

The role of urban agriculture in building resilient cities

Paper for the UK Foresight project on Global Food and Farming Futures

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This paper briefly reviews a number of global trends that provide important contexts for the quickly growing policy attention for urban agriculture, summarizes available evidence regarding the potentials of urban agriculture in responding to a number of urban challenges, and outlines some measures that have been by local and national governments to enable full use of these potentials. In the last section of the paper a number of key issues for further research and development in the field of urban agriculture are presented.

Introduction

Since 2008 the world's urban population outnumbered its rural population for the first time in history (UNFPA, 2007). The recent food and economic crisis have made policy makers aware of the increasing "urbanization of poverty" and the need to give more policy attention to the rising urban food insecurity and vulnerability of the urban food system to shocks. City authorities are in need of innovative strategies that enhance urban food security and improve livelihoods of the urban poor and strengthen the resilience of the urban food system.

Urban agriculture provides such a strategy by enhancing access of the urban poor and disadvantaged to fresh and nutritious food, reducing food expenditures and generating additional cash income while also contributing to the greening of the city, the productive reuse of urban wastes, and adaptation to climate change.

Based on a review of literature Mougeot (IDRC-Cities Feeding People Programme) arrived at the following definition of urban agriculture (*Mougeot 1999*):
"Urban agriculture is located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, and grows or raises, processes and distributes a diversity of food and non-food products, (re-)uses largely human and material resources, products and services found in and around that urban area, and in turn supplies human and material resources, products and services largely to that urban area".

In another publication (Mougeot, 2000) he stresses that the most striking feature of urban agriculture is not its location, but the fact that urban agriculture is an integral part of the urban socio-economic and ecological system: urban agriculture uses urban resources (land, labour, urban organic wastes, water), produces for urban citizens, is strongly influenced by urban conditions (policies, competition for land, urban markets and prices) and impacts the urban system (effects on urban food security and poverty, ecological and health impacts).

Contrary to what many believe, urban agriculture is a permanent feature of cities. Until some 15 years ago most local governments have for a long time given little attention to urban agriculture and city laws and regulations often were rather restrictive (or at best "permissive") regarding urban agriculture. This was amongst others due to a lack of information on urban agriculture and a biased view on city development in which agricultural land in/around the city was mainly seen as a reserve area for future city construction and agriculture as a relic of rural habits of recent migrants. National agricultural and food security policies related to rural areas and food imports and gave hardly any attention for urban food growing and distribution.

But research reveals that urban agriculture tends to grow when cities are growing when cities grow (although its relative share in the city economy may get smaller and the locations where agriculture takes place may shift over time). No matter how crowded cities may appear, there are always open spaces that may be used for agricultural productive use. In the city of Rosario, Argentina, an analysis revealed that as much as 35 percent of land in the built up city was vacant or partially vacant (Dubbeling, 2003). Closeness to the consumers and cheap and availability of cheap resources (e.g. organic wastes and wastewater) creates comparative advantages for urban producers over their rural counterparts especially where it concerns perishable products such as green leafy vegetables, fresh milk and poultry products. As such, urban agriculture is generally

complementing rural agriculture rather than competing with it, and thus strengthens the national food system.

Urban agriculture is strongly influenced by the urban dynamics and spatial development and is generally characterised by a low security of land use, intensive use of limited space, use of urban resources such as organic solid wastes and wastewater, low degree of farmer organisation and a high degree of specialisation.

Urban farming is practiced by households across the income spectrum, with some country and commodity variation. However, the main factor to get engaged in urban agriculture are the production of food for own consumption and income generation by poor urban households. The majority of urban farmers are small scale and family based, but also medium sized and larger enterprises are encountered. Urban agriculture (and especially intra-urban agriculture) is often done in addition to other employment (whether wage labour or domestic), and seasonal demands in the garden are dealt with by bringing in friends and relatives. Especially in Africa most urban gardeners are women.

The variation in types of urban agriculture is generally rather high under influence of the location where it is taking place (backyard, rooftop, in barns, on vacant land along railways and main roads, intra or peri- urban field plots), their organisational form (home gardens, community gardens, family farms, medium and larger agricultural enterprises), their main crops or animals (vegetables, mushrooms, herbs, small animals, dairy, ...), their scale, level of technology and capital investment (from micro/low input to macro/high capital intensive; but small / low to medium intensive is the main category), degree of commercialisation (from purely production for own consumption to purely commercial, with semi-commercial as the main category), etcetera.

