan area that is significantly more compact than most in North America. While this has been a positive outcome, ALR land values have risen to CAD\$ 250,000 or more per ha - a cost that cannot be supported by typical farm receipts. Urban agriculture and related efforts to support the ALR are necessary to increase sustainability and contribute to resilience in British Columbia, but they are not sufficient to achieve full sustainability and reconnect urbanity to its roots in the land.*



Peri-urban agriculture land in Metro-Vancouver  
Photo: Graham Osborne

In Canada, municipalities have a pivotal role to play in laying the foundations for a sustainable 21<sup>st</sup> century urban-centred society. Resilience and adaptability are examples of the type of potentials that we believe to be essential for creating sustainable futures for our cities and their associated agricultural lands. Urban agriculture, defined to include farming in and around cities for and by residents of those cities, can provide the comprehensive social, environmental and economic integration needed to create a sustainable agri-food system at the municipal scale.

The B.C. Ministry of Agriculture and Lands' recent publication: *British Columbia Agriculture Plan: Growing a Healthy Future for B.C. Families* calls for enhanced community-based/ local food systems that ensure food security through diverse local production, environmental stewardship / climate change mitigation and linkages across the urban/agriculture divide. At Kwantlen Polytechnic University, the Institute for Sustainable Horticulture (ISH) is responding to this call by making the advancement of urban agriculture and food sovereignty a programmatic priority. The institute is engaging community partners in applied research and using the land base to create living laboratories. Two examples can serve to illustrate our emergent focus.

We are promoting a dialogue across Metro Vancouver through which citizens, NGOs, governments and institutions of higher education can build partnerships and explore ways to create urban-focused, bio-regional agri-food systems that can, in tangible and substantive ways, connect urbanites to agriculture and contribute to regional food self-sufficiency. In a recent publication, *Agricultural Urbanism and Municipal Supported Agriculture* (2008), we advance our view of urban and peri-urban agriculture as a mechanism whereby municipalities can make municipally owned lands available, at affordable cost, for agriculture enterprise. In this approach, municipalities would procure lands to facilitate the development of an agri-food sector that serves its citizenry and thereby fosters

increased food security. A companion paper, *Agriculture on the Edge* (2009), addresses the central challenge of the increasing value of land in the region, and the pressure this creates for the remaining viable agricultural lands that face the continuous threat of encroachment by urban sprawl. The proposed solution is to reserve part of the rural-urban fringe land for agriculture, and to seek to maximise the value of this land. A new zoning designation would transfer a portion of this land to public ownership (to be held in perpetual trust for agriculture only). In addition the value of non-agricultural land use could be used to support this new urban agriculture infrastructure. To model this concept, a partnership of a local developer, broad community stakeholders, and ISH have designed a plan for a model community - a high density, 5000 person development - in which agriculture (on 100 designated ha) will be central to community economics, sustainable design and land use governance.

Our second example involves a partnership between ISH, the City of Richmond and two Richmond area NGOs. Together they plan to develop the **Richmond Farm School** in recognition of the fact that farmers in our region are aging and that developing urban agriculture in Metro Vancouver will require many knowledgeable, skilled and dedicated people. The objective is to prepare a new generation of urban farmers to engage in urban agriculture enterprises including production, processing, adding value, distribution, marketing and sales. The school will also develop the participants' leadership capacity to advance urban agriculture as an element of sustainable cities. This partnership and the land access programme are unique in North America.

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# Carrot City: Designing for urban agriculture

Diana Lee-Smith

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**Resilient cities and buildings that work with nature instead of against it have to be designed by professionals who have been trained in and are focused on sustainability. The landmark Carrot City show at Toronto's Design Exchange brought designers, planners, architects and the general public up-to-date on developments in designing for urban agriculture.**

## Green vision in the stock exchange

Despite the fact that food production, processing and consumption together constitute perhaps the most basic aspect of resilience for human communities, recognition of this has been slow in the design and planning professions. This is now starting to change. For Toronto it all started when a few students at Ryerson University chose buildings that incorporated urban food production as subjects for their architecture classes in 2006. The idea really took off and the core group linked up with others in schools of architecture, planning, design and landscape architecture across the city, eventually across the country, and even in other parts of the world.

"Carrot City, Designing for Urban Agriculture" is an exhibition that ran at the Toronto Design Exchange throughout March and April of 2009, and was curated by June Komisar, Mark Gorgolewski and Joe Nasr of Ryerson University. It

*Bagriculture: Growing bags for portable urban agriculture in small spaces, places with no or contaminated soil, or temporary locations.*

Topher Delaney Artist/Landscape Architect 2009



*Parking Space Community Garden Plot by Hellmann's Canada.*

Photo: Joe Nasr 2007

brought the vision of a green city (in which vegetables are grown and even livestock are raised) into the heart of Toronto's financial district, symbolically perhaps into the old Stock Exchange building. There are also plans to show the exhibition elsewhere and to produce a book. The exhibition showed how increasing interest in growing food within the city, supplying food locally, and food security in general, is changing urban design and built form. Projects in Toronto and other Canadian cities illustrated how the cities and buildings are changing, while relevant international examples showed how ideas from other countries can be integrated into the Canadian experience. The Carrot City collection of displays is divided into four parts: city, community, building (home or work) and products.

## Imagining the productive city

Despite the historical importance of food in cities, food production, distribution and related issues represent a new area of study for the building professions. Re-imagining the buildings and spaces within the city empowers designers to develop exciting and imaginative new proposals for what a future "productive" (and more resilient) city may look like.

The city level part of the exhibition looked at transformations of urban space that go beyond particular sites, pointing to new ways of imagining urban areas. An influential concept explored here was the idea of "Continuous Productive Urban Landscapes" (also see UA-Magazine no. 15), which link underused spaces such as riverbanks, median strips, public parks, schoolyards and boulevards for continuous urban food production. Large-scale public planning initiatives in Canada that incorporate urban agriculture within a larger master plan include the Mayor's Tower Renewal Project and Downsview Park in Toronto, and the Olympic Village of South East False Creek in Vancouver. The ambitious thinking

reflected in some of the concepts presented, such as Vertical Farms and Pig City, are purposely provocative, but other projects such as "Making the Edible Landscape" demonstrate that these ideas are not merely speculative but can be realized.

### Food production in communities

The process of designing for food production in, and with, communities has the potential for strengthening community cohesion. Yet the emerging alternative food movement in Canada has only just begun to take advantage of the possible contributions that designers and the design process can offer. The built environment and food policy meet at the point where architects and landscape architects incorporate farmers' markets, greenhouses, edible landscapes, living walls, permeable paving, green roofs, and community gardens into architectural programmes. Such connections between food issues and built form have the potential to transform not only food production and distribution, but basic assumptions about the programming required in the design of buildings and urban spaces.

