Scoping paper feeding into the development of UNEP’s position on urban and peri-urban agriculture

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Ir. Marielle Dubbeling, RUAF Foundation (International network of Resource centres on Urban Agriculture and Food security) with inputs from Yves Cabannes, DPU/University College London and from several UN and international organisations

Leusden, The Netherlands (www.ruaf.org)
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1. Executive summary
In an increasingly urbanising world, characterised by growing urban markets, urban poverty and food insecurity, a rising attention for urban or city-regional food systems responds to the need to place food higher on the urban agenda. Sustainable urban food systems are on their turn an increasingly important component of more resilient cities. Urban and peri-urban agriculture are seen as one of the strategies to contribute to such more resilient urban (food) systems.

The growing interest for urban and peri-urban agriculture was and is triggered by recognition of its (potential) multiple co-benefits and contributions to not only improving food security and nutrition, but also to community organisation, city greening, waste management, income and employment generation and –more recently- city resilience and climate change adaptation (including flood mitigation and reduction of urban temperatures).

This paper starts by placing urban and peri-urban agriculture in the context of more sustainable and resilient urban and city-regional (food) systems, discussing its contributions along the so-called food, waste, water and energy nexus. Based on an overview of the State of Play of urban agriculture and analysis of its benefits, the paper identifies and analyses mayor research and policy gaps in the field of urban and peri-urban agriculture and gives a set of recommendations regarding an UNEP potential role and interventions in the sector.

Urban and peri-urban agriculture are defined as the growing of food and plants and raising of animals and fish in and around urban areas; by making use of urban resources such as land, labour and urban organic wastes, growing produce for urban citizens, being strongly influenced by urban policies and regulations, land prices and availability and urban markets, and having effects on urban food security and poverty, as well as the urban environment and health.

Over the past 15 years, urban agriculture has grown from individual project and research interest and interventions to full-fledged donor programmes; university curricula, government policy and programmes and being a main topic of international conferences and publications. Drivers for urban agriculture are growing urban populations and markets, increasing exposure to crisis, growing urban poverty and urban agriculture’s potential contribution to urban food security, income generation and economic security, urban green design and management and climate change adaptation.

International organisations such as UN–FAO, UN-HABITAT and GIZ, networks such as RUAF and the Food Think Thank and local government bodies such as ICLEI, Metropolis and the Local Authorities Major Groups increasingly call for more resilient urban food systems to which urban and peri-urban agriculture, or increased local food production, may contribute as part of a comprehensive strategy that integrally considers rural-urban food flows, food production, processing and distribution, sustainable resource use, health and nutrition. Resilient urban food systems after all do require multiple sources of food (with urban and peri-urban agriculture being one of such –complementary- sources), buffers against increase in food prices and market disruptions (urban and peri-urban agriculture is acknowledged for its contribution to enhanced self-reliance, income and job creation), call for increased resource recovery and efficiency (with urban agriculture providing opportunities for closing nutrient loops and making productive use of resources) and more increased resilience to climate change (with urban agriculture and forestry playing a potential role in mitigating impacts of climate change).
Over the past years, an increasing number of local and national governments have supported urban agriculture in their programming and planning. In order to make more effective and efficient use of resource opportunities for urban agriculture available in cities, there is a need for enabling policy environments (either in the context of food security, environmental or climate change policies and programmes), integration of urban and peri-urban agriculture in development and land use plans and zoning codes, support for safe and environmentally sustainable resource recovery, marketing, financing and technical assistance to producers.

Support from international organisations and programmes to urban and peri-urban agriculture has grown from individual research and first UN support in the period between 1970-1995, to large increase in networking, research and policy making and more substantial UN support to urban agriculture projects and programmes (1995-2007), to a recent resurge in interest for urban agriculture (2008-recent) linked to the global food crisis, climate change and new debates on the green economy and resilient cities. Overall, this has led to (1) an increase in research capacity and programmes on urban agriculture; (2) rise in government attention and support to urban agriculture; (3) increasing diversity of funding (sources) for urban agriculture and (4) broader embedding of urban and peri-urban agriculture in policies and programmes dealing with resilient urban food systems, youth training and employment, resource recovery, climate change adaptation and biodiversity, amongst others.

Notwithstanding these positive achievements, the main gap is that urban and peri-urban agriculture are still lacking broader up-scaling (from local to national level; reaching a far larger number of cities; up-scaling from small projects to city-wide programmes; from limited to larger funding) in order to respond to the largely unmet demand for support and training by urban producers and city governments. Reasons for such lack of broader up-scaling include: (a) Still limited recognition and visibility of urban agriculture among bilateral and multinational donors and in international declarations and rights; (b) Limited investment in and financing for urban agriculture by banks and funding organisations; (c) Limited involvement of local government associations and networks and corresponding technical and policy support to their members; (d) Lack of training courses on urban agriculture in universities, technical training institutes and agricultural extension and (e) Lack of recent and standardised data on the impacts of urban and peri-urban agriculture in various fields, as well as lack of practical toolkits and guidelines on innovative policy approaches, technical systems and innovations and integration into urban food systems planning.

Six areas are particularly relevant for further support of urban agriculture: (i) Mobilising financial support and increased funding streams for urban agriculture; (ii) Research and extension for more safe, profitable and sustainable vegetable and animal systems ((such as risk-reduction strategies for wastewater use in urban agriculture; new land-intensive farming techniques; the contribution of specific production systems to climate change adaptation; and climate-optimised urban agricultural development); (iii) Increased attention towards more commercial forms of urban and peri-urban agriculture and innovative business models for short supply chains, multifunctional agriculture and resource recovery; (iv) Integration in urban land use and food systems planning (applying a food-water-energy nexus approach); (v) Better systematisation of information already available (in form of toolkits, planning or methodological guidelines) and training of actors involved (public, producers and private sectors) and (vi) Systematic impact assessment and monitoring (applying standardised research methodologies and focussing on gaps of information such as the number of decent jobs that can be created by urban agriculture, urban agriculture’s contribution to provisioning the urban food demand for specific products, its impacts on reducing food miles, energy use and emissions).

With regards to UNEP’s potential role in the sector, three main options may be identified:
(1) UNEP may prioritise mainstreaming of urban and peri-urban agriculture in on-going UNEP work programmes;
(2) UNEP may prioritise addressing one or more of the identified gaps or
(3) UNEP could implement a double approach and start integrating urban and peri-urban agriculture in 1-2 current UNEP programmes where linkages are most clear; while at the same time tackling 1 or 2 gaps where UNEP has the most capacity. In all cases, an UNEP shorter-term position on urban agriculture could be formulated, implemented and monitored for a 2 year planning period, providing inputs for development of a longer-term strategy.

Taking the first approach, UNEP could start integrating urban agriculture in its on-going work programmes and agendas and thus reap considerable results with relatively low initial disbursements of new money (though larger funding will be needed if UNEP decides to become a more substantial player in the field). Opportunities for such mainstreaming can be found in its Built Environment Programmes (for example the productive use of buildings and integration with water and waste management strategies); Green Job and Employment Programme (based on an initial study further promoting urban agriculture as a strategy for youth employment); the Global Food Waste Campaign (e.g. studying and testing options for reducing waste generation and enhancing re-use in local and short supply food chains and translating results in policy recommendations); Climate Change Programmes (climate financing for urban agriculture and forestry and assessing the ecosystem services provided by urban agriculture as well as the environmental hazards affecting it); Environmental Outlook (systematically mapping the area and existence of urban and peri-urban agriculture in cities over time and coupling this to FAO data on production); the Agri-Food work stream (promoting analysis and planning of resilient urban food systems) and the GI-REC programme on Resource Efficient Cities (including food as one of – currently missing - the resource flows; quantification of resource flows and promoting city-regional food system approaches along the food-water-energy nexus).

Taking the second approach, UNEP could aim to specifically address one or more of the identified institutional, research and policy gaps. Considering UNEP’s strengths in convening global platforms, influencing international debates, in bridging the science-policy interface and its environmental mandate, UNEP is considered to be well-placed to:

- Design, test and promote environmental impact (and risk) assessment for urban agriculture, including payments for ecosystem services offered by urban agriculture;
- Promote resource recovery in urban agriculture by disseminating available information, supporting elaboration of new information materials (such as policy guidelines and a publication on legal frameworks for resource recovery in urban agriculture) and facilitating strategic investment in application and up-scaling of relevant business models;
- Promote integrated urban food systems planning in small number of cities applying an integrated food-water-energy nexus approach; and
- Address certain institutional gaps, specifically by lobbying for increased visibility of urban agriculture in international declarations and covenants, making existing and new practical guidelines and toolkits available to local governments and collaborating with research institutes and universities in more systematic and comparable impact monitoring and analysis on urban and peri-urban agriculture.

The third approach would prioritise both mainstreaming in one or two UNEP programmes as well as tackling one or more of the identified gaps. Possible priorities or short-term actions suggested by the external reviewers include: (1) Building on the current visibility and momentum gained by the Food Waste programme, including activities related to urban agriculture and resource recovery/efficiency; (2) Integrating urban agriculture and food flows more strongly in the GI-REC programme, possibly starting from documentation of case studies and success factors on integration of urban food and agriculture in city development strategies and planning; (3) Supporting the elaboration of a toolkit on resilient urban food
systems analysis and planning and testing such an approach in one or more cities; (4) Developing a methodology, toolkit and policy guidelines on assessment of environmental benefits, services, risks and hazards of and affecting urban agriculture in a changing climate.

In all cases, partnerships and collaboration with other UN agencies (specifically UN FAO, UN Habitat and ILO) and international (such as RUAF Foundation, various CGIAR programmes and more recently GIZ) and the many local organisations already working in the field is deemed necessary to improve coordination, information exchange and effective building on the past achievements in the sector.

2. Aims of the paper

This scoping paper aims to support UNEP in its discussions on the relevance of developing an internal position on urban agriculture and urban food systems and possibly accommodate specific related activities in their current or potentially new work programmes. A scoping study on urban and peri-urban agriculture would help better understand the range of existing initiatives in the field, identify research and policy gaps and identify potential roles that UNEP could play in building on existing activities and filling these gaps.

This scoping paper maps initiatives in this field implemented (in the past or currently) by international key organisations, focuses on gaps and key challenges in the sector and provides preliminary recommendations for a possible future UNEP position on urban agriculture.

The scoping paper was developed through a UNEP partnership with RUAF Foundation-the International network of Resource centres on Urban Agriculture and Food security (www.ruaf.org). For the purpose of this assignment, urban and peri-urban agriculture are framed in the broader context of more resilient urban (food) systems and sustainable urban development, looking at it with a water-energy-food nexus lens.

RUAF conducted a survey or mapping exercise of past, existing and planned urban agriculture programmes of UN agencies and key international players by means of a questionnaire and/or phone interviews. The mapping exercise solicited views on key challenges for the urban agriculture sector; gaps where UNEP could potentially add value to the sector and asked for recommendations to support UNEP in drafting an internal position on urban agriculture. In total 13 respondents (see Annex 1) participated in the scoping exercise; 10 written responses were received and 8 (follow-up) phone interviews were conducted in the period from January -March 2013.

The analysis of the questionnaires and phone interviews provided the main source of information for development of a draft of the scoping paper. In addition, RUAF also searched and analysed web- or written information and publications by the involved organisations as well as did a quick literature search on recent discussions and publications on urban agriculture.

The draft scoping paper was presented to UNEP and all of the respondents for review and feedback. On 31 May 2013, a review meeting was organised in Bonn, Germany to present the findings of the paper and discuss and validate its conclusions. Also discussed where the most strategic ways for UNEP to address the identified gaps and how UNEP could best complement or build on the work that other organisations are already embarking on. Two UNEP staff and 8 respondents participated in the meeting. Based on their observations, this final paper was prepared and submitted to UNEP.
3. Placing urban and peri-urban agriculture in the context of urban food systems and resilient cities

In a world characterised by increasing urbanisation, growing urban poverty, food insecurity and increasing food prices, and climate change, the need for strategies and solutions for enhancing urban food security, sustainable environmental and urban development and the resilience of cities is on the forefront of today’s development debates. It is in this context that resilient urban or city-regional food systems are getting increasing attention by both international as well as governmental actors.

Growing urbanisation goes hand in hand with growing urban poverty and food insecurity. Urban poverty is increasingly outpacing rural poverty (UN HABITAT, 2011). The urban poor are among the groups particularly vulnerable to variations in food prices and income since food (often over 60%) makes up a large part of their household expenses. Variations in food prices and income directly translate into diminished purchasing power and rising rates of food insecurity, compromising dietary quantity and quality. Particularly women and young children suffer the most in times of food crisis. A nutrition study in low income neighbourhoods of 5 large cities implemented by the RUAF Foundation (Prain, 2010) showed that the financial and food crisis resulted in many urban poor households reducing the number of meals and turning to cheaper and less nutritious food, with negative effects on the nutritional status of the family members.