Urban Challenges

Growing urban poverty and food insecurity

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 (UN 2007), though in many countries this percentage is already higher.

Accompanying this urbanisation process is a phenomenon referred to as the "*urbanisation of poverty*" (Ravallion, 2002): the population growth is combined with a gradual shift in the locus of poverty from rural to urban areas. The percentage of the poor living in cities is expected to increase from 30% in 2000 to 40% by 2020 and 50% by 2035 (UNPF, 2007).

Moreover, in most developing countries urbanisation has become virtually synonymous with slum growth. The slum population has almost doubled in the past 15 years, reaching 200 million in 2005 (UNPF, 2007). It is common that 30–60% of the urban population lives in informal settlements with little or no provision of basic infrastructure and services (Hardoy et al., 2001). Due to lack of space and high rents, many people arriving in cities (as migrants or refugees) settle on marginalized land prone to flooding, landslides, cyclones and tsunamis. Most cities in developing countries encounter great

difficulties to create sufficient employment opportunities and to provide adequate basic services for the quickly growing population, leading to high unemployment (especially among the youth and disadvantaged categories of the population) and very poor living conditions in the slum areas.

Urban poverty goes hand in hand with food insecurity and malnutrition in cities. Urban food insecurity is often overlooked since at aggregate level, economic and social conditions in urban areas are much better than those in rural areas (FAO, 2004).

The recent financial/economic crisis and the rising food, fuel and energy prices have affected the poor in both rural and urban areas, though having a disproportionately large effect on the latter. The urban poor are particularly vulnerable to changes in food prices and variation in income since food makes up a large part of their household expenses (often over 60%) and urban consumers are almost exclusively dependent on food purchases. Variations in income or food prices have a significant and direct impact on their diets (lower food intake, turning to cheaper/less nutritious food) and lead further to reduced expenditure in health care and schooling or sale of productive assets (FAO, 2008). It is estimated that the rise in food prices between early 2007 and 2008 increased the number of people living in extreme poverty in urban areas in East Asia, South Asia, the Middle East and Sub-Saharan Africa by at least 1.5% (Baker, 2008). Since then food prices have come down and remain higher than before the food crisis and new price hikes are expected (ESCAP, 2009, Maxwell et al 2009)

Climate change; Natural disasters and human-induced emergencies

Climate change adds to the challenges faced by cities and is recognised as one of the most serious environmental, societal and economic challenges facing the world today (IPCC, 2007). Many cities are at risk of becoming “disaster traps”, through the direct effects of sea level rise, floods or hurricanes or through severe food supply problems (affected rural agricultural production and (thus) urban food markets), or indirect effects, like increased rural-urban migration.

The UN Population Fund indicates that the impacts of climate change disproportionately affects people “who live in slum and squatter settlements on steep hillsides, in poorly drained areas, or in low-lying coastal zones” (UN, 2007). There are 3,351 cities in such zones worldwide, of which 64% are in developing regions, and many of them are rapidly expanding (UN Habitat, 2009). Maxwell et al (2009) point out that urban poor are especially vulnerable to natural disasters due to the increasing concentration of people in vulnerable locations and the diminishing of their coping due to malnutrition, HIV-AIDS, tuberculosis, poor access to water and sanitation, etc.

Natural disasters and human-induced emergencies lead to massive internal or international displacements of people in most cases to the urban centres, exacerbating the pressure on urban systems to provide basic services and livelihoods and accelerating processes of massive slum formation, growing urban poverty, food insecurity, chronic malnutrition and poor health. Food security is a specific concern to recent IDPs and refugees in urban areas as they have very limited resources to help them cope. The distribution of food to affected populations by relief agencies is hampered by the fact that it is difficult to identify the IDPs and refugees in the slum areas and the limited capacity of local governments and NGOs to assist in distribution. According to the IASC Task Force traditional modes of (direct) food distribution in the aftermath of humanitarian crises are proving to be neither effective nor desirable in urban areas, except perhaps during and immediately after a crisis. Often, a large proportion of internally displaced persons (IDPs) and refugees end up living permanently in and around urban areas, even after short periods of displacement. The revival and diversification of their livelihoods holds the key to sustainable recovery especially through various forms of urban agriculture and related community-based agro-enterprises (compost making, food processing, transport, marketing and home-based manufacturing of tools) and by providing tools, seeds, access to land and essential services (training, organisational support, entrepreneur training) as part of residential arrangements (IASC, 2009).