This part of the exhibit presented projects, ranging from community greenhouses to community food centres, that house initiatives such as teaching people to grow food, helping to develop and manage allotment and community gardens, assisting in the development of food-centred micro-enterprises and supplying food banks and soup kitchens with fresh produce they otherwise lack. Neighbourhood-scale initiatives such as Growing Home in Chicago and Growing Power in Milwaukee have shown how urban gardening can have the power to transform communities through educational initiatives, back-to-work programmes, improved access to affordable and healthy food, and the creation of a focal point for the community. The exhibition showed how designers can play their part in this transformation.

### Designing buildings for food at home and at work

From restaurants to hotels, from condominium complexes to row houses, the projects in this part of the exhibition illustrated how to get food production closely linked to where it

*Mole Hill neighbourhood community garden, Vancouver, British Columbia.*

Photo: Joe Nasr 2008



*A proposed library with a rooftop urban agriculture garden for the UNESCO World Heritage City of Ouro Preto, Brazil.*

Photo: Jorge Silva, designer, 2008

is processed and consumed. Since design is the integration of many variables, buildings can provide a variety of benefits, including thermal performance improvements from productive green roofs and green walls that act as insulation and buffer layers. Chefs can offer fresh herbs in winter from their own greenhouses, and families can have vegetables from their front yard or rooftop that taste better than anything they can buy in the store.

Compelling ideas presented in this part of the exhibition included the integration of food production in alternative spaces, such as co-housing, orchards and allotment gardens on rooftops, and community gardens in laneways. All home and work spaces were shown to be potentially productive, from front lawns to flat roofs. But this was not all "pie in the sky". Alongside the student and other visionary projects were examples of buildings already in use and under construction. Toronto is already home to many green roofs and buildings and it has now adopted a green roof policy, by passing a by-law that requires such roofs on new buildings of most types.

### Product design for urban agriculture

Urban agriculture requires a toolbox of objects, technologies, systems and components that can enable food production to take place in urban locations or can incorporate it into building design. Shown in this section of the exhibit were designs from around the world, either proposed or currently in use, that foster urban agriculture. The term "products" describes ideas that are not site specific but can be applied in various locations and situations. These include technologies such as living walls, green roofs, planter systems, chicken coops, beehives, vertically integrated greenhouses, and mobile support structures. Several products that were shown tackle the problem of urban soil remediation through container gardening. Other designs solve the problem of small growing spaces or deal with existing roofs that cannot support heavy planters. While some of these items are based on sophisticated principles and state-of-the-art techniques, many use off-the-shelf components that provide creative urban agriculture solutions for a variety of challenges.

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# Agricultural Biodiversity Strengthening Livelihoods in Periurban Hyderabad, India

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Johanna Jacobi  
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Philipp Weckenbrock

**In periurban Hyderabad, India, leafy vegetables are increasingly grown along the Musi River and sold in urban markets. This agricultural biodiversity can significantly help urban and periurban farmers become more resilient to the impacts of such changes.**

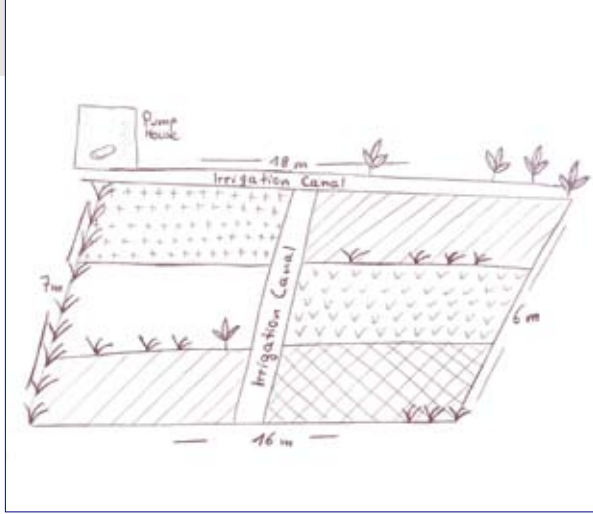
Previous studies showed that periurban agriculture in Hyderabad plays an important role in the livelihoods of a diverse group of people from different castes, religions and social classes (Buechler & Devi, 2002). These livelihood activities are subject to transition and are influenced by the constant growth of the city, with resulting effects like increasing pollution, growth of urban poverty, food insecurity and malnutrition.

Woman harvesting spinach (*Spinacea oleracea*)  
Photo: J. Jacobi



During a field study in 2007 (in cooperation with the International Water Management Institute (IWMI) and the University of Freiburg, Germany (IPG/APT)), a rapid appraisal of vegetables cultivated with wastewater irrigation was carried out<sup>1</sup>. A large number of vegetable varieties appeared to flourish in the vegetable gardens, unexpectedly also in those where wastewater was used for irrigation. Even though paragrass, a fodder plant, and rice were the dominant crops in the periurban fringes, the vegetable gardens played an important role by supporting the livelihoods of small-scale farmers, many of whom were women (Buechler & Devi, 2002). Spinach (*Spinacia oleracea*) was grown on nearly one third of the area under vegetable cultivation. Other important crops included amaranth (*Amaranthus tricolor*) and roselle (*Hibiscus acetosella* var. *sabdariffa*). These leafy vegetables - traditionally in high demand - have a short growing season and fetch high market prices due to their usage in traditional dishes. In 2008, the study was extended to compare crop diversity in different irrigation systems and to explore its role in the livelihoods of smallholder farming groups. This phase of the study used the home garden model, which is based on the sustainable livelihoods approach, as theoretical background (Drescher *et al.*, 2006; Drescher 1998). GIS mapping was carried out to capture richness and abundance of varieties and the extent of vegetable cultivation; and semi-structured interviews were conducted with vegetable farmers.

No significant differences were found in the biodiversity indices (Shannon-index or Simpson-index) of gardens that used groundwater compared to those that used wastewater for irrigation. Crop diversity played an important role in both systems in strengthening the resilience of smallholders, allowing them to spread risks such as yield loss or decreasing demand for a certain vegetable. Perennial crops and intercropping were common among farmers who owned the cultivated land and disposed of a well, but more than 70 per cent of the interviewees were in an insecure situation concerning land tenure. Therefore, fast-growing leafy vegetables were cultivated, mostly with wastewater irrigation. These farmers were exposed to pollutants like pesticides and industrial effluents, and fluctuating prices of food, seeds, pesticides and fertiliser. Only one third were native of Hyderabad. The evaluated monthly income from vegetables (in September 2008) per person was INR 1617.20<sup>2</sup>. On average, 4.8 people were farming per acre, so the cultivation was very intensive. Almost half of the participants had secondary sources of income besides vegetable cultivation, for example



Schematic sketch

Photo: J. Jacobi

fodder grass or dairy production. It was thus part of their livelihood strategy to diversify income sources, even though cultivating vegetables was generally regarded as rewarding by the participants.