Around the world, a lack of food security affects an estimated 870 million to one billion people. Food availability must be increased by 60% in 2050 to meet global needs. Such food availability should address not only lack of food, but also quality of nutrition as deficiencies in vitamins and minerals affect general health and the biological development of children (FAO, 2012). As food insecurity is on the rise for many rural and urban populations, feeding an urbanising world has become a pressing challenge for cities as highlighted by the UN-FAO under its strategic objectives outlined in the proposed Medium Term Plan 2014-2017 (FAO, 2013) (http://www.fao.org/docrep/meeting/027/mf490e.pdf) that was discussed during the Thirty-eighth Session of the Conference (15 – 22 June 2013):

SO1: Contribute to the eradication of hunger, food insecurity and malnutrition

Urban food security and nutrition

- 82. Given rapid urbanization around the world, food insecurity and malnutrition concerns in urban areas need to be addressed as much as in rural areas. Policies and investment programmes need to fully address these needs, while also strengthening urban-rural linkages and ensuring a sustainable use of natural resources for both urban and rural populations.

Cities are moreover highly vulnerable to the disruption in critical (food) supplies and climate change exacerbates this vulnerability. Cities like London only have a three-day of food. Urban economies may suffer as rural agricultural production is adversely affected by storms, floods, shifting seasonal patterns, droughts or water scarcity. At the same time changing temperature and precipitation patterns will affect what crops can best be grown in a given locale. Changing rainfall patterns for example are expected to affect rural agricultural productivity and threaten yields in many developing countries (Lotsch, 2007; UNEP, 2008). Droughts in Russia and Australia in 2007-2008 affected global grain prices, having a domino effect on prices of other food items.

An intervention made by Thomas Forster (Poliy2practice) in the last Joint ECOSOC and UN General Assembly meeting on food and nutrition (Thursday 16 February 2013, New York) clearly underlines these challenges:
“Increasingly, food security is one extreme weather event away and urban centres are highly vulnerable as are low lying rural areas, especially along waterways and along coastlines. In the context of urbanization and agriculture, the role of cities is becoming more prominent in creating more resilient urban food systems. There are new levels of attention (needed) from actors who have been less traditionally engaged in food and agriculture decisions, including professional planners and local urban and rural authorities” (personal communication; http://webtv.un.org/meetings-events/watch/food-security-and-nutrition-scaling-up-the-global-response-special-joint-meeting-ecosoc-and-general-assembly/2165533280001).

Current (global) food systems have various negative effects, including environmental contamination; conversion of rainforest and natural (fragile) areas into agricultural land; high amounts of CO2 emissions related to food production and transports; changes in dietary habits to lower-nutritious and more processed foods and related health diseases (obesity); and increasing amounts of food waste. Global food production is also predominantly based on a high input model meaning that inputs like fertilizer and pesticides as well as the labour and fossil fuel used to extract the food contribute not only to the natural capital loss but also financial loss in the sector. There is a need to critically look at sustainable global and local food systems and the place of urban food systems and food production therein, considering the potentials for lowering urban foot(d)-prints and protecting the agricultural land base around cities—which at the same time optimising the role of agriculture in providing other urban services and functions such as recreation, landscape management and quality, urban greening and health-, and strengthening urban-rural linkages. Urban and city-regional food systems offer new enterprise and marketing opportunities (supermarkets buying local/organic; procurement of local/region food; farm-to-school; local food shops and restaurants). Short food chains and enterprise development are seen as effective tools to stimulate local economic growth and help raise income and inclusion of small producers and vulnerable groups (poor households, women and youth) involved in processing and marketing activities; while local production and consumption will also result in expenditures being retained within a given locality. Urban food systems are also a response to an increasing market for local/regional food and increased felt need by consumers to control their own food system1 (healthy food, Slow Food, Buy Local Eat Local campaigns, awareness of food miles).

The increasing attention for resilient urban/ city-regional food systems is indeed demonstrated among several international organisations and local government forums.

Recently, ICLEI-Local Governments for Sustainability have started calling for more resilient city regional food systems and local government action in this area:

“Creating healthy, happy and sustainable communities in our cities requires resilient food systems for the city region. Until now this aspect of sustainability has largely gone unaddressed by cities, but the time has come for local governments to put food systems on the table and take the lead on sustainable food systems, and the right to food, for their urban populations.” - Konrad Otto-Zimmermann, Secretary General, ICLEI – Local Governments for Sustainability (Personal communication, December 2012).

1 While food safety risks are also of concern in urban production areas, because of various sources of pollution, e.g. heavy metals in water used for irrigation, and limited land area, forcing farmers to use excess fertilizers and pesticides, the proximity of production areas to consumers provides them with advantages for easier quality control. Proximity enables frequent contacts between farmers, traders and consumers, and monitoring of the production process. For example, in Paris, the persistence and success of farmers’ markets has been perpetuated at least as a cultural phenomenon. Moreover, since the food safety crises of the late 20th century, mistrust in the globalized agri-food system has resulted in the development of so called “alternative food chains” providing people with local quality products, mainly through short supply food chains (Aubry and Kebir, 2013).
This call was answered in the (June) 2013 Bonn Mayors’ Declaration that “Invites local governments to develop and implement a holistic approach for developing city-region food systems that ensure food security, contribute to poverty eradication, protect and enhance local biodiversity and that are integrated in development plans that strengthen urban resilience and adaptation”. It also: “Urges that appropriate mechanisms be made available for capacity building and to ensure direct access and scaled-up financial support for the implementation of urban adaptation, including the development of resilient food systems…”.

An intervention made by Mr Andrew Davis, Head of the Delegation of the Government of Catalonia to the United States on behalf of the Local Authorities Major Group confirms such calls by stating:

“The Rio+20 outcome document reaffirms the right of everyone to have access to safe, sufficient and nutritious food, and the fundamental right of everyone to be free from hunger. It furthers acknowledges that food security and nutrition has become a pressing global challenge and, in this regard, reaffirms the commitment to enhancing food security and access to adequate, safe and nutritious food for present and future generations. In this regard, we want to note that 16 years after the commitment at the First World Food Summit to halve the then level of undernourished people by 2015, progress in this area has remained limited and the world food situation remains critical. Taking this into account: We would like to stress the paramount role played by the sub-national level (note: regional and local governments) in anticipating crises and concretely improving food security and nutrition…… It is clear that a secure supply of food is an essential element of a healthy, sustainable and resilient city-region” (Mr Davis, talking on behalf of the Local Authorities Major Group, Third Session of the General Assembly Open Working Group on Sustainable Development Goals, 22-24 May 2013).

To develop resilient urban food systems, a holistic approach which integrates all aspects of the food system, is required. This includes urban and peri-urban agriculture, but also strengthening the rural-urban interface to ensure connections between rural supplies and urban contexts, and taking into account street food, retailers, food processing and distribution, nutrition and health.

Urban/city regional food systems will play an important role in balancing and linking urban and rural food supply. A growing body of evidence supports the geographic and economic complementarity between rural and urban production in their contributions to urban food supply. This complementarity should take into account that in reality rural to urban farming systems exist in a continuum with multiple types of flows and interactions between them. It is essential to define in which cases urban and peri-urban agriculture has a clear comparative advantage over rural agriculture. Such comparative advantage exists when (peri)urban agriculture can better serve the urban market by supplying products otherwise unavailable, at higher value or at a lower cost. As a result of its proximity, urban and peri-urban agriculture de facto shorten the food chain, allowing for savings in transport and other post-harvest expenses2. In places where rural infrastructure is poor or where farm-to-market systems are inadequate, where seasonal rural production is hampered by climatic conditions, urban and peri-urban agriculture can fill critical gaps. Urban and peri-urban production should logically concentrate on those activities in which it has such comparative advantage, such as the production of fresh, perishable foods and the production of foods that can be grown under

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2 Factors other than distance also give specific advantages to urban agriculture. In certain cases the hinterlands of cities are especially favourable for agriculture, and there are many cases when a city was established in a given location because of a rich agricultural hinterland. Furthermore, availability urban resources, especially waste and water may explain why urban production tends to be less seasonal than rural production, which is an important factor for guaranteeing food security in urban areas (Moustier and Danso, 2006).
space-intensive conditions (vegetables, small animals). In doing so, the challenge for urban agriculture is to demonstrate that it does not pollute the city environment, but rather that it produces safe food products despite a sometimes polluted urban environment.

Urban food system resilience, following from other sector planning, needs multiple and diverse sources of food supply. Urban and peri-urban agriculture are recognised as one of these (but by no means sole) sources, having specific importance in:

1. Increasing food security at household level, in cases where urban (poor) families resort to food production for home consumption and income generation. Urban and peri-urban agriculture may be an important source of food for urban dwellers both in terms of self-consumption and in terms of purchased food. Peri-urban areas for example may play a central role in the supply of perishable products, especially vegetables. In Hanoi in 2002, more than 70% of all leafy vegetables came from a production radius of 30 kilometres around the city. Ninety-five to 100% of all lettuce came from less than 20 kilometres away, while 73% to 100% of water convolvulus was harvested less than 10 kilometres from the city (Moustier, 2007). A further analysis of such contributions is given in Annex 2.

2. Buffering shocks to food price hikes, market distortions and import supplies, as is underlined in the following statement: “It has also been demonstrated that setting up short supply chains that encourage local consumption of local products, will act in favour of food self-sufficiency because it will bring down the level of reliance on imports” (Mr Davis, talking on behalf of the Local Authorities Major Group, Third Session of the General Assembly Open Working Group on Sustainable Development Goals, 22-24 May 2013). Short marketing chains furthermore enable low price differentials between the farm and final consumption. Such call for increased food self-reliance and reduced dependency on food imports was heard earlier in several countries and cities after the 2007-2008 food crises, which was characterised by a sharp increase in food prices and food riots. In addition to the food crisis, economic crises, fuel and energy crises, political acts (strikes, conflicts), natural disasters and climate change may increase the risk of food shortages and call for increased security against these phenomena (food self-reliance). Food security is now deemed a matter of local and national security by various countries and cities that have developed/are developing food security and food sovereignty policies, including urban and peri-urban agriculture production (see further Annex 2).

The role that can be played by urban and peri-urban agriculture in enhancing the sustainability and resilience of urban food systems is however not only limited to its role in enhancing food security and nutrition. Attention for urban and peri-urban agriculture as part of sustainable urban (food) systems is also triggered by recognition of its (potential) multiple co-benefits and contributions to community organisation, city greening, waste management, income and employment generation and –more recently- city resilience and climate change adaptation. Debates on resource recovery and efficiency increasingly consider urban and peri-urban agriculture for its potential to close nutrient loops, make productive use of waste, wastewater and urban open spaces as well as built-up areas. Urban demand for fresh water is rapidly rising while its availability is becoming a serious problem in several countries and cities. Meanwhile, large amounts of wastewater are disposed of and contributing to environmental contamination. Productive and safe reuse of wastewater in urban and peri-urban agriculture will enable year-round food production close to urban producers and reduce the pressure on fresh water resources. Growing cities also contribute to growing volumes of waste and related waste management problems. Organic waste can be re-used in urban agriculture and green spaces, thus also reducing the need for synthetic fertilisers, reducing municipal waste transport and landfill volumes. This will additionally reduce related energy needs and GHG emissions. By producing food closer to urban markets, energy consumption for food transport, (cold) storage and packaging can also be reduced. Urban agriculture and especially urban forestry can also have a beneficial effect on urban
temperatures and related energy needs for cooling and heating. In this context, urban and peri-urban agriculture is also starting to get acknowledgement for its potential role in climate change adaptation and enhancing overall city resilience (see further Annex 2).

In order to identify if and where further support to urban and peri-urban agriculture development is needed, this scoping paper looks in more detail at the past and current involvement of international and government organisations in urban agriculture projects, programmes and policy-making. This will allow better defining gaps and challenges that still require attention and support from international, UN and local organisations, researchers, policy makers and funding organisations.

4. Institutional, research and policy achievements and gaps in urban agriculture
Luc Mougeot from the International Development Research Centre (IDRC-Canada) discussed the international research and policy achievements in urban agriculture from 1970-2010 in an article he published in the Urban Agriculture Magazine (2010). In Annex 3 an overview of his findings, completed with findings from this UNEP-RUAF survey, are presented (though recognising that the overview will not be complete). The Annex distinguishes three main describes periods in urban agriculture research and development:

1. Individual research and first UN surveys and support (1970-1995)
2. Large increase in networking, research and policy making; several UN agencies develop projects and programmes on urban agriculture (1996-2007)
3. Resurge of interest for urban agriculture linked to the global food crisis, climate change, the green economy and debates on resilient cities (2008-present).

Analysis of the long list of past and current initiatives allows identifying key institutional achievements and gaps. These will be discussed below.

4.1 Main institutional achievements and gaps
The listed, as well as other not-recorded, initiatives have contributed to the following key institutional achievements (see also Mougeot, 2010):

1. **Growth in research capacity and programmes by universities and research organisations**, involving various disciplines (social sciences, agriculture, economics, urban and landscape planning, architecture, health). Research showed a shift towards more multi-disciplinary and multi-stakeholder research and from informative to more action and more policy-research. A present a larger set of tools available for collecting data and informing policy-making on urban agriculture is available. The past 2 years have also seen a large increase in the number of conferences and events dealing with the topic and the number of (special issues of) scientific journals dedicated to it. Urban agriculture has also been included in the mission of professional agencies such as the American Planners Organisation and in the curricula of many Universities.