Growing water scarcity and accumulating wastes

Rapid urbanisation generally puts high pressures on limited urban resources, like fresh water, while at the same time producing large amounts of wastewater and wastes. The urban demand for fresh water is rising rapidly while availability of fresh water is becoming a serious problem. According to UNESCO (2003), by the middle of this century, at worst 7 billion people in sixty countries will be water-scarce, at best 2 billion people in forty-eight countries. Of these, a majority will be living in Asia and Africa. Improved living standards and socio-economic conditions have led to the generation of vast amounts of wastes and wastewater.

Management of urban wastes and wastewater is a concern and high cost for many cities. Only a small proportion of urban wastewater is treated and most of it is discharged untreated into the environment. Insufficient sanitation facilities in many countries, has further led to the degradation of the quality of water resources.

The organic waste and wastewater contain valuable nutrients that in the actual situation are wasted (ending up in landfills or disposed off in rivers and sea). This while the prices of fertilizers are rapidly increasing and global reserves of phosphorous will have been depleted within the coming thirty years (Brown, 2003).

The contributions of urban agriculture to meeting these urban challenges

The body of research on urban agriculture is still relatively small but has been growing rapidly since the mid nineties of the past century. The publication of the book *Urban Agriculture, Food, Jobs and Sustainable Cities* in 1996 by the UN Development Programme provided an overview of early research on urban agriculture and marked the start of more intensive research and development in this field of work. The IDRC continued its “Cities Feeding People” and “Agropolis” programmes, the international agriculture research organisations (CGIAR) started the “Urban Harvest” programme, the Food and Agriculture Organisation of the UN included urban agriculture in its agenda and created the “Food for the Cities” priority action, organisations like CIRAD, NRI, ODI, GTZ, IFPRI and many others implemented action research projects on urban horticulture, urban livestock, urban aquaculture or urban forestry in cooperation with universities and NGOs. The website of the RUAF Foundation www.ruaf.org contains a bibliographic database of research and publications on urban agriculture since the early nineties (with on line access to part of the documents).

The following paragraphs are based on this body of research¹.

Improving urban food security and nutrition

Production of food by poor urban households can supply 20-60% of their total food consumption (especially in green vegetables, medicinal and aromatic herbs, eggs, milk, and meat of small animals). Urban households that are involved in some sort of farming or gardening are more food secure and have a better and more diverse diet and eat more vegetables than non-farming households (Zezza, Alberto and Luca Tasciotti. 2008).

Involvement in agriculture also leads to better mitigation of diseases (better nutrition, home-grown medicinal plants), more physical exercise, less dependency on gifts and food aid and enhanced self-esteem.

The positive value of urban agriculture is not limited to the households that are involved in the agricultural production themselves. Urban agriculture increases the availability of fresh, healthy and affordable food for a large number of other urban consumers, as much of the food produced by urban farmers is bartered or sold locally.

¹ In order to keep this text short and readable to non scientists we limited the inclusion of figures and references. Overviews with more extensive data can be supplied on request.

It is estimated that 15-20% of the world's food is produced in urban areas (Armar-Klemesu, 2000). In most cities, urban agriculture covers a substantial part of the urban demand for vegetables (especially fresh green vegetables: often 90 or more%) as well as fresh milk (often 60-70%), poultry and eggs (50-70%), and –often to a minor extent– pigs, fruits and fresh water fish (15-50%) (Van Veenhuizen, 2007). Locally produced food is fresher, more nutritious and diverse than food products bought in supermarkets or in fast food chains; it also leads to more regular food intake (Yeudall, 2006). This is of crucial importance for young children, the elderly or sick household members (e.g. HIV/AIDS and TB patients) and pregnant and lactating women.

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

Finally, the cultural role of urban agriculture deserves mention. Migrant groups often turn to growing their traditional foods in an attempt to maintain their own food culture and identity.

Urban agriculture can also contribute to ensuring 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. In Sierra Leone, the residents of Freetown are still well aware of the importance of local farming, as many of them would have starved during the decade-long civil war in the absence of urban and peri-urban agriculture (Forkuor and Cofie, forthcoming).