As the schematic drawing illustrates, the small plots were framed by irrigation canals. Between the plots, mostly cultivated with leafy vegetables, taller plants were grown, either for seeds (e. g. *Amaranthus tricolor*), for tubers and leaves (*Colocasia esculenta*, *Ipomoea batatas*) or perennial plants (*Lagerstroemia parviflora*). 54 varieties of vegetables from 20 families were mapped and identified in the three periurban villages in the research area. Among the vegetables mapped, 18 (including cabbage) were cultivated for the leaves, most of which were usually cooked like spinach.

### Reasons for cultivating a broad diversity of vegetables

More than 80 per cent of the respondents mentioned economic reasons for a high crop diversity. Statements such as “More varieties mean more customers and therefore more money” indicated a diversified demand. The need to react to variation in prices was also mentioned, and house-to-house sales practised by some respondents required a broad range of products as well. More than half of the participants said that diversity rendered them less vulnerable to pest infections and yield losses. All agreed that a broad diversity was desirable and the three persons with the lowest diversity (six varieties) mentioned their age and lack of external labour as reasons for not cultivating a larger number of different crops. A broad diversity mitigates vulnerability and can therefore be regarded as a strategy to strengthen resilience (Cromwell, 2001).

### Farmers’ adaptation strategies

Several adaptation strategies of the smallholders interviewed were evaluated during the study and previous research. These strategies helped make them more resilient to economic and ecological stress factors associated with the growing city, limited resources and socioeconomic changes:

- Adaptation to global change in the form of physical water scarcity in South India can be observed by migration to periurban fringes (the majority of the respondents came to Hyderabad in search of work and water), where wastewater is a reliable, uncontested source of irrigation water

that makes it possible to cultivate vegetables throughout the year.

- The study shows an adaptation through high crop diversity to several risk factors such as attacks by pests, yield loss, e.g. through heavy rainfall during the monsoon, and falling market demand and prices.
- Adaptation to the growth of the city can be observed in the selection of crops with a short growing season, which allows migration to other plots when the land is sold for construction, as was observed during the study.
- A short-term cropping system of 2-4 weeks allows farmers to react to market demand and insecure land tenure: most of the farmers reported that they cultivate fast-growing leafy vegetables like amaranth and spinach in order to guarantee a daily income and be able to pay the monthly rent (70 per cent leased the land on a monthly basis with no guarantee of continuation beyond the following month).
- Producing perishable goods like leafy vegetables close to the markets where they can be sold freshly has the advantage of short transportation routes.
- Through cultivation of their own vegetables, producers can reduce their families’ food expenditures, which enhances their resilience with respect to the global food crisis.
- The cultivation of leafy vegetables is also in part an adaptation to the use of polluted water. Leafy vegetables can cope with the high nitrogen supply better than fruit-bearing vegetables, and can be harvested earlier than those irrigated with groundwater due to the fertilising effect of polluted water (amaranth: 15-30 days reported in the study, 30-50 in the literature).
- Irrigation regulation helps to alleviate risks from polluted water: several farmers stated that the fields were not irrigated on days when industrial effluents were released. These days were known to the farmers by experience.

The direct advantages of crop diversity for the farmers are enhanced food security through **dietary diversity** (providing

Field preparation in Parvatapuram near Hyderabad

Photo: J. Jacobi







*Amaranth (Amaranthus tricolor), red and green variety*  
Photo: J. Jacobi

minerals, vitamins and proteins) facilitated by self-consumption of the cultivated vegetables (mentioned by all participants), and income generation to improve **financial assets** through the sale and bartering of their produce.

**The indirect advantages** of crop diversity are **adaptation** to fluctuating input prices and water scarcity (through the use of the reliable wastewater source) and **reduction of risk** through cultivation of plants with different agro-ecological requirements (losses due to the failure of one particular crop can be compensated with the yield of another).

Despite these advantages of cultivating a variety of crops in the urban environment, the producers' livelihoods remain insecure in terms of ecological, social and economic aspects. The use of wastewater, for example, entails health risks, especially the direct risk posed by industrial wastewater polluted with chemicals. An **indirect** economic risk is also posed by soaring fertiliser prices.<sup>3</sup>

## Conclusion

Although there are only a few hundred vegetable growers along the Musi, in a city of seven million, these farmers provide an important diversity of fresh vegetables to the

*Diversified vegetable garden near Hyderabad*  
Photo: J. Jacobi



markets of Hyderabad. The study indicates that this agricultural biodiversity is perceived as an important form of 'natural capital' in the livelihoods of farmers. It is determined mostly by the direct economic benefits to farmers, and in small part also by the type of irrigation used and ecological factors. Crop diversity is thus much more than a short-term adaptation strategy; it is part of the entire livelihood strategy. However, it should be assured that industrial effluents are separated from domestic effluents. This poses fewer risks and is more profitable for urban and periurban farming (Krishnagopal & Simmons, 2007). Cultivating a high diversity of crops in a sustainable way is knowledge intensive. Therefore, these periurban farmers need to be assisted in meaningful ways, such as by setting up farmer field schools and focussing the efforts of agricultural extension services on small-scale farmers.

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### Note

- 1) The water from the Musi River, which is polluted by more than 600 million litres of wastewater per day (Krishnagopal & Simmons, 2007) and from the sedimentation basin Nallah Cheruvu (Telugu for black lake) was classified as wastewater. Later, a sewage plant was constructed upstream with a capacity of around 339 million litres per day.
- 2) € 24.70, currency rate March 2009.
- 3) The Guardian, August 12th, 2008: "Soaring fertiliser prices threaten world's poorest farmers". The Hindu 15. 8. 2008: "Millions could starve as fertiliser prices soar"

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# Optimising Use of Water for Urban Agriculture: Responding to the challenge of growing water scarcity in Tunisia

Boubaker Houman  
Bouraoui Moez

**The growing scarcity of water in many regions around the world is a major challenge for the future. Irrigated agriculture is the main user of water in many countries, including in Tunisia, where the productive use of recycled urban wastewater and the use of rainwater, along with more efficient water use in agriculture, contribute to more sustainable production of food for its growing cities.**

Water availability in Tunisia is as low as 350 m<sup>3</sup> / inhabitant / per year. Since the early 1970s, the use of treated wastewater for irrigation has helped to sustain agricultural activities in periurban areas. However, the Tunisian government's severe restrictions on wastewater use significantly constrain agricultural diversification, and force farmers to abandon what is now a barely profitable sector.