2. **Rise of government interest and engagement.** From a prohibitive (or at best laissez-faire) attitude to better regulation and active support to urban agriculture as part of various government sectors and programmes. Government networks and international organisations are actively discussing the need and strategies for building more resilient urban food systems and greener cities. Policy briefs on urban agriculture, sample bye-laws, ordinances and statements and a set of fiscal and legal instruments are today available for policy makers.

3. **Increase in diversity of funding sources and support.** A larger variety of donor and international organisations, local and national governments and private foundations have been funding and supporting urban agriculture, though often on a temporal basis (linked to certain programmatic activities or specific project calls). Due to broadening of its focus, funding for urban agriculture has also come from a larger variety of thematic fields and organisations.
4. **Enhanced integration of urban agriculture in broader urban development and food security agendas.** From a focus on urban agriculture as a stand-alone field of interest (which was important and crucial to understand and recognise its presence and impacts) to understanding urban agriculture in a broader “nexus-context”. Conceptual frameworks and strategies on such broader integration are available, allowing for more effective integration of urban agriculture activities in programmes dealing with green economies, climate change, food systems, integrated environmental and resource management and city resilience.

However, and at the same time, it can be concluded that:

- Financial resources put forward to urban and peri-urban agriculture have been and are limited, comparing them to the larger number of urban and peri-producers and cities struggling with challenges that may –partially- be met by urban and peri-urban agriculture development.
- Local government authority associations are still missing from the scene and could play an important role in providing support, training and technical advice to their members.
- Most initiatives are project-based and spatially restricted, not reaching a larger number of cities for a longer period of time. There is also a gap in local to national level up-scaling.
- Notwithstanding the many research activities that have been implemented, quite some research questions and gaps remain, amongst others related to the development of more safe, sustainable and profitable urban agriculture, the role urban and peri-urban agriculture can play in employment creation and in creating more resilient urban food systems. In addition, recent and standardised data are often lacking on the specific impacts of urban agriculture in a different cities, research findings are neither easily accessible nor used sufficiently as basis for training and extension (research to practice outreach).
- A key role focus is on and is played by capital or large cities, while further support to smaller and intermediate cities is crucial given that highest urbanisation rates will take place in smaller cities. Likewise, most projects have dealt with only one or two aspects of urban agriculture (be it waste management, community gardening for food security, while an integrated (and spatial) approach testing various urban agriculture models in various parts of the city, involving various beneficiary groups, and targeting various policy goals is needed if urban and peri-urban agriculture are really to find their place in resilient urban (food) systems.
- There is very limited experience, especially in the global South, in urban and city-regional food system planning and analysis, which take into account urban agriculture next to other food strategies.

The question can be asked, why, despite growing attention for, information on and interventions in the sector, there is apparently still lack of funding for urban agriculture at international and local level and limited wider uptake of urban and peri-urban agriculture at local and national level. It is indeed positive that initiatives are taking place in a growing number of cities and countries that are supported by a larger number of institutions. However, even when adding up all these experiences, they still fall very short of addressing the needs and demands of both urban producers and city governments. What is strategically needed is to really shift scale, shift from isolated and temporal projects to larger scale programmes and funding.

Shifting scale is not happening due to a combination of lack of larger-scale awareness and information (dissemination) on the potential (and limits) of urban and peri-urban agriculture, on current and potential practices policy and technological innovations (which is still limited to certain confined circles); limited visibility of urban and peri-urban agriculture among multilateral and bilateral donors as well as in international declarations, lack of recent (after
2007/2008) and standardised data on the impacts and associated benefits of urban agriculture; lack of wider application of innovative mechanisms for local and international financing of urban agriculture and limited inclusion of urban agriculture as an integrated nexus strategy in programmes and funding sources such as for climate change, disaster risk reduction and sustainable urbanisation. At the same time, several institutional gaps can be identified that limit further growth and up-scaling of urban agriculture and its wider inclusion in government and financing programmes:

I. At the level of the **United Nations** and although urban and peri-urban agriculture are supported by various UN agencies (as indicated above) and mentioned in international declarations, rights and covenants, recognition and visibility on urban agriculture is still limited in:

- The MDGs and SDGs which are silent on urban food security, the role of urban agriculture and the role of cities in feeding growing urban populations
- Urban food security and the role of urban and peri-urban agriculture is scarcely mentioned in the Rio+20 The Future we Want Declaration, and declarations on the Right to Food and Food Security.
- Secure tenure for urban agriculture is hardly addressed, while the mayor focus and campaigns deal with secure tenure for housing.
- Declarations and programmes on sustainable, resource efficient and resilient cities and local and national climate change action plans do highlight water and waste management, transport and energy, rural agriculture and adaptation to climate change, but do generally not include food, nor do they highlight the potential linkages among urban agriculture and these other programmes and resource flows (UN-FAO, 2011).

II. **Multilateral (the World Bank), regional and local banks, and international funding organisations** (including climate change funds), overall channel low -or only incidentally- investments and funding to urban and peri-urban agriculture. Though the diversity of funding sources for urban agriculture has grown over the past years, lack of investment and international finance for urban agriculture is in general a clear bottleneck for further growth of the sector, reason why amongst other the newly established Food Think Tank calls for more investment in urban agriculture. Urban and peri-urban agriculture are increasingly mentioned as part of for example project calls on sustainable development, but the actual amount of funding dedicated to it is still very low. No specific urban agriculture funding window exists anymore, after IDRC closed its Cities Feeding People programme a couple of years ago. Demand for urban agriculture financial support is growing by cities as well as farmer organisations and small business enterprises.

III. Growing local government interest and demand for technical and training support to urban agriculture/urban food systems policy making, strategic planning and project support cannot be sufficiently met by organisations working in the field (also related to lack of finance as mentioned above). Potentially a larger role could be played by **local government associations** that have only recently --if at all- included urban and peri-urban agriculture in their agendas. This may indicate their limited awareness, but possibly more their limited capacity to provide support to urban agriculture and put it higher on their agenda. UCGL, Metropolis and ICLEI are starting to give urban food and agriculture a more prominent role, though at the same time highlight the needs for further training and technical assistance to their members and local governments.

IV. Notwithstanding the increasing number of courses and student thesis on urban agriculture, urban agriculture is –except in very few cases- not taught at master level in **universities**, with the international Master course on urban agriculture taught by the DPU/University College London- part of the Environmental Sustainable
Development Master-, probably being the frontrunner. Demand for such master level courses is high and largely unsaturated. The number of people trained on the various dimensions of urban agriculture is low and needs to be increased if growing government demand is to be well addressed. In addition inclusion of urban and peri-urban agriculture in the agenda of training and extension institutes is still often lacking.

The above will on its turn require more systematic attention to a series of specific research and policy gaps. Six areas are particularly relevant for public support of urban agriculture: (i) Mobilising financial support (see also 4.2); (ii) Research and extension for more safe, profitable and sustainable vegetable and animal systems (see also 4.3); (iii) Increased attention towards more commercial forms of urban and peri-urban agriculture and innovative business models (see also 4.5) (iv) Integration in urban land use and food systems planning (see also 4.6); (v) Training of actors involved (public, producers and private sectors) and capacity building of producers and their associations and (vi) Systematic impact assessment and monitoring (see 4.7).

4.2 Mobilising financial support

Lack of financing is a clear bottleneck for the growth of urban agriculture, as illustrated by recent research (Cabannes, 2011). There is a need to channel a mix of funding and subsidies to the sector, including small grants for subsistence agriculture, revolving local funds, grants for technical advice, loans and credits for support to business plans, guarantee funds and insurance facilities. Access to credit and other sources of financing (e.g. subsidies/grants) are crucial for up-scaling of the activity and to further investment in agricultural production and/or processing and marketing activities.

There is a large unmet request to co-finance local urban agriculture projects (often presented by NGO’s and local urban farmer groups in coordination with supporting local government departments) or to assist in the identification of donor and financial organisations that are willing to fund urban agriculture projects or programmes. However, for many donor and financial organisations such urban agriculture projects either do not fit in their actual grant programmes or credit lines (often rural/agriculture or urban/other sectors); are potentially funded but have to compete with many other activity lines; or the size of the projects is too big or too small to be funded. Also, urban farmer groups and businesses often lack the expertise to formulate proposer project proposals, business plans and loan applications. In response to these identified needs and demands, RUAF Foundation has already proposed to establish an Intermediate (Co)Funding mechanism for Urban Agriculture that will take charge of managing the process of project assessment, results monitoring; the co-funding of local multi-stakeholder initiatives on urban agriculture and the realisation of activities that will lead to increased local financing urban agriculture (providing local revolving funds and enterprise development support to farmer groups and targeted guarantee funds to local financing organisations). Such a Funding facility could pull together resources from different donor organisations. Applying mechanisms such as guarantee funds and loans, the continuity of the Fund receives important attention.

Alternatively, donor organisations or banks might set up specific urban and peri-urban agriculture programmes or counters; or more specifically include it in other funding streams (climate change; sustainable urbanisation) but with a minimum funding quota for urban agriculture. Traditional rural agriculture grant schemes could be revised as to also be accessible for urban producers, as is done in India and Brazil already.

Other needs include:

- Better optimisation of the combination credit+ subsidies+ monetary and no-monetary savings,
- Better quantification of the demand for credit and finance among small urban producers,
Better information about producers’ repayment capacity - lessons could be learnt from successful small-scale loan schemes such as in Bangladesh, especially about methods for handling small loans and strengthening repayment,

Producer training in business development skills, preparation of business plans and record-keeping, assistance to producer groups in preparing loan applications,

Specific (municipal) guarantee schemes to financial institutions willing to provide loans to small scale urban producers,

Development of insurance systems to reduce impacts of natural and climate change risks and increase investment in urban agriculture, as in Beijing, China, for example, where the local government set up an insurance system for 18 different types of crops and animals that engaged over 1,600 urban farming households in 2007 (Cabannes, 2011).

Lobbying (through campaigns or international charters) is needed to get more international, national and local resources channelled to the sector, while optimising subsidies to address the issues mentioned below.

4.3 Research and extension for safer, more efficient and sustainable farming systems

Environment and health risk reduction remains a key issue in urban agriculture development. Despite numerous projects on Integrated Production Management in the urban agriculture of large cities around the world, there is still much to do in training farmers, extension workers, and chemical retailers and traders in the areas of waste water use, fertiliser use and management and organic waste management, pest and disease identification, correct use of pesticides and their application, and promotion of less toxic or more natural pest control and integrated pest and fertiliser management.

Furthermore, very little is known about certain environmental risks, such as the extent to which air pollution or growing in flood-prone areas or in the vicinity of/under power-lines influences quality of food grown in these areas. Further research and monitoring in these areas is needed, as well as farmer training and extension in these fields.

Re-use of waste and wastewater is a key element for enhanced resource efficiency in urban agriculture. Because of (perceived) health risks, there is generally a common hesitation to take advantage of great potential of wastewater re-use in (urban) agriculture. Low-cost technologies for decentralised wastewater treatment and reuse in urban and peri-urban agriculture are available (including amongst others natural infiltration and oxidation ponds or reed bed systems), but their further development and larger-scale implementation is needed. Especially research on and further implementation of medium and small-scale wastewater treatment allowing keeping a maximum of nutrients and eliminating pathogens is an area that needs further attention. Such systems need to be developed for or adapted to local contexts. This would be beneficial not only for urban agriculture, but also limit the need for or, at least, deferring investments in building new, costly wastewater carrying and treatment infrastructure. Research supporting development of low-cost rainwater harvesting and safe storage (preventing water-borne diseases propagation) options for the purpose of urban agriculture may be a complementary but no less essential area.

In cities 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 WHO guidelines for safe use of excreta and wastewater (WHO, 2006). These new guidelines assist decision-makers to plan how to achieve the required levels of pathogen reduction by choosing and combining a number of different health risk reduction measures and entry points for action along the “farm to fork” pathway, depending on what is feasible locally. As the new WHO guidelines allow for incremental and adaptive change (in contrast to the earlier strict water quality thresholds), they are a cost-effective and realistic approach for reducing health and environmental risks in low-income countries. The
dissemination of such information and training on potential risk reduction measures to urban and peri-urban agriculture producers is however lagging behind and limits wider application.

With urban encroachment and competition of scarce resources (especially land and water), more research on and dissemination of innovations is also needed that focus on:

- Raising land (m²) / space (m³) rent of agricultural production, by intensifying production per unit of land, promoting low-space, no-space production techniques (growing in containers, baskets) and off- and above-ground production (high beds, hanging, climbing, rooftops). More data and examples are needed on how urban agriculture systems can viably be embedded in buildings and other urban structures. Most rooftop programmes for example still focus on green rooftops and few data; costs-benefit analysis, technical guidelines and impact analysis are available for the promotion of productive rooftop gardens in various climates and cities.

- Adding value to agricultural production (see further below & 4.4).