For refugees and displaced people and recent migrants that live in camps around cities or with relatives in slum areas local food production on vacant land or in containers is an important survival strategy and their involvement in productive activities may also help to regain dignity, hope and self respect and enhance their self reliance, while reducing operational costs for humanitarian agencies.

Under certain conditions urban agriculture may also have some risks for public health, especially where soils or irrigation water have been contaminated or where animals are not properly managed or slaughtered in an inadequate way. Proper education of urban producers and other simple but effective measures to prevent such health hazards have been outlined by WHO and IWMI (WHO 2006, Drechsel et al 2010)

Poverty alleviation

Poor households involved in urban and peri-urban agriculture benefit economically from their production activities in various ways. The first gain is that the household food expenses are reduced which can lead to important savings since poor urban households spend 60-80 per cent of their household budgets on food. The households that produce more than they need for their own consumption will barter or sell their surpluses. Other poor urban households may gain an income by producing certain agricultural inputs (e.g. producing compost and worms from organic wastes), processing and marketing activities or providing other services (transport, veterinary services).

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

Urban agriculture can be as profitable (or even more than that) compared to other urban jobs and also compared to rural farming. In Ghana, irrigated urban vegetable farmers are earning an average annual income 2-3 times higher than that of rural farmers (Danso et al., 2003). Although the production levels and turnover of individual urban producers in many cases will be small, the high number of urban producers in each city makes their overall contribution to the urban economy highly relevant, generating employment for many poor households and providing incomes equivalent to or higher than the official minimum wage (Moustier and Danso, 2006).

In addition, urban agriculture makes productive use of land that is not fit for construction (flood or earthquake-prone areas, land under power lines and in buffer zones) and adds value to land that might not otherwise have an economic output. It also gives a productive use to urban wastes and wastewater and can play a role in the management of public parks and the maintenance of open green urban spaces (e.g. flood plains / wetlands) and thus reducing the related public costs (van Veenhuizen and Danso, 2008).

Questions are sometimes raised regarding the sustainability of urban agriculture in the context of a dynamic urban market with high competition for land, soaring land prices and largely uncontrolled urban growth. Responses given by local actors refer to the need to provide more protection to urban agriculture by integrating it as a formal land use in the Municipal land use planning, strengthen the development of safe and profitable urban agriculture through facilitating policies and programmes, and combining agriculture with other services to the city and citizens (recreation, storm water management, management of open green spaces) as will be discussed in more detail in a later section of this paper.

Improving the urban environment and enhancing urban resilience to climate change

Urban agriculture can play an important role in improving the urban environment and climate change and (to a lesser extent) mitigation. 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). The International Conference “*Urban challenges and Poverty Reduction in African, Caribbean and Pacific Countries*” 8-10 June 2009, Nairobi, jointly organized by World Bank, the EU and the ACP countries, identified urban agriculture and (agro-)forestry as having a high potential for improving the urban environment and climate change adaptation (UN Habitat 2009). FAO, when analysing the effects and opportunities resulting from the high food prices, concludes that it is crucial to build more resilient cities by enhancing local food production and diminishing the dependency of food imports (FAO, 2008). Also the UN Comprehensive Framework for Action of the High Level Task Force on the global Food Crisis (UN, 2008) states: “*A paradigm shift in design and urban planning is needed that aims at: (.....) Reducing the distance for transporting food by encouraging local food production, where feasible, within city boundaries and especially in immediate surroundings*”.

Urban agriculture helps cities to improve the urban environment and become more resilient against climate change by:

- 1) *Reducing the vulnerability* of most vulnerable urban groups and strengthening community-based adaptive management by diversifying urban food sources and income opportunities of the urban poor and being a source of innovation and learning about new strategies/ technologies for land and water efficient food production.

- 2) *Maintaining green open spaces and enhancing vegetation cover in the city* with important adaptive (and some mitigation) benefits. Urban agriculture (including urban forestry) helps to improve the urban micro-climate by capturing Co₂ and dust and producing O₂, by reducing the urban “heat island” effect (temperatures in the built up city are several degrees higher than in the surrounding areas) through creating more shade and increased evatranspiration (Tidball and Grasny, 2006). Urban agriculture also helps to reduce the effects of climate change by preventing building on risk-prone land (like flood plains, earthquake zones and slopes prone to landslides). By maintaining such areas (and other land not suitable for construction like buffer zones and reserves) as agro-forestry spaces, urban food security is enhanced, urban biodiversity and living climate are improved, while risks of flooding, landslides and other disasters are reduced. Such open green spaces also help to control storm water flows by allowing storage and increased infiltration of excess storm water.
In open green spaces in and around the city food production can also be combined with other services to urban citizens like park maintenance (“productive parks”), agro-tourism, ecological education for children, etcetera.