Located six kilometres from the capital of Tunisia, La Soukra city was a veritable green belt for Tunis until the 1980s. Since then, socio-ecological stability has decreased, and now 32 per cent of the area's agricultural land lies fallow, threatened by urbanisation. To maintain agricultural activities in the area

*Visiting the pilot in La Soukra, Tunis*  
Photo: Marielle Dubbeling



and enhance the city's resilience to possible future effects of climate change and increasing urban food insecurity, research is being undertaken by the Club Unesco Alecs pour le Savoir et le Développement Durable (a local NGO). The research focuses on improvement of the socio-economic conditions of small farmers of La Soukra city by making use of rainwater and treated greywater in urban agriculture, and is part of the UPE Focus Cities Research Initiative, financed by IDRC-Canada. The research project seeks to develop participatory models for the sustainable management of water resources in urban agriculture, foster the creation of small agricultural family enterprises, establish a greenhouse agricultural system, and integrate hearing-impaired youth in practical activities to enhance their community integration.

Over the past six months, two pilot projects were initiated to further study the scientific, technical and socio-economic aspects of setting up units for the collection, storage, and use of rainwater and greywater for various greenhouse crops (strawberries, tomatoes, lettuce, paprika and ornamental plants). Data gathered so far show that there is a potential to collect 380 cubic metres of rainwater from a total area of 700 m<sup>2</sup> roof and 250 m<sup>2</sup> greenhouse, which (after temporary storage) would allow irrigation of 500 m<sup>2</sup> of crops in the greenhouse. With this system, yields, of tomato for example, could go up to 6000 kg per greenhouse. This offers farmers a new source of income.

Similar models will be installed for another 20-40 producer families in La Soukra in the coming year. The results will be disseminated nationally and internationally to assist in improving living conditions for poor populations and in reducing pressure on the environment.

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[www.idrc.ca](http://www.idrc.ca)

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



# Urban Agriculture and Resilience in Lisbon: The role of the municipal government

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Jorge Castro Henriques

**In recent years, urban agriculture in Lisbon has become more widespread and has received unprecedented media coverage. News articles have appeared on the expansion of agriculture within the city and its suburban areas and on the urban poor who grow vegetables in response to the current crisis. In this way, society has been contributing to the city's resilience.**

However, despite a few initiatives in the late 1990s, municipal authorities were initially slow to grasp the real importance of this activity. There was little or no planning of urban agriculture and the existing legal framework still does not provide any protection to those practicing it. Only in the last couple of years have these matters been finally addressed by the municipal government. This paper describes the recent developments in urban agriculture in Lisbon and the contribution of municipal intervention for enhancing the city's resilience.

## General features of urban agriculture in Lisbon

An extensive overview of urban agriculture in Lisbon has been given by Madaleno (2001). Urban agriculture is a legacy from a distant past. Vegetable patches (*hortas urbanas*) remain a part of the city's character, to the extent that its inhabitants still bear the affectionate nickname of "little lettuces" (*alfacinhas*). Historically, Portuguese town-planning included spaces for small-scale agriculture within the city (Rossa 1998), and despite the relentless urban sprawl of

*Hortas Urbanas*

Photo: Jorge Castro Henriques



the last decades, *hortas urbanas* are still part of the cityscape.

Much of the land farmed (legally or illegally) within the city belongs to the municipality, a circumstance that heightens the local authorities' responsibilities. They should therefore implement UN guidelines regarding urban agriculture, such as UN Habitat (in which urban agriculture is seen as part of "sustainable urban development") and FAO, whose focus is on "food security"<sup>1</sup>. Moreover, as a member of the European Network of Healthy Cities, Lisbon should take into account WHO's charters that call for the promotion of urban agriculture as a means to increase the amount and distribution of locally grown food, especially fresh vegetables, which provide several health benefits<sup>2</sup>.

## Designing resilience: the Green Plan

Portuguese urban planning laws require each municipality to draw up its "municipal ecological infrastructure" (*Estrutura Ecológica Municipal*), in order to "protect its values and natural, cultural, agrarian and woodland resources"<sup>3</sup>. On October 2007, the Municipal Assembly of Lisbon ruled that the land use defined in the existing comprehensive plan (*Plano Director Municipal*)<sup>4</sup> must incorporate the *Green Plan* (*Plano Verde de Lisboa*) as the "municipal ecological infrastructure". This decision opened up new possibilities for the development of urban agriculture in the city, as the *Green Plan*, designed by the renowned Portuguese landscape architect Gonçalo Ribeiro Telles, defines a city-wide 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. The idea is to form so-called "green corridors" crossing the city that link various land uses, such as *hortas urbanas*, urban parks, gardens, bicycle lanes and footpaths.

## Building resilience: Urban Agriculture Strategy

After approval of the *Green Plan*, the Lisbon municipality created a working commission for urban agriculture (*Grupo de Trabalho de Agricultura Urbana*). One of the results of their work was the Urban Agriculture Strategy (*Política do Pelouro de Ambiente, Espaços Verdes e Plano Verde para a Agricultura Urbana*). This document maps the areas currently dedicated to urban agriculture that are to be integrated in the comprehensive plan. It also underlines how important urban agriculture sites are to the city, namely because of the city's dependence on imported fresh vegetables, the rising prices in the international food markets, and the added income urban agriculture provides for many families.

Another factor mentioned in the Urban Agriculture Strategy



*Hortas comunitarias in Lisbon*

Photo: Jorge Castro Henriques

is the importance of urban agriculture in dealing with possible food shortages. This relates to concern about the city's resilience. You never know what can happen tomorrow - disruptive events, from natural disasters to war, can occur suddenly and forcefully. For example, Lisbon is located in a seismic region and has experienced frequent earthquakes, including one in 1755 that was among the worst in human history.

The Urban Agriculture Strategy recommends that the major part of urban agriculture takes place in agricultural parks (*Parques Agrícolas*). These will consist of organised structures that can be used by the farmers, but are also open to visitors.

The letting of the hortas in agricultural parks will be based on a proposed municipal regulation (*Regulamento Geral de Agricultura Urbana*)<sup>5</sup>, which will establish a contract between the municipality and the users that clearly states the rights and duties of each party, namely concerning the utilisation of the collective space. The users of the agricultural plots will be responsible for their maintenance and will have to adhere to specified rules. The municipality will be responsible for surveillance and assurance of proper use.