- Valorising multiple urban functions of agricultural production and value chains. Urban and peri-urban agriculture does not only contribute to generating jobs and revenues, but also to preventing costs by using people, land and resources productively. Calculating such net savings will help inform better policy making. Estimating the value that people attach (or not) to particular urban agriculture land uses and functions, can be done by Valuing Public Appreciation, Willingness to Pay and Willingness to Accept. These methods have yet only been applied to a very limited extent in urban agriculture and merit broader application and testing.

There is also a need to further investigate production systems and technologies that are "resource efficient" and use more "renewable energy" in areas of irrigation and pumping of water, soil preparation and plant management, drying, processing, storing and transport of food.

In the context of climate change, there will also be a need to further investigate and promote specific production systems that may have highest climate change adaptation impacts in specific contexts, cities or urban areas, such as rooftop gardens and the edible vegetalization of buildings in densely built-up inner city areas; the production of food and biomass in flood zones and low-lying areas in cities with higher flood incidences and risks and the promotion of agro- and productive forestry in open spaces and on steep slopes to mitigate increase in urban temperatures and reduce risks of land slides. At the same time more research is needed on exposure to natural and climate-induced risks by producers growing in environmentally risk-prone areas.

Stronger integration of and funding for urban agriculture in international climate funding and programmes - such as for example the CDM (Clean Development Mechanism) - should be promoted, building on a first example in Amman (Jordan) where urban agriculture and forestry are funded under the Green Growth Programme. Similarly local climate change funding could be oriented towards urban agriculture as done in the UN Habitat-RUAF programme on "Integrating urban and peri-urban agriculture and forestry in city climate change strategies". As already experimented by the city of New York, inclusion and funding of urban agriculture as part of its green infrastructure and storm-water management programme constitutes another strategy and funding source.

In this context, there is however also a need for better understanding of the interactions between climate stressors and no-climate stressors and their impacts on urban and peri-urban agriculture. For urban and peri-urban agriculture to keep playing a role in climate-optimized development, innovation of systems and practices is needed for urban agriculture itself to become more resilient to climate change. Increased rainfall/ floods/ temperature will
affect urban and peri-urban agriculture (for example in terms of diseases, yields, crop failures, livestock mortality). Response strategies could include adjustment of production systems, cropping patterns, selection of adapted crop varieties, diversification of cropping and/or farming systems, improved water management, rezoning of urban agriculture etcetera. Pest and (zoonotic) disease management (including potential livestock mortality form heat waves) may become even more crucial as a result of changing climate, and further farmer training on the subject is required. Local innovation funds are interesting mechanisms by which farmers can fund testing of new technical, but also social and organisational innovations. Activities can build on work done by IWMI, WHO and FAO (in the field of safe wastewater use), CGIAR and AVRDC in the field of crop management and ILRI (in the field of zoonotic diseases).

4.4 More commercial forms of urban agriculture and business models for short supply chains; multifunctional urban agriculture and resource recovery

Farm and household level waste recycling are quite well covered by past research on manure reuse, backyard composting or Ecosan (see amongst others IWMI and FAO research, but also the Sustainable Sanitation Alliance SuSanA: http://www.susana.org/). However more and better (business) models for district-level waste recycling and resource recovery for urban agriculture and energy still need to be developed. The focus should turn to be on centres of waste accumulation to have a high probability of economics of scale. Following a range of analyses, IWMI and other partners suggested that the fundamental factor that could result in the scaling-up of resource recovery and reuse (RRR) efforts is the formulation and implementation of “business models” that generate value and allow cost recovery or profits if well designed. In their definition, resource recovery & reuse business models are any practices that utilize the resource value in waste in such a way that the use of the resource generates value that can be used to support the sanitation service chain or at least supports safe disposal. Because sanitation, including urban solid waste management, is still predominantly financed by the public sector with limited attention to cost recovery, they consider any improvement that RRR can support, from partial to full cost recovery, as steps in the right direction and business models worth our attention.

Similarly, up-scaling of short food supply chains and multifunctional urban agriculture will also require more research on and promotion of related business models. On-going RUAF research in the context of the EU SUPURBFOOD programmes, shows that information on such business models, their costs-benefits, their organisational and logistical set up, customer segments and market demand is still very scarce (at least for the global South), and can benefit from further analysis, testing and dissemination. Another research gap identified is the need to better understand different forms of business models (varying from Small and Medium Enterprises (SMEs) or producer groups selling directly to consumer groups, to intermediary SMEs assisting farmers with marketing and training, or rolling-out franchise concepts to mainly government-driven food delivery chains and their governance mechanisms. Commercial urban and peri-urban agriculture and short food chains to a different degree are driven by initiatives of market parties (including producers), government agencies and civil society. Generally initiatives which build on a balanced and complementary mix of governance mechanisms e.g. through public-private partnerships, multi-stakeholder platforms and an increased role for SMEs appear to be relatively successful and more resilient (Renting and Dubbeling, 2013).

In the past, many urban agriculture projects have mainly focused on urban and peri-urban food production for reasons of food security, while commercial urban and peri-urban agriculture, agro-processing and value addition activities are only recently and better addressed (Dubbeling and Pasquini, 2010). How can urban and peri-urban agriculture be strengthened as a livelihood income activity? An additional challenge is to understand and promote how market—oriented urban agriculture, beyond self-provision, can expand its niche in the urban food-retail system (fresh, chilled, frozen, dehydrated, canned)? Supporting
business models for short food chains will on its turn require policy, financial and technical support for:

a) Improving (market) infrastructure, capacity strengthening and extension
b) Strengthening producer organisations and networking among producer organisations
c) Promoting value-chain development in urban agriculture and direct producer-consumer marketing, localising food hubs
d) Quality labelling on local and safe food production,
e) Increasing producers’ access to financing (see also 4.2).

Business opportunities for multifunctional agriculture may on their turn result from:

- Marketing of products & services (e.g. leisure, tourism, education), resulting in profit/revenue generation and portfolio diversification
- Cost savings and/or cost recovery for public goods or services provisioning compared to state provisioning (e.g. waste disposal, green space management)
- Cost avoidance, e.g. by means of health improvement, flood control, climate change mitigation, etc.
- Creation of distinctive product quality or reputation or creation of ‘basket’ of products & services.

A key question is how to translate social benefits/ cost savings in opportunities for producers/SMEs, e.g. by means of revenues from public funding or access to resources (land, credit, etc.) resulting in cost reductions? (Renting and Dubbeling, 2013).

4.5 Need for further integration of urban and peri-urban agriculture into land use planning and urban or city regional food systems

Access to land is always quoted among the first constraints by farmers. Land planning policies are needed that are favourable for urban and peri-urban agriculture and preserve existing agricultural areas. Formal recognition of urban agriculture as a legitimate use of urban land and of its value to city livelihoods and liveability can be a crucial step towards effective planning for as well as regulation and facilitation of the development of urban agriculture. Instead of a concentric circle approach to city development and growth, cities could plan for land mosaic patterns that integrate productive zones in the city structure, protect valuable agricultural systems, ecosystems and biodiversity hotspots, optimize and expand urban-rural linkages and existing network infrastructure.

Next to the preservation and protection of existing agricultural land, governments could optimize the use of vacant and non-built land areas up for food production. Institutions (schools, hospitals, prisons, offices) could utilize all their free spaces in this way and serve the food grown in the premises. Urban agriculture could also be integrated in social housing and slum upgrading programmes by including space for home gardens or community gardens, street trees for shade and fruits, “productive parks”. Priority should also be given to using land that is earmarked for other uses but not yet in use as such, land that is not fit for construction e.g. flood zones, land under power lines or buffer zones. Giving economic value to open and ‘marginal’ space helps prevent development encroachment.

City-regions need to include urban agriculture in their strategic development plans in order to regularize the use of public open spaces for cultivation. Even a limited acceptance by government can influence the status of urban farmers in two ways. First, it encourages a sense of security that will lead them to make more improvements to their farming system and, secondly it allows urban farmers to access credit and to use their land occupancy as collateral for small loans, thus overcoming the barrier of not having formal “property”. Cities may also provide fiscal and tax incentives for land owners who lease out vacant private land to groups of urban poor people willing to produce on this land, while idle land could be taxed. Since land is a valuable resource, combinations of different forms of land use (multifunctional land use), for example by combining agricultural land use with recreational, water management / flood protection, green space or other functions may also be required.
There is a need for better characterisation of different types/models of urban agriculture and their “best” location within a given neighbourhood, city or city-region. The integration of such urban and peri-urban agriculture types and food systems at the various levels of planning needs to be supported by urban, metropolitan and regional/national management, incentives and governance measures. Providing a legal and normative framework that protects existing agricultural land and guarantees secure tenure longer-term use of urban land by producers is pivotal. Such facilitating land use planning framework, should specifically address the fact that a (large) part of urban agriculture is practised on hazard prone areas including swamps, flooding areas, steep slopes that are cultivated by the probably the poorest segments of the population. Land uses are needed that at the same time open such areas for production and protect the environment. Further technical assistance and studies are required.

Similar legislation, governance and policy frameworks are needed that will enhance resource recovery and efficiency in urban and peri-urban agriculture. Innovative experiences exist at local and national level that may be replicated elsewhere (see also the recent FAO publication on Legal frameworks for urban agriculture at: http://www.fao.org/docrep/017/i3021e/i3021e.pdf). Lessons may be learned from “advanced cities” that have experimented with various governance framework (addressing supra-municipal governance structures; intra-municipal governance and collaboration among various city departments and sectors; as well as broader public-private-civil society governance mechanisms). Key factors for success –as documented in various policy briefs published by RUAF, IDRC, FAO, the UMP/ UN Habitat programme and GIZ- include, amongst others, strong political will, identifying the right entry-points (food security, waste management, climate change...) while at the same time linking urban agriculture to broader city development, inter-departmental cooperation, institutionalisation in public programmes and budgeting.

Urban and peri-urban agriculture should also better find its place in urban or city-regional food systems that embrace both urban and rural areas and food flows. The concept of urban and city-regional food systems however needs further operationalisation. City-regions may run across existing political boundaries, encompass various smaller urban centres/municipalities, have a complex mix of jurisdictions spreading across district, state and national governments which bear on regional land use and marketing and these different jurisdictions receive different pots of money from central government. There is therefore a need for planning and investment across boundaries.

In addition, more information on current city or regional government initiatives on urban food systems is lacking (though still being mainly a strategy applied by cities in the global North), as is comparative action- and policy research and data on urban food systems and planning to analyse and understand:

- Actual city food flows and vulnerability to externalities;
- Related energy, waste and nutrient flows and opportunities for reduced waste generation or increased resource recovery;
- Mapping and assessment of food/nutrition deficiencies and risks;
- The actual and potential production of a given geographic area; the extent to which urban and peri-urban agriculture (as a sector and for specific food items) already does or can contribute to urban food security as cities grow (e.g. under which conditions and to what extent can urban agriculture feed the urban poor and increase their food security? To what extent and for which food items can cities feed their populations?);
- Value chain mapping; Actual presence and potential for localised food processing, transport, storage and marketing infrastructure. Particular research attention could be given to the existence of, or potential for (and limitation off!), localised food chains within and around cities: small-scaled, labour intensive, skilled, networked, value-adding, market-oriented, engaging youth and women, reducing waste and
transportation, improving local environment and community, generating growing and processing businesses.

- Examination of the comparative advantages of food production and supply in different parts of the urban area/city region;
- Assessment of results and costs of existing initiatives and proposed solutions;
- Analysis of governance structures (at supra-municipal, intra-municipal and public-private-civil society level);
- Action planning, implementation and monitoring.

Obtained information will provide strategic inputs to planning of city-regional or urban food systems and help defining key problems, the setting objectives, identification of alternative interventions and the calculation of costs/benefits of alternative interventions.

4.6 Agricultural training and extension programmes

Further integration of urban agriculture in agricultural and extension training programmes is needed to build more extension and technical staff capacity to help urban producers (and producer organisations) sustainably innovate their production systems and better organise themselves for more market-oriented production. In Ghana and Kenya special urban agricultural officers are trained and employed. In Vancouver, a partnership between a local environmental NGO and a social organization, designed as a social enterprise, offers 25 classes in a variety of subjects related to sustainable urban farming systems. Such Urban Farmer Field Schools could be more widely promoted (De Zeeuw and Dubbeling, 2009).

A low degree of organisation hampers producers’ efforts to obtain a stronger market position, undertake processing and engage in direct marketing and limits the capacity to represent the political interests of producers. Past studies call for strengthening of existing producer organizations and promoting the formation of new ones, so as to enhance their participation in policy lobbying and marketing. The formation of viable farmer groups and farmer-based enterprises with gender equity should be promoted, to enhance their knowledge, skills, and access to resources, and for stronger bargaining power in inputs, marketing and access to financing. A specific attention is needed for women’s groups and their urban agriculture collective practices need to be promoted and supported so as to be recognised as social and political actors.

The (further) integration of urban and peri-urban agriculture in the curricula of Southern Universities and Colleges and the training of their staff in (participatory) education and (action-) research on urban agriculture and urban food security also requires further attention. Activities could include: Joint curriculum development; Training/coaching University staff in action learning approach to education and research; Setting up local co-operation between university, urban producer groups, local governments and other relevant actors and jointly develop and implement an agenda of applied research on urban agriculture; Development of additional distance learning modules; Sharing of developed educational materials and experiences with a wider group of universities.