- 3) *Reducing energy use and green house gas emissions by producing fresh food close to the city.* 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) and many cities in developing countries are developing quickly in that same direction. Encouraging food production close to cities will reduce the ecological foot- (and food-) print of the city since energy use will be reduced due to less transport and cooling, more consumption of fresh food (hence less storage, processing and packaging) and by enabling synergic and cyclical processes between urban domestic and industrial sectors and agriculture (e.g. use of excess heat, cooling water or CO₂ from industry in green houses; reuse of urban wastewater and organic wastes).

- 4) *Decentralised reuse of wastewater and composted organic waste in urban and peri-urban agriculture.* Productive reuse of wastewater in urban agriculture will help to reduce the demand for freshwater supply as well as to reduce the discharge of wastewater into rivers, canals and other surface water sources and thus diminish their pollution. Use of wastewater as a source of irrigation provides will help to adapt to drought by facilitating year-round production. Urban wastewater can be recycled for irrigation/fertilisation of horticultural crops, i.e. floriculture and fruit crops as well as for irrigation of forest plantations for combating desertification, providing fuel wood², and turning steep slopes and low-lying lands into urban ‘green lungs’, that can also be used as recreational areas while creating flood buffers for neighbouring housing areas.

² In many cities attempts to decrease pressure on wood energy (fuel wood and charcoal) by subsidizing gas or electric technologies have not succeeded. The prognostic for many regions, such as in SS-Africa, is that wood energy will continue to be the main source of energy for cooking and heating of the majority of their population.

The last two decades have seen a strong move towards alternative decentralised and low-cost treatment of wastewater that allow reuse of wastewater and nutrients or even include aquaculture or agriculture as part of the wastewater treatment process. Where only partial or no wastewater treatment is available, health risks of productive reuse of waste water can be reduced through complementary health risk reduction measures as explained in the new WHO guidelines for safe use of excreta and wastewater (WHO 2006, Drechsel et al. 2010).

Decentralized collection and composting of urban organic wastes will reduce the costs of public waste management while large amounts of nutrients are reclaimed. Domestic waste in developing countries contains a great deal of organic biodegradable material, ranging from 60 to 90 per cent (Lacoste and Chalmin, 2007) and could potentially be used for livestock feed or compost making. In Nairobi every year about 2,223 t each of nitrogen (N) and phosphorus (P) and about 3,700 t of potassium (K) – together worth about USD 2 million – could be generated from the city's estimated 635,000 t of waste (Urban Harvest, 2010). Reuse of wastewater and composting of organic wastes will help to reduce the mining of finite mineral resources (like phosphorus) and reduce energy expended to produce artificial fertilizers.

Diverting solid organic waste from landfills by composting is also one of the simplest ways to prevent emissions of methane (a green house gas) and to reduce the pollution of groundwater due to leachates from the landfill. Organic wastes are also used as a source of energy, either by incineration in an electricity- producing plant, by capturing methane from composting sites for biogas or by making briquettes for household use.

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

Social Inclusion and community building

A majority of the world's urban producers are women (around 65 percent). Urban agriculture may provide these women some advantages over other jobs and income earning opportunities, like the low capital needed to start farming, the possibility to combine this activity with attending children, less travelling (and related costs in money and time) to the city centre or better-off neighbourhoods for an informal job as housekeeper or another low paid job.

Urban agriculture can also play a role in the social inclusion of marginalised groups (the aged without a pension, unemployed youth, persons with disabilities, those afflicted by HIV-AIDS, refugees, female-headed households etc.) by providing them an opportunity to feed their families and raise income, while enhancing self-management and entrepreneurial capacities.

In more developed cities, urban agriculture may be undertaken for the physical and/or psychological relaxation it provides, rather than for food production per se. Also, urban and peri-urban farms may take on an important role in providing recreational

opportunities for citizens (recreational routes, food buying and meals on the farm, visiting facilities) or having educational functions (such as bringing youth in contact with animals and teaching ecology).

Urban agriculture may also help to raise the self-esteem and participation of those who once had nothing (as was shown before when discussing the issue of refugees and IDPs).