The agricultural parks will have "social" and "community" plots (*Hortas Sociais ou Comunitárias*). These hortas will be, or already are<sup>6</sup>, situated near poorer neighbourhoods and access will be open to all those willing to cultivate a plot. Access will be based on certain criteria that will give priority to those who are more threatened by the current economic context (unemployed, elderly or low-income people). Most of the production will be oriented towards self-consumption, however, the possibility of commercial production is also being considered. In this way urban producers could earn a supplementary income or even a living, by supplying the local markets.

However, in these parks there will also be space for "recreational" plots, which are expected to have a positive impact on leisure and facilitate more contact with nature, and hortas with "educational" purposes (*Hortas Pedagógicas*), whose aim will be to involve schools and local networks in urban agriculture.

The last category being envisaged by the municipality is very

sensitive as it comprises the hortas in municipal lands that are currently being used without any contract or license (*Hortas Dispersas*). These are scattered all over the city, including in areas contiguous with freeways. This "informal sector", at least in the short term, will be tolerated and offered some assistance.

## Conclusion

The increase in urban agriculture in Lisbon has been part of a spontaneous response to a widespread sense of crisis, attesting to the resilience of the people of this city. However, the citizens involved have much to gain from municipal intervention, which can provide and operate the communal infrastructures so important for agriculture. The municipality is also in an ideal position to design and apply a comprehensive strategy for its territory and to protect the rights of the urban farmers. In short, municipal intervention is instrumental for urban agriculture, which, as a vital source of food in times of crisis, is in turn instrumental for the city's resilience.

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### Note

- 1) Habitat Agenda and Rome Declaration
- 2) Urban and Peri-Urban Food and Nutrition Action Plan
- 3) DL n.º 380/99, de 22 de Setembro - Regime Jurídico dos Instrumentos de Gestão Territorial - State Decree related to Urban Planning instruments.
- 4) The Plano Director Municipal is a land use plan covering the area of the municipality.
- 5) Regulation still to be approved by the Lisbon Municipal Council and Assembly.
- 6) It is important to mention that the "green corridors" that have been planned include areas, mostly on municipal land, that are already occupied by urban agriculture as well as others that are not.

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# Books

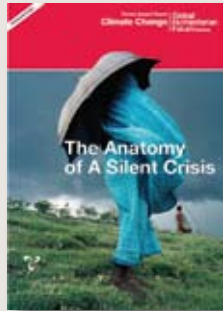
## further readings

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**Human Impact Report. Climate Change: The anatomy of a silent crisis**

**Global Humanitarian Forum, 2009**

This is the first-ever, comprehensive report looking at the human impact of climate change. Its findings indicate that climate change is responsible for hundreds of thousands of deaths each year, and it affects hundreds of millions of lives. Climate change is a serious threat to close to three quarters of the world's population. Half a billion people are at extreme risk. Worst affected are the world's poorest groups, who are the least responsible for causing climate change. The report also includes an estimate of the economic cost of climate change. For more information please contact: [media@ghf-geneva.org](mailto:media@ghf-geneva.org)



**The Right to Survive: The humanitarian challenge in the twenty-first century**

**Tanja Schuemer-Cross and Ben Heaven Taylor, Oxfam International, 2009**

This report projects that, by 2015, this number could grow by 50 per cent to an average of more than 375 million people, and shows that the humanitarian challenge of the twenty-first century demands that the humanitarian response needs to change.

To download the report go to:

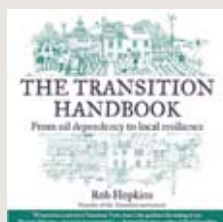
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**The Transition Handbook: From oil dependency to local resilience**

**Rob Hopkins, 2008. Published by Green Books**

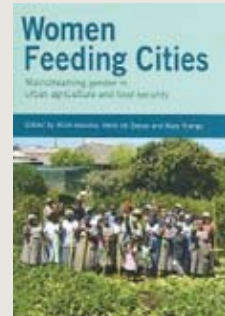
We live in an oil-dependent world, and reached this level of dependency in a very short space of time, using vast reserves of oil in the process – without planning for when the supply is not so plentiful. Most of us avoid thinking about what will happen when the world's supply of oil runs out (or becomes prohibitively expensive), but The Transition Handbook shows how the inevitable and profound changes ahead can have a positive outcome. These changes can lead to the rebirth of local communities, which will grow more of their own food, generate their own power, and build their own houses using local materials.



**Women Feeding Cities: Mainstreaming gender in urban agriculture and food security Practical Action**

**Alice Hovorka, Henk de Zeeuw and Mary Njenga (Editors), 2009**

The book analyses the roles of women and men in urban food production, processing and marketing in case studies from three development regions and includes field-tested guidelines and tools for gender mainstreaming. It is essential reading for researchers, policy makers and development practitioners. The publication is based on experiences gained in the context of Urban Harvest, the CGIAR System-wide Initiative on Urban and Periurban Agriculture and The Cities Farming for the Future programme of the RUAF Foundation.



**The Food and Farming Transition: Toward a post carbon food system**

**Richard Heinberg and Michael Bomford, Post Carbon Institute, Spring 2009**

This report, prepared in cooperation with The Soil Association (UK), argues that the best way to make the food system more resilient is to decentralise and relocalise it. Decentralisation and relocalisation of the food system will enhance societal resilience to shocks, but should be viewed as a process that requires planning at the level of government, business, communities, and individuals/families. The report outlines processes for resilience action planning at all levels. Available to download at <http://www.postcarbon.org/food>.

**Negotiating a Place for "Sustainability" Policies in Municipal Planning and Governance: The role of scalar discourses and practices**

**Wendy Mendes in Space & Polity 11 (1): 95 – 119, 2008**

The widespread adoption of sustainability agendas in urban contexts has opened a now well-recognised "policy space", in which sustainability principles are linked with urban development and local politics. A central focus of these agendas is on the need to spatialise debates on sustainable urban development by examining the scales at which locally based tensions are resolved. Using a case study in the City of Vancouver, Canada, this article shows how the adoption of one specific sustainability policy – food policy – was enabled by specific reframing of the scale at which it was assumed to be most appropriately situated, and shows how new strategies for coordinating governance at and between scales were deployed.