As illustrated in Annex 3, a large amount of information on (innovative) tools, approaches, technologies and policy frameworks is available among different organisations that can be used in such training and educational programmes. Often however this information is not (yet) systematised, bundled and disseminated in form of practical guidelines and toolkits that could be more widely made available to interested governments and organisations working with them. Examples of relevant toolkits, guidelines and policy briefs that could be elaborated and disseminated could include:

- A toolkit on innovative local financing for urban and peri-urban agriculture (can built on the RUAF analysis of local financing practices in 17 cities\(^3\)).

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\(^3\) Innovative mechanisms are available and could be up-scaled such as:
• A methodological guideline on local value chain development in urban and peri-urban agriculture (can built on experiences gained in the RUAF From Seed to Table programme as well as EU and other programmes dealing with this issue).

• A compilation of city and national government profiles who designed and implemented programmes and policy frameworks on urban and peri-urban agriculture (building on RUAF and FAO work). Examples of cities which included urban agriculture in their environmental policies and programmes, as is the case in Lima as described in Annex 2, will be of particular relevance to UNEP.

• Documentation of successful factors for integrating urban and peri-urban agriculture into city development strategies (building on cities who have been working on the issue for longer periods of time).

• A toolkit for planners on the potential of and planning for different urban and peri-urban agriculture and forestry models for different areas of a city (building on recent UN Habitat work).

• Practical technical guidelines on certain production systems, including cost-benefit analysis.

• Practical technical guidelines on adapting urban and peri-urban agriculture systems to become more resilient to climate change (building on the work done by START, FAO and RUAF).

• A practical toolkit on urban food systems planning and analysis (building on work done by several, mainly Northern America, researchers).

Toolkits and policy briefs that are already available could be more widely disseminated to cities.

In June 2013, ICLEI and RUAF signed a partnership agreement to establish a city network on resilient urban food systems and urban agriculture in response to the Bonn 2013 Mayors’ Declaration, underlining the need of cities to receive better training and information on the topic of city-region food systems and urban and peri-urban agriculture. The network will be open to any city in the world. It will start simultaneously working on global information provision; while at the same time starting to work in a selected number of cities on specific topics. The purpose of this network is to:

• Raise awareness on resilient urban and city-regional food systems.

• Create an advocacy platform for cities to gain political recognition and support from national governments and international support organizations.

• Provide information to cities around the world, stimulate exchange of experiences, identify and disseminate important lessons, good practices, practical guidelines and toolkits.

• Provide cities with training and technical assistance and guidance in managing their food systems and in engineering resilience.

• Facilitate cooperation between cities worldwide and between local government and civil society in this important policy area.

Specific (municipal) guarantee schemes
Public food procurement of locally produced food
Crop insurance schemes for producers
Directing credits for consumption and local procurement to urban and peri-urban agriculture produce
Securing tenure (temporary occupancy licenses) as means to access micro-credits.

4 The methodology developed by RUAF in its From Seed to Table Programme links urban agriculture value chain development to financial and legal/normative support systems. This approach (next to other approaches for local value chain development) could be further disseminated and the methodological and technical guidelines developed could be published and made widely available. Likewise, the innovations documented in the 17 partner cities on urban agriculture financing could be edited into a publication that can orient cities and financial organisations in enhancing access to financing for urban and peri-urban agriculture.
Strong UNEP support to this network would enable it to work more effectively, upscale activities and work in a larger amount of cities.

4.7 Need for more systematic and standardised research on impacts

Data on the contribution of urban agriculture to food security are generally out-of-date, based on punctual research (no indication of trends) and not easily comparable. As most data on the better studied potential benefits of urban agriculture on food security, nutrition and income are stemming from research done in the 1990’s, there is a need for more current and continued research, applying standard methods and geographic boundaries, on data and trends on the presence of urban and peri-urban agriculture production systems and land uses, numbers of households and percentage of the urban population involved in the practice, production volumes and shares of specific urban and peri-urban agriculture food groups to urban consumption, food security, nutrition and income impacts for various groups of the population. Data collection is often focussed on specific components only, hampered by the often informal nature of urban agriculture and the lack of standardised mechanisms for data collection (though FAO is trying to address this by incorporating data on urban and peri-urban production in FAO stats) and by lack of local (research) capacity to collect such data. Surveys implemented also typically estimate urban agriculture’s contribution to urban households’ food supply based on own production, but they hardly account for food grown in the city that is acquired by producing and non-producing households through gifts, barter or purchase. Accounting for these supply chains is needed to get a more complete picture when estimating urban consumers’ reliance on food grown in and around the city.

Similarly the value of urban agriculture value chains to the urban economy needs to be better estimated; while also information is lacking on what kinds of jobs are created? Are they decent? How to secure decent employment and income-generation through urban and peri-urban agriculture and forestry? How do they benefit excluded urban groups? How to address decent work deficiencies in the food production chain? What is the contribution of different urban agriculture value or commodity chains to employment creation? In which parts of the chain are or can most jobs be created? Further action and policy research is needed in these fields.

Past research also mainly focussed on capital cities. As urban growth will mainly take place in small and medium cities, where institutional and technical capacity may be limited, while at the same time opportunities to manage and plan for urban growth while preserving and maintaining agricultural areas is greatest, more research should be focussed on such future centres of growth.

If urban and peri-urban agriculture are to further be promoted as integral strategies for climate change adaptation, biodiversity protection and management, green economies etc. respective indicators and monitoring frameworks are needed to better understand its actual contributions. It is in this context that the RUAF Foundation, UN-Habitat and local and international researchers (with CDKN funding) have started developing a monitoring framework to monitor the impacts of (peri)urban agriculture and forestry on climate change indicators such as the Urban Heat island, run-off co-efficients, food miles, emissions reductions and vulnerability indicators. However such framework could be tested in a larger variety of cities and put forward to wider replication. In addition, this mentioned framework does not account for certain environmental impacts such as ecosystem services, the productive re-use of (waste)water, resource management and efficiency, biodiversity etc.

5. Potential role that UNEP could play in the sector

There is a general consensus by the organisations involved in the scope exercise that UNEP can indeed play a catalytic role in up-scaling urban and peri-urban agriculture through its national and international level influence. Through providing vision and authoritative information and advice, UNEP can help to move urban and peri-urban agriculture higher in
the priorities of national governments, international agencies and donors. A major UNEP potential strength lays in supporting research and evidence-based policy formulation on the environmental dimensions of urban and peri-urban agriculture (environment services, benefits and risks) as well as in wider dissemination of related information, toolkits and best practices.

Different approaches are suggested in further defining a UNEP position and strategy on urban agriculture. For one, UNEP could start mainstreaming urban agriculture in one or more UNEP programmes which would enable UNEP to draw on its considerable institutional assets and reap considerable mileage with more limited initial disbursements of new money. Alternatively, or in addition (combining the two approaches of mainstreaming and tackling gaps), UNEP could start tackling some of the identified gaps in the sector which both correspond best to UNEPs mandate and have received relatively little attention so far on part of other external support agencies.

Whatever approach is chosen, further coordination with other UN agencies and other international key players in this field is deemed essential, so that UNEP could rather build on and complement their work and develop synergies for progress in fields that UNEP is uniquely positioned to promote.

5.1 Mainstreaming urban agriculture into current UNEP programmes and agendas

There are many opportunities for UNEP to integrate urban and peri-urban agriculture in its various programmes. UNEP should internally best decide which program would take the lead, amongst others depending on how much funding UNEP has to do anything substantial on urban agriculture under any of these programmes, which of those programmes would be the most politically receptive and the more financially supportive of urban agriculture, or what be the most influential home for urban agriculture from which it could flare out to other programs in UNEP. Content-wise the key focus should probably be on the environmental dimensions of and links to urban agriculture. Activity-wise UNEP strengths are considered to be international mobilisation, awareness and campaigns and collecting scientific based evidence for policy making (research and monitoring, pilot projects and policy formulation). Furthermore, UNEP could play a key role in supporting training, technical assistance and programmes implemented by other organisations. In this light, possibilities for integrating urban and peri-urban agriculture in mayor UNEP programmes are listed below:

**UNEP Built Environment Programmes**

Fitting urban and peri-urban agriculture into UNEP’s Built Environment activities could include the productive greening of buildings, promotion of rooftop agriculture as an integrated strategy with potential climate change impacts; and promoting the integration of urban agriculture in slum upgrading and social housing initiatives. In doing so, attention could be paid to researching and monitoring environmental risks and benefits of urban agriculture, and its linkages with water and waste management.

**Green job and employment programme**

UNEP could also start or more strongly promote urban and peri-urban agriculture as one focus area of its green jobs and employment programme, especially for youth, and catalyse green investments in food and agriculture. In a first stage – and building on recent ILO activities - a research study could be funded and supported to explore the number of youth worldwide already engaged in urban agriculture and related employment activities (input provision, processing, marketing, service delivery), the potential for new youth jobs in urban agriculture, and (potential) working problems faced by youth engaged in urban agriculture related jobs, that need to be addressed - e.g. occupational health and safety, or-and lack of proper training, lack of access to markets, low remuneration, etc. Answers to these questions are particularly important to understand the need to further invest in youth employment in urban agriculture. Research could also be done in the potential of different urban and peri-
urban agriculture value chains to generate (decent) employment, in which part of the chain more jobs could be created and how, and in comparing the job creation potential of urban agriculture to other (informal) urban sectors.

**Global Food Waste Campaign**

Further links could be made to the global food waste campaign entitled Think Eat Save, recently launched by UNEP in partnership with the UN Food and Agriculture Organisation (FAO), the Waste Resources Action Programme of the UK (WRAP) and other partners ([http://www.thinkeatsave.org](http://www.thinkeatsave.org)). According to the draft toolkit developed by the programme partners: "A recent study has revealed that worldwide about one-third of all food produced gets lost or wasted in the food production and consumption systems" (Working draft of the "Reducing and preventing food and drink waste in businesses and households: A tool kit for governments, local authorities, businesses and organisations"). Can such food waste be reduced when shortening food chains and thus also reduce resource loss and reduce methane emissions resulting from food waste decomposition in landfills? If so, in which part of the chain (from field to table, or from table to garbage bins)?

Research on the extent to which localised food production, shorter food chains and direct sales and promotion of local food processing can provide opportunities to prevent and reduce food losses and waste (as transport and food chains may be shorter - thus reducing transport and storage losses- and as a larger percentage of the grown food is directly consumed) is lacking as well are studies on how to put a larger part of this waste to productive re-use (also considering infrastructure needs to get the wastes to where it is needed). Concretely, UNEP and its partners could compare food wastes generated along a global food chain with localised food chains for a specific product or a group of products, building on existing studies done in Amsterdam and other (northern) cities. Applying techniques as listed in the draft toolkit, such comparison could be made for one or more European cities and for one or more cities in rapidly developing economies such as China, India or Brazil. Data from such assessments will help make the case for promoting local food production and urban and peri-urban agriculture as part of the global campaign and the toolkit developed for households, businesses, public facilities (hospitals, schools) and local governments. Arguments can then be put forward to local governments to support both local food procurement and urban and peri-urban agriculture as this may contribute to reduced waste generation.

As UNEP is currently seen as a leader in the field of food waste where they have developed actions and raised momentum, UNEP could well select this programme as one of the first programmes to further integrate urban agriculture and urban food systems thinking.

**Climate change programmes**

UNEP could promote urban agriculture and forestry as one strategy for urban CDM projects and related financing, building on the initial experiences in the city of Amman (Jordan). UNEP could also contribute to the still very limited knowledge base regarding the impacts of urban agriculture on climate change adaptation and mitigation and study and assess the environmental contributions and ecosystem services of urban agriculture in a perspective of changing climate and hazards.

**Environmental Outlook**

There is no current monitoring system to map and monitor the existence/area of urban and peri-urban agriculture and land use changes in various cities over time. Baseline data on the area dedicated to urban and peri-urban agriculture in selected cities, and monitoring of the changes over time, will provide information to orient policies and preservation of existing agricultural land use and help analyse the impact of urban and peri-urban agriculture in that particular urban food system/environment. This could be done by systematically including
such data in the UNEP Environmental Outlooks. Such data could then be cross-referenced and analysed with production data gathered by FAO.

The Agri-Food Work-stream

Programmes in the Agri-Food work-stream could more explicitly promote a focus on assessment of urban or city-regional food systems. A holistic approach to urban food systems link amongst others to work done on rural-urban linkages (including the comparative advantages and production potential and contributions of rural, peri-urban and urban agriculture), on nutrition (both malnutrition as well as obesity) and sustainable diets and consumption, on increasing market access to food to low-income communities and on addressing (climate) vulnerabilities in the food system. UNEP, together with other actors, may help orient cities in integrating food planning in their political agendas and long term policies and plans. This would lead particular countries and cities to develop in urban areas, the kind of activities planned for by the Agri-Food programmes: demo-projects, review of existing policy frameworks, instilling value-added chains and efficiently utilising resources. In this regard, the focus should not be on UNEP supporting particular NGO projects. UNEP, in collaboration with other partners, could work instead with some pilot or model cities to distil and develop citywide interventions, drawing from cities, pilot test them and share them with a larger number of cities.