Building resilient and food secure cities

Since the Mid nineties a large number of cities (e.g. Rosario, Lusaka, Cape Town, Beijing) and several countries (e.g. Cuba, Brazil, Sri Lanka) have developed new policies regarding urban agriculture and have initiated major programmes to facilitate the development of safe and sustainable urban agriculture.

On the basis of the experiences gained with the development of policies and programmes on urban agriculture the following *key lessons*³ can be derived³

Policy and programme development at national level

Governmental policies at national level need to create adequate framework conditions for the development of safe and sustainable urban agriculture, departing from the recognition that urban (and peri-urban) agriculture is an integral part of the urban socio-economic and ecological system.

An important first step normally is the **creation of an institutional home for urban agriculture**. Conventionally, sector policies have been defined under the assumption that agriculture refers to the rural sphere. As a consequence, urban and peri-urban agriculture often does not receive proper attention and support from the agricultural institutions nor from the urban authorities. The Ministry of Agriculture seems in most countries the best equipped to take a coordinating role regarding urban and peri-urban agriculture, but experiences to date reveal that **close cooperation with other Ministries** is also required (Health, Social Development, Economic Development) and that these ministries have to play an active role in the design and realisation of urban agriculture related programmes (either as part of their own sector policy or as inputs to the agricultural policy or programme).

Urban agriculture needs to be **integrated in the agricultural policy as well as in national food security strategy, poverty reduction strategy and national strategies for sustainable urban development**. Local initiatives on urban and peri-urban agriculture are often constrained by an absence of national policies regarding urban agriculture, restrictions put by actual national legislation (e.g. restrictions in mandates of local governments, unjustified restrictive health regulations, etcetera) and lack of financial and technical support from national level. This makes local actors hesitant to

³ For more details see the recent publication: Dubbeling, de Zeeuw and van Veenhuizen: *Cities, Poverty and Food; Multi-stakeholder Policy and Planning in Urban Agriculture*, Practical Action Publishers, UK, May 2010

develop more pro-active policies and programmes due to lack of financial and technical support from the national level.

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

- **Remove unjustified restrictions on urban and peri-urban agriculture in national laws and regulations** and replacement by evidence-based new policies and regulations (for example basing regulations regarding the reuse of wastewater and excreta in agriculture on the 2006 WHO guidelines replacing the ones based on strict water quality norms).
- **Promote close cooperation between national programmes, municipal authorities and civil society actors (urban producers, local NGOs, CBOs, entrepreneurs, universities) in the design and implementation of municipal policies and programmes on urban food production and consumption** and provide technical assistance to the crafting and implementation thereof. The experiences gained by the 20 major cities that participated in the RUAF Cities Farming for the Future programme (2004-2008) with the establishment of Multi-stakeholder Forums on Urban Agriculture and the development and implementation of a City Strategic Agenda on Urban Agriculture are of high value here (see the publication mentioned in footnote 2 and www.ruaf.org for more details).
- **Make available funds for the (co-)financing of local urban agriculture programmes** (preferably involving local authorities as well as civil society actors and private commercial actors) and provide loans (for more market-oriented urban producers) and subsidised inputs or grants (to engage the very poor in urban food production activities) as well as encourage other financing institutions to do the same (e.g. by providing guarantees to credit institutions willing to provide credit to small urban producers).
- **Include issues related to urban and peri-urban agriculture into the national agricultural research agenda and agricultural extension programmes, as well as into the national educational system** (universities, colleges), giving due attention to specific technology development and training & education needs related to urban horticulture, livestock, aquaculture and forestry. Urban agriculture is performed under specific conditions that require technologies and organisational and marketing models different to those used in the rural agricultural context. Most available agricultural technologies need adaptation for use in these conditions whilst new technologies have to be developed to respond to specific urban needs (e.g. space-confined production methods, non-soil production technologies for use on roofs and in cellars; development of safe and economic practices for productive use of wastewater). For example, the national urban agriculture programme in Cuba undertakes extensive practical research to develop technologies suited to urban conditions e.g. agro-ecological production methods that do not harm the urban environment and development of varieties adapted to urban conditions.
- **Link the “urban food security” agenda with agendas related to climate change adaptation and reduction of the effects of disasters and with the urban environmental agenda.** Promoting maintenance of green, open, productive and multifunctional spaces in and around the city (and multi-centric or cluster cities), rather than a concentric spread of the city; promoting a shift from centralised “end-of-pipe” treatment and disposal systems to decentralised and flexible treatment of wastewater and composting of solid organic waste, allowing productive reuse in urban agriculture nearby. Awareness raising among national and local government

officials on the new WHO guidelines on the agricultural use of urban wastewater and excreta and application of these at local level.