# Books

## further readings

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### The Food Economy: Global issues and challenges

**Frank Bunte and Hans Dagevos (Editors), 2009**

The Food Economy looks into existing and emerging issues and challenges related to the expanding food economy. The Food Economy is relevant to academics, students, policy makers and consumers who are interested in recent developments in the food system and their implications for food policy and research agendas in the years to come. For a table of contents and to order the book, go to: [www.WageningenAcademic.com/foodeconomy](http://www.WageningenAcademic.com/foodeconomy)

### Resilience Thinking: Sustaining ecosystems and people in a changing world

**Brian Walker and David Salt, Island Press, 2006**

Resilience is the capacity of a system to absorb disturbance and still retain its basic function and structure. The old approach of maximising efficiency and optimising for particular outcomes and outputs no longer applies to a world in which systems are now being altered by extreme events associated with climate change, as well as other socio-economic forces. Key features valued in a resilient world are diversity (of all types); ecological variability; modularity; slow, controlling variables; tight feedbacks; social capital; innovation; redundancy in governance structures; and the inclusion of all ecosystem services in assessment – particularly those that have gone unrecognised, unpriced or are considered “free”.



### Resilient Cities: Responding to peak oil and climate change

**Peter Newman, Timothy Beatley, Heather Boyer, Published by Island Press, 2009**

Half of the world's inhabitants now live in cities. In the next twenty years, the number of urban dwellers will swell to an estimated five billion people. With their inefficient transportation systems and poorly designed buildings, many cities – especially in the United States – consume enormous quantities of fossil fuels and emit high levels of greenhouse gases. But our planet is rapidly running out of the carbon-based fuels that have powered urban growth for centuries and we seem to be unable to curb our greenhouse gas emissions. Are the world's cities headed for inevitable collapse? More information: <http://www.resilientcitiesbook.org/>

### The Environmental Food Crisis

**UNEP (Nellemann, C. Editor), 2009**

A new rapid response assessment report released by UNEP warns that up to 25 per cent of the world's food production may become lost due to environmental breakdown by 2050 unless action is taken. Prepared by the Rapid Response Assessment Team at UNEP/GRID-Arendal and UNEP-WCMC, the report provides the first summary by the UN of how climate change, water stress, invasive pests and land degradation may impact world food security, food prices and life on the planet and how we may be able to feed the world in a more sustainable manner. <http://www.grida.no/publications/rr/food-crisis/>

### Climate Change and Food Security: A framework document

**Food and Agriculture Organization of the United Nations, 2008**

This document provides background information on the interrelationship between climate change and food security, and on ways to deal with the new threat. It also describes opportunities for the agriculture sector to adapt, as well as how it can contribute to mitigating the climate challenge. The report can be downloaded from: <http://www.fao.org/docrep/010/k2595e/k2595e00.htm>

### Re-framing Resilience: A symposium report

**Melissa Leach (Editor), Economic & Social Research Council, 2008**

The STEPS Centre Symposium, which was held at Sussex University from 24-25 September 2008, set out to explore questions as How do we deal with the spread of HIV/Aids or avian flu? How can farmers in dryland Africa cope with the challenges of climate change? How do we address water and pollution problems in rapidly growing Asian cities? What insights does resilience thinking bring to understanding poverty, vulnerability and marginalisation? It gives implications for practical policy challenges in fields such as climate change adaptation, agricultural innovation, water management and periurban transitions. The report can be downloaded at [www.steps-centre.org](http://www.steps-centre.org)

### Also from UNEP:

**The Natural Fix? The role of ecosystems in climate mitigation.**

**UNEP, 2009:** [http://www.unep.org/publications/search/pub\\_details\\_s.asp?ID=4027](http://www.unep.org/publications/search/pub_details_s.asp?ID=4027)

**Rainwater Harvesting: A lifeline for human well-being.**

**UNEP, 2009:** [http://www.unep.org/publications/search/pub\\_details\\_s.asp?ID=4024](http://www.unep.org/publications/search/pub_details_s.asp?ID=4024)



## [www.resalliance.org](http://www.resalliance.org)

The Resilience Alliance is a research organisation comprised of scientists and practitioners from many disciplines who collaborate to explore the dynamics of social-ecological systems. The body of knowledge developed by the alliance encompasses the key concepts of resilience, adaptability and transformability and provides a foundation for sustainable development policy and practice.

## [www.reliefweb.int](http://www.reliefweb.int)

Reliefweb is an electronic hub for international NGOs and the UN. It offers a global view of the crisis - with updated policy reports and research data on food prices internationally. This is an essential resource for anyone wanting to understand the big picture of our shrinking food security.

## [www.farmtoschool.org/](http://www.farmtoschool.org/)

This growing US farm to school movement is supported by eight regional lead agencies that comprise the National Farm to School Network, which offers training and technical assistance, information services, networking, and support in policy and media and marketing activities.

## [www.transitiontowns.org/](http://www.transitiontowns.org/) / [www.transitionus.org](http://www.transitionus.org)

The Transition Towns movement is UK based and originated with a book by Rob Hopkins, founder of the Transition Network (see page 34 of this issue). Transitions US is a non-profit organisation that supports the development of Transitions Initiatives in the United States to address problems of peak oil, climate change, and the current economic crisis.

## [www.uac-m.org](http://www.uac-m.org)

The project "Megacity Casablanca" analyses to what extent urban agriculture can make a relevant contribution to climate-optimised and sustainable urban development as an integrative factor in urban growth centres (see page 26 of this issue).

## [www.foodsecurity.org/](http://www.foodsecurity.org/)

The Community Food Security Coalition (CFSC) is a non-profit North American organisation dedicated to building strong, sustainable, local and regional food systems that ensure access to affordable, nutritious, and culturally appropriate food for all people at all times. CFSC has over 200 member organisations.

## <http://extras.leisa.info/info-packs/climate/index.html>

On the LEISA website you can find a renewed set of dossiers, called Theme Info Packs. One of the dossiers focuses on climate change. Here you can find additional sources of information relating to this topic and issue 24 of the LEISA Magazine "Dealing with climate change".

## <http://blogs.worldbank.org/climatechange/>

This blog is hosted by the authors of the World Bank's upcoming World Development Report 2010, "Development in a

Changing Climate". It is a forum to get broad-based input on fundamental questions relating to climate change and development.

## [www.fcrn.org.uk/](http://www.fcrn.org.uk/)

The Food Climate Research Network is a UK research-council-funded initiative. It works to research and promote ways of achieving absolute reductions in greenhouse gas (GHG) emissions from the whole UK food chain.

## [www.postcarbon.org/](http://www.postcarbon.org/)

The Post Carbon Institute is a US-based research think tank that takes a holistic approach to the challenges and solutions of a post carbon world. The Institute's goal is to help individuals, families, communities, businesses and governments understand and manage the transition to a more sustainable world.

## [www.ruaf.org/node/2022](http://www.ruaf.org/node/2022)

Here you will find the report of the session called "Urban and peri-urban agriculture for Resilient Cities (Green, Productive and Socially Inclusive)" which was organised by RUAF, IDRC, FAO, Urban Harvest, the Chinese Urban Agriculture Association and the Nanjing Agriculture and Forestry Bureau at the World Urban Forum of UN Habitat from 3 to 7 November 2008 in Nanjing, China.