The GI-REC programme

The GI-REC programme on Resource Efficient Cities could effectively integrate food as one of the –currently missing- resource flows to cities. UNEP can use its convening and lobbying power to continue to raise awareness and address the need for action by national and local governments, as well as international organisations, regarding the rapidly increasing rates of urbanisation and urban food insecurity. It can highlight at that level that the urban sustainability agenda should extend to the issues, challenges and opportunities of urban food systems and agriculture, with particular attention to the mounting competition for resources. This could include knowledge sharing, development of tools and learning opportunities with respect to the role that urban and peri-urban agriculture can play in optimising efficient use of resources (water, waste, energy, excess heat) as well as optimising resource efficiency in urban and peri-urban agriculture (by intensifying production systems and applying non soil-bound production technologies or integration in buildings). UNEP has also a potential role to play in further quantification and mapping of food flows, food waste and other waste streams as part of city-regional food and resource flow assessments (see the Global Food Waste and Agri-Food programmes).

In both the Agri-Food as well as GI-REC programme, collaboration with UN-FAO, UN Habitat and the new ICLEI-RUAF city network on resilient urban food systems and urban agriculture, among other actors, would enhance efficiency and outreach.

5.2 Tackling identified gaps in the sector

Alternatively –or in addition to- mainstreaming urban agriculture in its current work programmes- UNEP could aim to address one or more of the identified institutional, research and policy gaps. According to the scoping exercise, UNEP, in collaboration with a wide spectrum of partners, should specifically build on its strength to support the science policy interface - ensuring that it encourages the flow of knowledge from the basic and applied science to policy action, as well as the flow of information from the policy arena back to the scientific community. Considering in addition UNEP’s key environmental mandate, expertise and strength, UNEP’s role would probably be most strategic in addressing at least the following gaps:

Designing, testing and promoting environmental impact assessment of urban agriculture

UNEP can play an important role by focussing on the environmental impacts and ecosystem service perspectives of food supply under population pressure and in the context of a
changing climate. Comparable and more systematic data on the environmental impacts and risks of urban and peri-urban agriculture are required to support further evidence-based policy making. Designing such an assessment method, testing it and disseminating its use is a task UNEP is well-placed to take on. There is a need for standardised indicators that will be reported on in a comparable manner across cities and regions. Such an environmental impact assessment methodology tool could be developed and shared among member countries. Complementary research can be done on consumer willingness to pay for these environmental services of urban agriculture and application of such mechanisms in cities in the global south.

Collaborating partners in this area could include UN Habitat, RUAF Foundation and the World Bank (monitoring impacts on climate change), START (already engaged in environmental assessments of urban agriculture with UNEP), ICLEI (impacts on biodiversity, payment for ecosystem services) and FAO, as well as local and international research organisations.

Donors like CIDA (and possibly IDRC) could possibly partner with UNEP for joint funding of such research activities. CIDA’s priority areas are food security, economic growth and child and maternal health. Therefore, the agency could support urban agriculture activities as these address one or more of those three priorities. CIDA’s Environmental Sustainability Section recently convened a group of Canadian organizations engaged in international cooperation on urban agriculture, for a mutual exchange on opportunities to work one with another, for instance under the Section’s programming on climate change.

Promoting resource recovery and efficiency for urban agriculture

UNEP can play a strategic role in promoting further resource recovery and efficiency in urban agriculture. This can be done by making available information on various technological options and business models –and related risk reduction strategies- more widely available to governments, urban farmers and training institutes. Strategic investment and support to application of appropriate resource recovery and re-use (business) models in various cities may also be taken on by UNEP, in collaboration with other partners working in the field, such as the International Water Management Institute.

UNEP can specifically help further identify, document, assess, compare and share good practices on municipal policies for resource recovery and efficiency in urban agriculture. In doing so, UNEP, together with FAO and the RUAF Foundation amongst other actors, could build on the former series of UMP policy briefs on urban agriculture and the recently published FAO publication on legal frameworks for pro-poor urban agriculture in producing a specific set of policy guidelines on resource recovery and efficiency in urban agriculture and a complementary publication on “local and national legal and normative frameworks for resource recovery and efficiency in urban agriculture”. Such publications would contribute to:

- Providing future support (capacity development, technical assistance etc.) to national and local governments regarding the development of national and local policies and programmes on resource recovery in urban agriculture (in collaboration with municipalities, civil society and private actors) and related institutional, operational and financial mechanisms needed to implement such policies and programmes
- Promoting inclusion of urban agriculture into environmental, water and sanitation, and climate change programmes in urban areas.

Promoting integrated urban food systems planning across the food-water-energy nexus

UNEP could take the lead in elaborating a toolkit on urban/city-regional food systems assessment and planning. Such a toolkit could include subjects like: “Rationale for developing an urban food strategy; its benefits; approaches, tools and strategies on how to do this; costs and requirements”. RUAF Foundation and ICLEI could be logical partners to work with.
Based on this work, UNEP, in collaboration with other partners, could also support a small number of cities in actually applying an integrated approach to urban food system planning across the food-energy-water nexus (analysing and promoting interactions between the food, energy, water, waste and transportation systems that can be exploited for sustainable urban and green growth). Such integrated approach could be tested in cities of various sizes and in varying agro-ecological zones, with particular attention to small or intermediary cities that are planning for future urban growth and food needs. Government and city networks and organisation mandated to work with such cities such as ICLEI-RUAH city network, UN Habitat and the FAO-Food for Cities would be potential partners to collaborate with, as these organisations are already working to support implementation of activities on the ground and in supporting cities to incorporate urban agriculture and city-region food systems’ approaches in their city strategic planning and development programmes.

Addressing the institutional gaps

Looking back at the institutional gaps presented earlier UNEP may decide to also play a role in targeting its political lobbying efforts and weight towards addressing some of these institutional gaps and support several of the key players mentioned. UNEP can definitively play a key role in bringing the debate to higher levels, upscale the work that has been successfully realized by different international groups over the last decades by drawing on its role as a global platform and its capacity to facilitate collective action.

International organisations and agendas

With regards to increasing visibility of urban agriculture in international agendas and declarations, UNEP can more strongly promote attention for and inclusion of – environmentally friendly- urban agriculture as a stronger component in current and new international agendas that are being discussed in the perspective of Habitat III, the new SDGs, agendas for resilient cities or follow up agendas to the Rio +20 Declaration. Similarly, UNEP can call for increasing financing for urban agriculture under such programmes, as well as climate change funding streams.

There is wide agreement that UNEP should coordinate such lobbying and interventions with other UN agencies (ILO, FAO, UN Habitat) and in doing so, jointly agree on its role versus the role played by other UN Agencies. UNEP can then effectively collaborate with each of the other agencies on issues that are relevant to both organizations (“UN as ONE” approach). Proposed mechanisms for such coordination mentioned include:

- Collaboration on a bilateral and programmatic basis
- Through an inter-agency UN group such as the UN High level task Force on Food Security or the Environmental Management Group.
- By mainstreaming food and nutrition security, and urban agriculture and food strategies into the UN Development Assistance Frameworks at country level (Delivering as One – UN collaboration).
- Through a Joint Work Programme, such as the Cities and Climate Change programme (World Bank, UN Habitat and UNEP) funded by Cities Alliance.
- By forming an Expert Group on urban agriculture among various UN organisations, local government organisations (UCLG, ICLEI, Metropolis), key technical actors like RUAF Foundation, as well as (potential) donor agencies, to support further strategy development and legitimisation.

Such UN coordination, as well as coordination with other organisations active in the sector, will serve to improve coordination, information exchange, the taking of a common position and effective building on earlier work done. It would also provide opportunities to offer joint services to UN coordination teams and local governments in the various countries.
Local authorities and government associations
UNEP may play a role in supporting recent efforts of local authorities and government associations to enhance information and training to their members by (1) making existing tools and policy documents on urban agriculture widely available; (2) supporting the development of new practical methodological and technical guidelines and toolkits (on a variety of issues like financing of urban agriculture; promoting a local value-chain approach in urban agriculture, enhancing resource efficiency in urban agriculture etc.). UNEP could be a strategic partner in the new collaboration between ICLEI and RUAF whom will be coordinating the exchange of information and best practices on urban agriculture and resilient urban food systems between and among experts, local government representatives and politicians. They will also seek to provide training and technical assistance, in collaboration with other actors in this field.

Research organisations and academia
With regards to fostering the role of research organisations and universities, UNEP can collaborate with research organisations and universities to gather good scientific data on (the environmental) impacts and risks of urban agriculture that will be regularly be monitored and analysed. In doing so, it may help stimulate debate on and introduction of more master courses on a large range of urban agriculture related topics.

6. Conclusions
Growing urbanisation, poverty and food insecurity call for increased attention to building more resilient urban and city-regional food systems. Urban and peri-urban agriculture are one important urban food systems strategy. Urban and peri-urban agriculture are not only promoted for its potential direct food security benefits, its role in enhancing self-reliance and reducing dependence on import and market structures (and failures); but also for its role in job creation, environmental management, resource recovery and climate change adaptation.

Over the past 15 years urban and peri-urban agriculture has clearly become a research and policy field in its own right, thanks to the growth of interest and actions by a widening spectrum of local, national and international sectors and actors. However, a critical gap and need remains with regards to broader up-scaling of urban agriculture from local to national level, from working with a limited to a far larger number of cities; from working at pilot project level to city-wide development strategies, from limited to larger-scale funding. Such up-scaling is needed to respond to the largely unmet demand for support and training, and to better understand and promote urban and peri-urban agriculture as a strategy for creating more resilient urban (food) systems.

For this reason UNEP’s assessment of its potential role is in this sector is deemed timely and relevant. Taking into account UNEP’s comparative strengths and mandate, possible priorities or short-term actions that could be taken up by UNEP, and as suggested by the external respondents include:

(1) Building on the current visibility and momentum gained by the Food Waste programme, including activities related to urban agriculture and resource recovery/efficiency;

(2) Integrating urban agriculture and food flows more strongly in the GI-REC programme, promoting an integrated food-energy-nexus approach to resource efficient city planning, starting from documentation of case studies and success factors on integration of urban food and agriculture in city development strategies and planning;

(3) Supporting the elaboration of a toolkit on resilient urban food systems analysis (rationale for urban food systems planning; benefits; assessment and planning approaches; costs and requirements) and planning and testing such approach in one or more cities;
(4) Developing a methodology, toolkit and policy guidelines on assessment of environmental benefits, services, risks and hazards of and affecting urban agriculture in a changing climate.

Such activities implemented in collaboration with local government organisations, UN organisations, research institutes and other organisations with a long working history in the sector would then pave the way for longer-term strategy development. Larger involvement of local government organisations is deemed pivotal. In this context, strong UNEP support to the newly formed ICLEI-RAF city network on resilient urban food systems and urban agriculture would help increase outreach and up-scaling of support and training to a larger number of cities.

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## Annex 1- Questionnaire on institutional urban agriculture programs and visions for the future- List of respondents