Controlling (industrial) pollution of urban land, water and air (which is threatening the safety of urban food production and consumption) needs to be intensified and separation and treatment of industrial and hospital waste and wastewater at the source should be strongly encouraged.

- **Intensify data collection and analysis on (impacts of) urban and peri-urban food production and the effectiveness of various policy measures and action strategies** regarding urban agriculture and urban food (in-)security and (mal-)nutrition.

Policy and programme development at City level

Urban food strategies and programmes will complement national agricultural and food security policies that often don't take into account the specific regional and local needs and conditions and/or don't respond to the specific urban challenges.

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

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

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

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

2. *Enhancing access to and security of agriculture land use*

Increasing access of the urban poor to land and water, and especially enhancing security of agricultural land use, needs to be given proper attention. To this end, the **integration of agriculture into urban development and land use and zonification plans**, as well as active maintenance of the protected agricultural zones against the land hunger of other urban interest groups is crucial. In most cities, there is no real shortage of land, but there is lack of pro-active management policies regarding use of land for food security and sustainable urbanisation.

Around many cities, peri-urban agriculture is threatened by urban sprawl, yet this land may be most needed for food production (Newman *et al.*, 2008). It is important that land-

use planning avoids using high-risk areas for housing, while protecting the areas for green and agricultural functions (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. These productive and green spaces could be the structuring element around which the city and neighbourhood develops.

In addition, various cities have taken innovative **measures to enhance access of the urban poor to land including**, for example by making municipal land available to groups of urban poor households in medium term leasehold, by integrating space for home or community gardens or “productive parks” in social housing and slum upgrading programmes, by providing fiscal and tax incentives for land owners who lease out vacant private land to groups of urban poor people willing to produce on thermal users of municipal land some measure of security through providing “temporary leases” or “occupancy licenses”.

3. Establishment of a Municipal Programme on Urban Agriculture

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

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

- **Strengthening the organisation of urban producers and their capacities** to design and implement projects to improve their food and marketing systems and to actively participate in local planning activities (see FAO 2007 a resource book on strengthening urban producers’ organisations).
- **Providing training and technical assistance to urban producer groups** and supporting them in implementation of their production and marketing activities and/or encouraging/enabling local NGOs, CBOs, universities and colleges to do the same. Important topics for training are ecological farming practices, proper management of health risks, farm development (e.g. intensification and diversification), enterprise management and marketing.
- **Support for infrastructure development** (e.g. storage spaces, packaging sheds, green houses etc.) and **access to equipment and inputs** (e.g. irrigation equipment, quality seed/seedlings/young stock; at cost or subsidised prices).
- **Enhancing access to and efficient use of irrigation water** by delivering a minimum amount of fresh water free of charge to community gardens in slum areas, by providing treated wastewater (plus training on its use) to poor producers operating in a peri-urban scheme, by promoting systems for rainwater collection and by constructing wells and establishing localised water-efficient irrigation systems (e.g. drip irrigation) in urban agriculture (see the thematic issue of Urban Agriculture Magazine # 21 on this topic; RUAF Foundation, 2008).
- **Facilitating (direct-)marketing** of food products. Municipalities may facilitate marketing initiatives of poor urban and peri-urban farmers by providing them access to existing city markets, by assisting them in the creation of farmers’ markets (infrastructure development, licenses, control of product quality), and by authorising food box schemes and/or supporting the establishment of “green labels” for ecologically grown and safe urban food.
- **Preferential food procurement from family- and community-based farms located within the city** (government canteens, school feeding programmes, etc)

and facilitating direct marketing of fresh and ecologically produced food from regional sources (less packaging and cooling, more nutritious)

- **Promotion of multi-functional land use** Under certain conditions urban farming can be combined with other compatible forms of land use. Farmers may provide recreational services to urban citizens, receive youth groups to provide ecological education, act as co-managers of parks, etc.
- **Assistance to re-allocation of urban producers who are poorly located** (and therefore may cause serious health and/or environmental risks due to these locations e.g. intensive pig production in an area where the sources of drinking water might be easily affected).