## <http://moodle.ruaf.org/>

ETC-Urban Agriculture, RUAF in partnership with Ryerson University's Centre for Studies in Food Security and The Chang School developed distance education courses on urban agriculture. *The free and self-paced* (independent learning) course, first two modules, are available here.

## [www.fao.org/nr/climpag/](http://www.fao.org/nr/climpag/)

Climpag is aimed at bringing together the various aspects of and interactions between weather, climate and agriculture in the general context of food security. Climpag contains methodologies, tools for a better understanding and analysis of the effect of the variability of weather and climate on agriculture as well as data and maps.

## [www.grassrootsonline.org/publications/educational-resources/food-thought-action-a-food-sovereignty-curriculum](http://www.grassrootsonline.org/publications/educational-resources/food-thought-action-a-food-sovereignty-curriculum)

Food for thought and action, this food sovereignty curriculum offers a practical way to strengthen a growing food sovereignty movement that includes consumers, farmers, environmentalists and faith communities.

## [www.wmo.ch/pages/food\\_security/index\\_en.html](http://www.wmo.ch/pages/food_security/index_en.html)

The World Meteorological Organisation recommends that countries invest more in urban and indoor agriculture that can assist greatly in providing food for the hundreds of millions of people living in the growing cities of Asia.

## Climate Change Adaptation in Africa (CCAA)

The International Development Research Centre and the UK Department for International Development jointly fund the CCAA programme, which is a research and capacity development programme, that aims to improve the capacity of African countries to adapt to climate change in ways that benefit the most vulnerable. *More information:* [http://www.idrc.ca/en/ev-94424-201-1-DO\\_TOPIC.html](http://www.idrc.ca/en/ev-94424-201-1-DO_TOPIC.html).

## Great Places, Great Cities

[Glasgow, Scotland]

4-5 June 2009

This two-day conference brought together an international audience to discuss the role of public space and green networks in creating truly sustainable cities – cities which have a reduced impact on the environment, which cope better with the consequences of global climate change and where people want to live and work. *More information:* <http://www.greenspacescotland.org.uk/default.asp?page=482>.

## Fifth Urban Research Symposium: “Cities and Climate Change: Responding to an Urgent Agenda”

[Marseille, France]

28-30 June 2009

At a time when climate change is a major priority for the international community, this symposium aims at pushing forward the research agenda on climate change from a city's perspective. Specifically, the main questions are structured around the impacts of city and urban growth on climate change; measuring and anticipating the consequences of climate change on urban quality of life, city assets, and local and national economies; and assessing alternatives to increase the resilience of cities and related costs and incentives required for successful implementation. <http://www.urs2009.net/index.html>

## All Africa Horticulture Congress

[Nairobi, Kenya]

31 August – 3 September 2009

The congress will focus broadly on horticulture for improving livelihoods in Africa. It will be aimed at bringing all stakeholders together, facilitating researcher-consumer-producer interactions for integrating research and creating a forum for African stakeholders in horticulture to exchange ideas, experiences and design coordinated perspectives. In addition, it is expected to promote and facilitate public-private sector partnerships/linkages in horticulture, to give rise to a forum for the dissemination of horticultural research innovations and the joint formulation of proposals, and to encourage training and education in the horticulture industry to attract young and skilled entrepreneurs. *More information:* <http://www.globalhort.org/news-events/all-africa-horticulture-congress/>

## World Climate Conference 3

[Geneva, Switzerland]

31 August – 4 September 2009

The overarching theme of the conference is “Climate prediction and information for decision-making: focusing on scientific advances in seasonal to inter-annual time-scales, taking into account multi-decadal prediction”. It includes the application of climate prediction and information to societal problems enabling adaptation to climate variability and change in various sectors such as agriculture and food security, forestry, energy, water, health, urban and rural settlements, infrastructure, tourism, wildlife, trade and transport that contribute to sustainable socio-economic development. *More information:* <http://www.wmo.int/wcc3/>

## Distance Learning Course on UA: Dimensions of Urban Agriculture (CVFN 411)

Schedule: September – December 2009

This course describes the dimensions (functions, roles, benefits, potential risks) of urban agriculture and how these complement, supplement, compete with, substitute for, or undermine those provided by other land uses, sectoral activities and actors. For more information and instructions on enrollment, please visit [www.ryerson.ca/ce/foodsecurity](http://www.ryerson.ca/ce/foodsecurity) or contact Reg Noble, Academic Coordinator, E-mail: [food@ryerson.ca](mailto:food@ryerson.ca) or [mnoble@ryerson.ca](mailto:mnoble@ryerson.ca).

## How to feed the World in 2050 Conference

[FAO Headquarters, Rome, Italy]

12-13 October 2009

*More information will be available at the FAO website:* <http://www.fao.org/climatechange/home/en/>

## First International Conference on Sustainable Cities

[Morella Michoacan, Mexico]

25-29 October 2009

In principle, cities offer a more favourable setting for the solution of social and environmental problems than rural areas. Cities generate jobs and income. With good governance, they can deliver education, health care and other services more efficiently than less densely settled areas simply because of their advantages of scale and proximity. The density of urban life can relieve pressure on natural habitats and areas of biodiversity. *More information:* <http://www.sustainablecitiesweb.org/enindex.html>

## Urban Greening: Towards Carbon Neutral Buildings and Districts

[Copenhagen, Denmark]

3 November 2009

The University of Copenhagen and the City of Copenhagen are hosting a series of conferences focusing on carbon neutral buildings and city districts. The City and the University share an interest in promoting and creating a sustainable campus and city. This conference series will therefore focus



on how carbon neutral buildings and city districts can be enhanced and on the barriers to implementing carbon neutral principles in the construction and planning phases. <http://climate.ku.dk/urbangreening/programme/>

### Urban Forestry Conference 2009: Lessons for Sustainable Development

[Malaysia]

17-19 November 2009

Many cities within the region are in different urban development phases and have had different experiences. Experiences, lessons learnt and sound urban development programmes should be shared among countries. The conference will therefore provide opportunities for collaboration and information sharing on urban forest and park development. The conference is organised along the five main themes. The conference is organised by the Forest Research Institute Malaysia (FRIM) <http://www.frim.gov.my> and will be held back-to-back with an FAO workshop on urban and periurban forestry.

### Road Map Towards a Flood Resilient Urban Environment

[Paris, France]

26-27 November 2009

As a consequence of climate change, increasing urban populations and economic development, great uncertainty exists about the necessary adaptation of the urban environment to flood risk.