<table>
<thead>
<tr>
<th>Organization</th>
<th>Name and contact details respondents</th>
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</thead>
</table>
| **1** FAO- Food and Agriculture Organisation of the United Nations | Julien Custot, Coordinator, Food for Cities  
Makiko Taguchi, Agricultural Officer, Plant Production and Protection Division  
FAO - Food and Agriculture Organization of the United Nations  
Viale delle Terme di Caracalla - 00153 Rome, Italy  
Tel : +39 06 570 56879 - office : B550bis  
E-mail: [Julien.custot@fao.org](mailto:Julien.custot@fao.org); [Makiko.Taguchi@fao.org](mailto:Makiko.Taguchi@fao.org)  
| **2** FMDV- Fonds Mondial pour le Développement des Villes | Jean-François Habeau  
FMDV- Fonds Mondial pour le Développement des Villes  
Directeur adjoint/Deputy Director  
132 rue du Faubourg Saint-Denis, 75010 Paris - France  
Tel: + 33 1 40 38 66 95  
E-mail: jfhabeau@fmdv.net  
[www.fmdv.net](http://www.fmdv.net) |
| **3** GIZ- Deutsche Gesellschaft für Internationale Zusammenarbeit | Barbara Krause, senior advicer  
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH  
Postfach 5180  
65726 Eschborn  
Deutschland  
T + 49 6196 79-1424  
E-mail: [barbara.krause@giz.de](mailto:barbara.krause@giz.de)  
[www.giz.de](http://www.giz.de) |
| **4** ICLEI - Local Governments for Sustainability | Emily Dowding-Smith  
Urban Food Systems Forum Manager  
World Secretariat  
ICLEI - Local Governments for Sustainability  
Kaiser-Friedrich-Str. 7  
D-53113 Bonn, Germany  
Tel: +49-(0)228 / 976 299-38  
E-mail: [emily.dowdingsmith@iclei.org](mailto:emily.dowdingsmith@iclei.org) |
| **5** ICMA International - International City/County Management Association | Judit Deilinger  
Director, New Initiatives  
ICMA International -International City/County Management Association  
777 North Capitol Street NE, Suite 500  
Washington, DC 20002-4201, USA  
Tel: + 202 962 3520  
Email: [jdeilinger@icma.org](mailto:jdeilinger@icma.org)  
| **6** IDRC (International Development Research Centre) | Luc Mougeot  
Senior programme specialist  
Canadian Partnerships Programme  
IDRC (International Development Research Centre)  
PO Box 8500 , Ottawa, ON, Canada, K1G 3H9  
E-mail: [lmougeot@idrc.ca](mailto:lmougeot@idrc.ca)  
[www.idrc.ca](http://www.idrc.ca) |
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<tr>
<td>7</td>
<td><strong>ILO-International Labour Office</strong></td>
<td>Edmundo Werna, PhD, Team Leader Sectoral Activities Department, ILO (International Labour Office), 4 Route des Morillons, 1211 Geneve-22, Switzerland Tel 41 22 799 6036 E-mail: <a href="mailto:werna@ilo.org">werna@ilo.org</a> <a href="http://www.urban-labour.net">www.urban-labour.net</a></td>
<td></td>
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<td>9</td>
<td><strong>Municipality of Belo Horizonte, Brazil</strong></td>
<td>Zoraya B. Souza Gerente de Apoio à Produção e Comercialização de Alimentos PBH/SMASAN – Secretaria Municipal Adjunta de Segurança Alimentar e Nutricional Prefeitura Belo Horizonte, Brazil Tel +55 (31) 3277 – 1606 / 8618-2211 E-mail: <a href="mailto:zoraya@pbh.gov.br">zoraya@pbh.gov.br</a></td>
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<td>10</td>
<td><strong>START</strong></td>
<td>Jon Padgham Deputy director International START Secretariat 2000 Florida Ave NW, Washington, DC 20009 United States E-mail: <a href="mailto:jpadgham@start.org">jpadgham@start.org</a> <a href="http://start.org/">http://start.org/</a></td>
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<td>11</td>
<td><strong>UNCRD- United Nations Centre for Regional Development</strong></td>
<td>Jean D’Aragon, PhD Coordinator Disaster Management Planning Unit UNCRD-United Nations Centre for Regional Development 1-47-1 Nagono, Nakamura-ku, Nagoya 450-0001, Japan Tel.: +81-(0)52) 561-9377 / 9481 (direct) Email: <a href="mailto:daragonj@uncrd.or.jp">daragonj@uncrd.or.jp</a> <a href="http://www.uncrd.or.jp">www.uncrd.or.jp</a></td>
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<td>12</td>
<td><strong>UN Habitat</strong></td>
<td>Rafael Tuts Coordinator, Urban Planning and Design Branch United Nations Human Settlements Programme, UN-Habitat P.O. Box 30030, Nairobi 00100, Kenya UN Gigiri Campus, Block 3, Level 2, North Wing Tel.: +254-20-7623726 E-mail: <a href="mailto:raf.tuts@unhabitat.org">raf.tuts@unhabitat.org</a> <a href="http://www.unhabitat.org">www.unhabitat.org</a></td>
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<td>13</td>
<td><strong>World Bank</strong></td>
<td>Marcus Lee Cities and Climate Change Urban and Resilience Management Unit The World Bank 1818 H Street NW, Washington, DC, 20433 USA Tel: +1 (202) 473-0880 E-mail: <a href="mailto:mlee1@worldbank.org">mlee1@worldbank.org</a> <a href="http://www.worldbank.org/urban">www.worldbank.org/urban</a></td>
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Annex 2- Urban agriculture, the food, waste, water and energy nexus and policy frameworks

Urban agriculture, food security and income generation: the food nexus

Agriculture has been practised in and around cities since the time of city development. Formally recognised urban agriculture however, only recently made it to international (development) agendas. Urban and Peri-urban Agriculture (UPA; or sometimes also called Urban and Peri-urban Agriculture and Forestry UPAF) can be defined as the growing of trees, food and other agricultural products (herbs, pot plants, fuel, fodder) and raising of livestock (including fisheries) within the build-up area (intra-urban agriculture) or on the fringe of cities (peri-urban agriculture). UPA includes various production systems such as horticulture, livestock, (agro-) forestry and aquaculture as well as related input supply, processing and marketing activities (Mougeot, 1999).

UPA is practiced in a variety of places (in peri-urban field plots or green belts, on vacant public land, on steep slopes and along road and water ways, in home gardens, on rooftops, in barns and cellars). UPA most often focuses on perishable and high-value products (green vegetables, mushrooms, fruits, herbs, fresh milk, eggs, poultry and pig meat, fish as well as plant seedlings and ornaments) as its comparative advantage to rural agriculture its it close proximity to urban consumers and markets. The orientation and scale of UPA may vary from purely subsistence-oriented or recreational types of UPA at the micro scale, through small-scale semi-commercial gardeners and livestock keepers, to medium- and large-scale fully commercial enterprises.

Urban agriculture is practised by private corporations (also supply and purchase), public institutions, state enterprises (also supply and purchase), local government departments and agencies (also supply and purchase), independent coops or associations of small producers, other civil society organizations, informal groups of neighbours, households and individuals of all income groups, social groups: retirees, children, youth, women, ethnic minorities, refugees. Some urban farmers are recent immigrants but, contrary to popular belief, more often than not urban and peri-urban farmers have already lived in the city for longer periods of time; time that is needed to gain access to urban land, water and other resources Many urban producers, especially in Africa, are women.

In Kampala (Uganda), as well as in many other African cities, a significant proportion of the population is involved in this sector (Cole et al., 2008). A recent figure from the Food and Agriculture Organization (FAO) estimates that some 200 million people are engaged in urban and peri-urban agriculture and related enterprises, involving up to 40% of the population in urban Africa; (FAO, 2012). However, data vary a lot amongst cities and do not always distinguish between participation in urban agriculture for self-sufficiency or leisure purposes, versus participation for income generation.

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5 Data collected by the FAO from 1998-2005 on the participation rate in urban agriculture give an extremely varied picture (Zezza and Tasciotti, 2010): “the shares of urban households that earn an income from agriculture vary from 11% in Indonesia to almost 70% in Vietnam and Nicaragua. However, in 11 of the 15 countries in their dataset, the share of households participating is over 30%”. They also found that “For between 18 and 24% of all urban households in the African counties in the sample, agriculture constitutes 30% of total income or more”. This figure is lower for households in Guatemala, Nicaragua and Vietnam. By decomposing participation rates and income shares by quintile of expenditure levels, the study also found confirmation that urban agriculture is an eminent activity practised by the poor. These figures are consistent with those found in a 2010-2011 study done by the World Bank and RUAF Foundation in the cities of Accra, Lima, Bangalore and Nairobi (Prain and Dubbeling, 2011). This study found that over 30% of the interviewed producers (except for Lima) consider urban agriculture an important source of income. If data from the study are extrapolated, a conservative 20% of the overall population is estimated to be involved in urban agriculture, this would imply that over 1,346,000 households in the four cities generate an important share of their income from urban agriculture. Data from a recent AFSUN study (Crush, Hovorka and Tevera, 2011) however found much lower numbers of households deriving an income from urban agriculture. Reasons for this may include that the incorporation of urban agriculture...
After reviewing the research literature on UPA, Mougeot (1999) came to the conclusion that the most striking feature of urban agriculture is not its location, but the fact that it is an integral part of the urban socio-economic and ecological system. UPA uses urban resources (land, labour and urban organic wastes), grows produce for urban citizens, is strongly influenced by urban conditions (urban policies and regulations, high competition for land, urban markets, prices, etc.) and impacts the urban system (having effects on urban food security and poverty, as well as having impacts on ecology and health). Drivers for urban agriculture are: growing urban markets, increasing exposure to crisis, growing urban poverty, urban agriculture’s contribution to urban food security and urban economic security and urban green design and management (Mougeot, 2013).

In this respect, Mougeot (2013) analysed that research shows that thousands of metric tons of produce and millions of litres of milk are produced in urban and peri-urban agriculture in any given city (high share of all fresh and perishable products), that the sector contributes to a non-negligible share of all food consumed (higher for poorer households) and that food production in and around the cities contributes to enhancing household food security (see also Baker 2008, FAO, 2008, De Zeeuw and Dubbeling, 2009, Smit et al, 2011), improving nutrition (more meals, more balanced diet year-round, savings for other food, children with better health and nutritional status) (see also Zezza and Tasciotti, 2010, Yeudall, 2007).

Though it is recognised that urban and peri-urban agriculture will by itself not be able to feed entire cities, nor will it provide all food that households need, it may constitute a relevant and needed food source to meet world food demand, as illustrated by Jeb Brugmann in his presentation to the recent Megacities Programme (Hamburg, April 2013; http://future-megacities.org/fileadmin/documents/konferenzen/Megacities_in_Action_2013/evening_lecture_brugmann.pdf):

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agriculture in (in)formal markets in Southern Africa is much more limited. In addition, the study focussed only selected areas and did not provide insights into the relevance of urban agriculture across the city as a whole.
In 2006, the WHO already expected that “urban agriculture, with urban wastewater as a common resource, will play a more important role in supplying food for the cities in the future” (WHO, 2006).

In 2008, UN-HABITAT stated that: “Rather than applying crisis management through ad hoc responses, African governments should consider how they can strategically position themselves for changing urban food requirements and the need for supply strategies and systems in the short, medium and longer term so that they will continue to be able to feed their increasingly urban societies. Policies are needed that protect (peri-)urban agricultural land, land rights and agricultural livelihoods of the poor. Solutions can be found in stimulating urban and peri-urban agricultural production; improving infrastructure to facilitate inputs into agriculture and outputs from agriculture to cities; and better water management to convert the non-productive territories of the continent to food production for internal use and future export” (p. 34).

It is also in this context that the UN High Level Task Force on the Global Food Security Crisis (2008) recommended that: “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” (p. 15).

Or according to the UN-FAO: “Urban and peri-urban agriculture is already an important reality in developing countries. As urbanization will likely accelerate in the decades ahead, its contribution will be even more significant. Consequently, governments and city administrations must recognize the opportunities offered by urban and peri-urban agriculture to improve urban food security and livelihoods. By adopting policy responses that better integrate agriculture into urban development, developing countries can reap considerable benefits, especially enhancements in social, economic and environmental sustainability” (FAO Statistical Yearbook 2012: 216).

One such country is Brazil that has developed an urban agriculture programme as part of its “Hunger Zero” policy. Sierra Leone has included urban and peri-urban agriculture in its “Operation Feed the Nation”. Ghana included urban and peri-urban agriculture in the national food and agriculture sector development policy (FASDEP II), while Sri Lanka integrated urban food production in its National Campaign to Motivate Domestic Food Production 2007-2010. In India, urban agriculture has been included in the 12th five year national plan for agriculture. In 2012, the National Government set up a 68 million USD initiative on urban horticulture, to address the food crises in cities. Another proposal put forward, states that new development activities should be carried out with zero loss of agricultural productivity – if agriculture lands are being built upon, innovations should be included to introduce new forms of agriculture in the same premises.

In addition, many Northern American cities (including Toronto, Vancouver, Seattle, Portland, Chicago, New York and many others) and cities in the global South (including amongst others Freetown, Monrovia, Lima, Bulawayo, Beijing, Bangalore, Accra, Bobo Dioulasso, Amman, Nairobi, Antananarivo, Cape Town) have in recent years set up Food Policy Councils or Food Platforms to deal with urban food security in a more comprehensive way. The promotion of local food production (either by promoting backyard and community gardening or more commercial peri-urban agriculture) is a common strategy in their programmes (De Zeeuw and Dubbeling, 2009).

Urban and peri-urban agriculture not only contributes to food production and thus food availability, but also to urban employment and income (having a direct effect on purchasing
power and access to food) and food expense savings (Mougeot, 2013). Research data show that:

- Thousands of farmers and tens of thousands of workers may be involved in a single type of UA production at any given time (estimated 10,000 market gardeners in Brazzaville (FAO, 2012),
- UPA contributes to considerable low-cost job creation in periods of crisis; and has the ability to grow in periods of recovery (as in Cuba),
- The higher the market value of the produce, the larger its contribution to household income,
- Incomes and wages in market UPA compare favourably to those of unskilled construction workers, even of mid-level civil servants (up to 5X higher than national per capita income, Dakar and Nairobi, 4 X national poverty line Maputo (FAO, 2012),
- Annual savings in food purchase can add up to several months of a minimum wage,
- Savings and incomes from home-based UPA allow to re-invest in other income-generating home business to improve household well-being,
- Market UPA provides a relatively accessible entry on job market for youth (with beneficial impacts on income, food, trade learning, own small business, self-esteem).