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

Various cities are already including urban agriculture as part of their strategies to reduce their ecological foot-print and enhance the resilience of the urban food system.

Interesting experiences in planning and implementation of such urban agriculture-related adaptation measures to climate change are currently being gained by the climate change programme for Asian cities of the Rockefeller Foundation (Rumbaitis del Rio, 2009). Investments in climate adaptation must be focused on low-income groups (who often live in the most vulnerable areas) and fully involve them in plans to reduce flooding and other risks, also as part of slum upgrading programmes (Reid and Satterthwaite, 2007). Such programmes apply measures that include:

- **Protecting and stimulating of sustainable urban and peri urban agriculture in flood zones and wetlands and on steep slopes** in order to prevent construction in such areas, enhance storm water storage and infiltration and to reduce run-off;
- **Involvement of urban poor producers in the maintenance of open green spaces in the city area (greenbelts, or green “fingers”, parks and other open spaces) and promotion of agro-forestry** in order to reduce the urban heat islands effect, CO₂ capture and to enhance biodiversity and landscape management.
- **Facilitating (safe) reuse of urban wastewater and organic waste in order to reduce waste disposal into open water systems, reduce fresh water use, recycle nutrients, and reduce emissions of methane from waste dumps.** In this context a shift to decentralised and low-cost treatment of wastewater allowing the reuse of wastewater and nutrients close to the source (stabilisation ponds, cluster approach, constructed wetlands) needs to be supported strongly as well as decentralised collection and (co-)composting of organic waste and excreta.

Some key issues for further research regarding urban and peri-urban agriculture

As was indicated already in the introduction, research on urban and peri-urban agriculture is still a relatively young field of work and the challenges are many.

A first point of attention in the coming years will be to **include indicators regarding urban food production** in the Global Urban Observatory, the monitoring of the Millennium Development Goals, and in standard surveys on urban poverty and urban food security. Many case studies on urban agriculture and its impacts are available but systematic and longer term data gathering at city level is very scarce. Measuring these contributions in qualitative and quantitative terms is essential to justify financial support to urban agriculture and to target it to the different types of urban agriculture.

The trade-offs between urban agriculture and other land uses in cities and **effective ways to maintain open productive green spaces** in the build up city should also be investigated. Capturing the urban value of cultivated land refers to the valuation of the benefits, opportunity costs and costs avoided through urban agriculture in our cities, not only in economic and monetary terms, but also in social terms and environmental terms. And what are the most effective strategies to maintain open green productive spaces in the cities? What combination of legal, economic and communication/education measures will be required?

Innovative research on **building sustainable urban food systems with short value chains** is another important area of research. What are the effect of certain policies and programmes and the enhancement of urban food security and the quality of the nutrition especially of the urban poor? What is the actual energy and fresh water use related to food consumed by the urban population and what is the likely effect of alternative policy measures to reduce the ecological foot (and food) print of the city? How to link the interests of small scale producers in the city region (seeking a decent income) more strongly with those of poor urban consumers (seeking low priced but nutritious food)? How to create more equitable participation of all chain actors in the market chain (and prevent domination by super markets or agribusiness)? In many city regions various forms of direct marketing from producers to consumers have sprung up: “consumer supported agriculture”, “farmers markets”, “food box schemes”, “food buying collectives”, etcetera. Such initiatives often have become linked to a drive for more food sovereignty and healthier food produced in an environmentally friendly way. Under what conditions such initiatives can develop and become sustainable? What is and can be the role of public institutions (schools and others), consumers’ associations, private sector business in the development of short and more equitable value chains in the urban regions?.

Participatory research on safe and sustainable technological practices for urban agriculture: technologies for intensive production under space confined conditions, transition to ecological farming practices, safe reuse of wastes and waste water and related measures to prevent health risks, etcetera continues to be another important area for research.

Also attention will be needed for research on **innovative forms of financing for urban agriculture**. This includes the ways through which urban producers mobilise financial resources and invest in urban agricultural activities, as well as innovative ways to

enhance the provision of funding and credit to different types of urban producers (Cabannes and Dubbeling, 2006).

By undertaking more **participatory and multi-stakeholder research and action planning** on urban agriculture one will not only enhance the required evidence base for effective policies and programme regarding urban food production and consumption but also contribute to empowerment of the urban poor and the building of more resilient cities.

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