It is the objective of this conference to highlight the recent advances in the progression towards flood-resilient cities. The conference intends to provide politicians, policy and decision makers, researchers and practitioners the platform to present and discuss their experiences, new trends and technological innovation in the area of flood risk management.

<http://www.urbanflood.org/>

### Waste & Climate Conference

[Copenhagen, Denmark]

3-4 December 2009

The conference will be organised as a prelude to the United Nations Climate Change Conference (COP15) to take place 7-18 December 2009 in Copenhagen (see below). The intention is to present how intelligent waste management plays an important role in efforts to reduce climate change. As an integrated part of the overall material flow through the economy, waste management has a tremendous potential in mitigating climate change. Thus greenhouse gas emissions could be avoided or reduced by material recycling, improved emission controls, organic carbon storage in soils and by using waste as an energy source – and of course not least of all by waste prevention. The conference is organised by DAKOFA and ISWA.

<http://www.wasteandclimate.org/web/guest/home>

### 15<sup>th</sup> United Nations Climate Change Conference

[Copenhagen, Denmark]

7-18 December 2009

The Kyoto Protocol sets targets for emissions from 2008 to 2012. At the 13th annual conference of member countries (COP13) in Bali it was decided to work towards a new agreement for the subsequent years. The plan – which is called the Bali Action Plan – aims for a new agreement, which is to be negotiated at the 15th annual conference – COP15 – in Copenhagen in 2009. More information: <http://en.cop15.dk/about+cop15>

### 2010 National American Planning Association Conference

[New Orleans, USA]

10-14 April 2010

Urban agriculture was one of the hottest topics at the April 2009 American Planning Association conference, held in Minneapolis. Eleven sessions and workshops were held on a variety of urban agriculture-related topics and attended by record crowds of urban and regional planners, planning commissioners, and student (future) planners. In 2010, the conference heads down the Mississippi River to New Orleans, where the conference theme is resilience. Proposals will be accepted online beginning in June 2009. Please check [www.planning.org](http://www.planning.org) for further details.

### CABI Global Summit; Food security in a climate of change,

19-21 October 2009.

For more information: [www.cabiglobalsummit.com](http://www.cabiglobalsummit.com)

## On DVD / VIDEO

### Rob Hopkins' Transition Handbook

<http://www.youtube.com/watch?v=kGHRWptCvgo&feature=related>

### FRESH

This film by Ana Sofia Joanes documents the work of innovative farmers, thinkers, and business people in the US who are reinventing the food system to be healthier and more sustainable for all. The film profiles farmers as Joel Salatin (Polyface Farms, Shenandoah Valley, VA) and Will Allen (Growing Power, Milwaukee, WI), and writer Michael Pollan. The work of these innovators is contrasted with the food contamination, environmental pollution, natural resource depletion, and morbid obesity caused by the industrialised food system.

<http://www.freshthemovie.com/>

### The Garden

Film on urban agriculture practiced by Hispanic Americans on a large tract of land in the middle of the city of Los Angeles, California. Watch the trailer at: <http://www.facebook.com/video/video.php?v=15926634221&ref=mf>

**We would like to receive your contributions or suggestions for the next issue of the UA Magazine**

## **NO. 23: Urban Nutrient Management (DECEMBER 2009)**

**Please send us your contribution before:  
15 SEPTEMBER 2009**

Urban food demand, especially for fresh perishable food products, is increasing with population growth. Urban agriculture responds to this demand through intensive and continuous production taking advantage of market proximity. Such intensive production is highly dependent on nutrients and water. Rapidly growing cities face the challenge of providing basic services such as drinking water and sanitation on the one hand, and sustainably managing urban wastes and wastewater on the other. UA-Magazine no. 20 focused on water, and the following issue, no. 23, will focus on the equally important aspect of nutrient management.

Especially in an urban environment, many resources are available that can be directly used as sources of nutrients in urban agriculture, most notably organic wastes and wastewater. Urban agriculture takes place in densely populated areas and potential health and environmental risks should be avoided. As high and inappropriate use of agro-chemicals in urban horticulture may pollute ground and water sources and contaminate crops and drinking water, intensive agriculture that applies ecological principles and techniques and makes optimal use of locally available resources should be promoted. By applying ecological principles, soil fertility and overall productivity can be improved and maintained. Moreover, nutrient loops can be closed, especially through safe recycling, and the environmental benefits of urban agriculture can be enhanced. There is a close relationship between resource (nutrients) use and disposal patterns of a city, as cities depend on sinks outside their boundaries. Agriculture is a key sector for understanding the cycling of macro-nutrients like phosphorus, carbon, nitrogen and sulphur. Related agricultural activities include the use of fertilisers, compost, excreta or domestic or agro-industrial wastes such as soil conditioners, mulches or blending materials. With the rapid increase in prices for fertilisers and a dwindling phosphate market, the need for alternative sources of fertiliser materials is becoming more and more important.

**We are interested in receiving your articles and well-documented experiences regarding nutrient management in urban agriculture. Topics could include:**

- Urban nutrient cycles and methodologies to calculate inputs and outputs, and material / nutrient cycles in urban agriculture.
- The role of urban agriculture in waste management: safe re-use of urban organic wastes and urban wastewater, and the recycling of nutrients.
- The role of urban agriculture in reducing the city's nutrient footprint, and in decentralised systems of nutrient recycling (closing the loop).
- Experiences with eco-intensive agriculture in an urban context.
- Different types of composting and its contribution to closing the nutrients cycles, reasons for composting and the marketability of compost.
- The role of institutions (including micro-enterprises) in the waste management and urban agriculture chain, and policies in enhancing nutrient recycling.

### **Next issues of the UA-Magazine in 2010**

In 2010 two issues of the UA-Magazine will be produced. Your contributions and suggestions are most welcome.

No. 24 will focus on: "Linking Urban Producers to Markets: Chain development for urban agricultural products", Deadline for your contribution is 1 March 2010

Articles should consist of no more than 2000 words (three pages), 1300 words (two pages) or 600 words (one page), preferably accompanied by an abstract, a maximum of 5 references, figures and 2-3 digital images or photographs of good quality (more than 300 dpi or in jpg format more than 1 Mb preferably). The articles should be written in a manner that is readily understood by a wide variety of stakeholders all over the world.



# 22

## **Urban Agriculture magazine**

### **Building Resilient Cities**

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UA Magazine is published two times a year by the Network of Resource Centres on Urban Agriculture and Food Security (RUAF), under the Cities Farming for the Future Programme, which is financed by DGIS, the Netherlands, and IDRC, Canada.

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