A systematic assessment of urban and peri-urban agriculture activities in 4 cities (Accra, Ghana; Bangalore, India; Lima, Peru and Nairobi, Kenya) implemented by the World Bank and RUAF Foundation between March 2010 and May 2011 demonstrated such role of urban agriculture as an economic livelihood strategy. Findings of the study show that:

- Agriculture provides a stable occupation and income strategy for a vulnerable sector of the urban population, that is, the old and less well educated poor households, especially women-headed households.
- There is some hard evidence to support the claim that agriculture is highly compatible with other kinds of work. The data even suggest that it is more compatible than other kinds of employment such as petty trading or even casual labouring. This apparent greater adaptability of agriculture to combine with other occupations also facilitates access to multiple income sources. Such diversification of income sources is very important as a risk-aversion and adaptation strategy.
- Thanks to its versatility as an income source, income generation is in many cases considered of greater importance than access to additional food as a reason for cultivation, although this differs for individual households or locations.

Literature also discusses the role played by UPA in reducing the vulnerability of the urban poor and vulnerable groups and enhancing their coping capacity by:

- Enhancing access to nutritious food and diversifying food sources and thereby reducing the vulnerability of producer (and non-producer) households and enhancing their coping capacity by increasing the stability of household food consumption against seasonality, disturbances in food supply from rural areas or imports, increases in food prices and (temporary) losses of income. The mentioned World Bank study on urban agriculture found that an important income source from agricultural production were cash savings from producing own food that otherwise would have to be purchased. Although the foods purchased with savings depend on local food cultures to some extent, there are commonalities, primarily in the important use of savings to purchase local staple foods. The vast majority of staple foods are typically produced in rural areas and facilitating their purchase through savings from own production is a key contribution. Savings are also important for covering higher value items in the diet, such as micro-nutrient and protein rich animal foods and supplementary vegetables (Prain and Dubbeling, 2011),
- Enhancing community building and acting as a source of innovation and learning.
Several cities and countries have included or are including urban agriculture as part of its food security strategies. In 2012, the Ministry of Western Province in Sri Lanka adopted 10 policy statements on urban agriculture, with view to – amongst others - enhance food self-sufficiency in the Province. Currently the National Cabinet is developing a similar national policy on urban agriculture (see also.

For over 10 years, the municipality of Belo Horizonte (Brazil) has promoted an integrated urban food strategy, that links support to all kinds of food security to programmes on school feeding, popular restaurants (where nutritionally balanced meals can be obtained at an affordable price), direct marketing, education and training and food price information and price fixing (a number of vegetables and fruits must be sold at a fixed low price in special places called abastecer).

Urban agriculture was also included in the Food and Agriculture Sector Development Policy (FASDEP II) and the Medium-Term Agriculture Sector Investment Plan 2011-2015 for Ghana. Extension support for especially crops, livestock and fisheries production is now provided by the Ministry of Food and Agriculture (MoFA) at the district level and the Department of Agricultural Extension (MoFA) has created an UPA and Environment Desk (Dubbeling et al., 2010; Dubbeling and Prain, 2011).

**Urban agriculture, resource recovery and efficiency and city resilience: the waste, water and energy nexus**

In order to manage urban growth and urban food systems more sustainably it is also necessary to de-couple the quality of life of existing and new urban dwellers from an ever-increasing extraction of resources, in particular fresh water, fertile soil and certain minerals such as phosphor; increasing consumption of energy; increasing generation of waste; and the deterioration of biodiversity as well as ecosystems and their services. “De-coupling” will depend on how cities are planned, how natural resources and ecosystem services are being preserved and on how city-based energy, waste, transportation, food, water and sanitation systems are expanded and/or reconfigured. Cities take up only about 2% of the world’s land area, yet they consume 75% of all resources, and therefore utilise far more resources than those contained within their boundaries. Furthermore, and as distances between food producers and consumers grow, food becomes more expensive (transportation costs assuming a rapidly growing share of food prices; while post-harvest losses are further increased caused by inappropriate handling and packaging). Especially low-income households, residing farther away from food markets, may face higher prices, time constraints and transport costs in accessing food (FAO, 2010).

Key to the debate on resource efficiency is the recognised need that input-output cycles (the output often being waste) should be closed, also within urban areas or city-regions. This approach looks into, amongst others, food, water, energy and waste as combined systems (“the nexus approach”). Food production and consumption have an important impact on such resource efficiency.

Cities and towns can be engines for increased resource efficiency by decoupling agriculture from fossil fuels by bringing waste and nutrients – through household or municipal composting and urban waste water - back into the food production cycle. Composting of the organic fraction of urban solid wastes (and subsequent use of such compost in urban and peri-urban agriculture) will enable:

- Reduction of the need for artificial fertilizers in production as well as reduce the energy needed for producing the fertilizers.
- Reduction of transport of municipal waste to landfills and thus emissions related to such transport.
• Reduction of landfill volumes and thus methane emission from landfills (in case this methane is not captured for energy use which would off-set emissions).
• Reducing GHG emissions from waste treatment.
• If the compost is used in UPA, C-storage/sequestration in the soil and water infiltration capacity will be enhanced.
• Waste management also create the potential for the creation of new green jobs. For example in Quito (Ecuador), a micro-company involved in composting and vermiculture signed an agreement with the Municipal Department of Parks and Gardens for selling its products, which would be used in municipal green areas. With a steady source of income, the company was able to apply for micro-credit and provided employment for several families (see Dubbeling and de Zeeuw, 2011, World Bank, 2010).

Urban and peri-urban agriculture provide an outlet for productive re-use of waste, either in form of compost or as animal feed. The Cuban Ministry of Agriculture is implementing two programmes respectively called Materia orgánica" (aimed at recycling organic matter in urban agriculture) and "Alimento animal" (animal feed), the latter aimed at "using all local food sources for animal feed, including fruit and vegetable harvest residues, legume seeds, agricultural by-products, oil seed residues (e.g., peanuts, soy), and other crops". The IDRC-funded research Kampala Focus City Research Initiative, whereby researchers were looking for solutions to flooding in low-lying slum areas of Kampala, found that the banana peels (banana being a major element of staple diet in Uganda) that were a major cause for blocking the water channels and the resulting flooding could be dried up and pulverized (through a low-tech, low-energy and labour intensive natural process) and be used in replacement of maize in poultry feeding without altering the quality of the meat. In Montevideo (Uruguay), the municipality relocated pig producers, earlier operating in densely populated areas, out to peri-urban areas near waste recycling stations.

The small city of Camilo Aldao, Argentina (5000 inhabitants) is one example of various cities promoting organic waste recycling for composting and use in urban and peri-urban agriculture. Eighty percent of all organic household and municipal waste is recycled in this way. Also in Ibadan (Nigeria) and in Pune (India), the Municipal Corporations are promoting organic waste recycling, stimulating use of compost in and around the city. In Cagayan de Oro, (Philippines), the Xavier University and the Municipality worked closely with farmers in developing composting and using organic food waste as fertiliser in food production. Keskewa Urban Council (Sri Lanka) and Kathmandu Metropolitan City (Nepal) are currently implementing a research study –with support of RUAF and UN HABITAT- to calculate actual household waste re-use in home or rooftop gardening and –by up-scaling project level data to city level- they will calculate equivalents of reductions in GHG emissions and energy use resulting from reduced waste transports, reduced emissions at the landfill and by replacement of artificial fertilisers6. It is being discussed that financial savings on municipal

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6 The extent to which urban and peri-urban agriculture fertiliser or nutrient needs can be replaced with waste-based nutrients is however dependent on the extent to which urban farmers currently use chemical fertilisers (in most home production these are not or very little used), the quantity of the actual waste-related nutrients produced in a certain city (total amount of waste generated) or the amount currently collected. IWMi calculated for four African cities how much the collected waste could support food production if returned to urban and peri-urban areas (see also: http://www.ruaf.org/sites/default/files/UAM23%20pag11-12.pdf). For Kumasi, Ghana, this resulted in the following: “In a “realistic” scenario, which only considered the waste currently collected (70-80 %of all waste produced), the entire N (Nitrogen) and P (Phosphor) demand of (intra)urban farming could be covered, as well as 18 percent of the nitrogen and 25 percent of the phosphorus needs of peri-urban agriculture in a defined 40 km radius (Dreschel et al., 2007). This amount of collected organic waste would thus only support about 1/5 of the peri-urban derived production. When further considering that 9% of the urban food demand is produced in urban areas and 40% in the peri-urban area of Kumasi; only 8% (1/5 of 40%) on top of the 9% urban production can be covered. This would mean that in total 17% of the food the city needs can be supported by waste-based nutrients in urban and peri-urban farming in Kumasi assuming full recovery of all what is collected. Could we say then that urban and peri-urban agriculture has the potential to reduce 17% of the fertilizer-energy needs? This is only possible if the production is fertilizer based. As indicated, in many urban agriculture, fertilizer
waste transport and disposal can be (re)invested in the urban agriculture support programme.

The food system can neither be separated from water use and hydrological resources. The urban demand for fresh water is also rising rapidly, due to population growth as well as increasing supply, coverage and overall urban economic growth, while availability of fresh water is becoming a serious problem. In water-scarce countries (especially in the Near East and North Africa, South Africa, Pakistan, and large parts of India and China) and in densely populated areas, growing competition between industrial, energy and domestic uses of water and agricultural use of water can be observed. Concurrently, water demand for food production is increasing due to rising populations as well as due to changes in urban food consumption patterns: as urban dwellers move towards richer and more varied diets (from tubers to rice; from cereals to meat, fish and high-value crops) that require more water to be produced (UN Water, 2007). With climate change, water conservation in cities becomes even more of a crucial issue (see also UNEP, 2008).

The availability of increasing quantities of urban wastewater provides a great opportunity for productive re-use in urban and peri-urban agriculture and wastewater fed aquaculture. Decentralised (safe) reuse of wastewater in urban and peri-urban agriculture will help to:

- Adapt to drought by facilitating year-round production;
- Reduce the competition for fresh water between agriculture, domestic and industrial uses;
- Reduce the discharge of wastewater into surface water sources and thus diminish their pollution;
- Lower the depletion of certain minerals (e.g. phosphor) by making productive use of the nutrients in wastewater and organic wastes. Werner (2004) showed that at present farmers worldwide use around 150 million tons of synthetically produced nutrients (N; P_2O_5; K_2O) annually, while at the same time conventional sanitation systems dump more than 50 million tons of fertiliser equivalents with a market value of around $ 15 billion into water bodies.

A paradigm shift in sanitation towards a recycling-oriented closed loop approach is needed. A multifunctional wetland system in the East Kolkata Wetlands (India) constitutes an example of an area covering approximately 12,500 ha and being comprised of over 250 wastewater aquaculture fisheries, agricultural land and residential areas. It provides a unique system of resource recovery, in which nutrients are extracted from the city’s wastewater through fish farming and agriculture. By doing so the management costs of such areas may be reduced, and protection against unofficial uses may be enhanced.

On the other hand, urban food production must be compensated by responsible water use if the practice is to be sustainable. In many Canadian cities for example, garden watering can account for more than 40 percent of household water use during the summer months, and wasteful irrigation practices are often the norm. In Montreal (Canada), but also in Jordan, use of simple recycling systems are installed in new city housing projects that allow grey water from households to be re-used safely in home gardens. This involved some minor modifications to household plumbing in order to divert water from kitchen and bathroom sinks through several filters instead of allowing it to go down the drain or into the septic system.

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is used, but only in small quantities. Actual GHG emission reductions by replacing chemical fertiliser by organic waste may thus be very small in these cases. Life Cycle Analysis Studies also have shown that fertiliser transport itself has very limited impacts on fossil energy use. Mayor benefits will probably stem from reducing waste volumes at landfill and disposal sites and reducing related waste transport needs.
Innovative multiple use and safe recycling of grey water for food production and management of green spaces will become of greater importance in the near future. Nevertheless, it is associated with health and environmental risks from the use of polluted water and attendant contamination of vegetables with pathogens. The revised WHO guidelines on safe reuse of treated wastewater and excreta provide concrete tools to reduce health risks along the “farm-to-fork” pathway.

Wastewater recycling will also result in reduced potable water consumption on household and city level for non-drinking purposes, and thus enhance the availability of drinking water. In this perspective, the National Government of Peru (Ministry of Housing, Construction and Sanitation) and the Municipality of Lima, have adopted a series of policy guidelines that promotes and controls the use of treated wastewater for irrigating parks, green spaces and community nurseries.

Next to use of wastewater, improved water management and reduced depletion of groundwater can be achieved by improving rain water harvesting, storage and use. Systems tested in Beijing, China and Tunis, Tunisia harvest rainwater from the outer surface of greenhouses and use of this water by using micro (drip) irrigation. Research in Beijing (carried out under the EU funded SWITCH programme) showed that the rainwater collected substitutes more than 90% of groundwater use, implying that the annual collection of rainwater can basically meet the basic water demand in agriculture and provide high-quality irrigation water. By also improving production techniques, the higher returns obtained also enabled farmers to pay for the investment of rainwater harvesting facilities. The local government, of the Beijing Huairou District as well as other districts in and outside Beijing have propagated wider application of this system.

Due to the influence of climate change, deforestation and rapid urbanization (including on low lying areas and steep slopes) cities increasingly have problems with floods and landslides affecting the city economy and urban livelihoods. Urban and peri-urban agriculture can help keeping flood plains free from construction, facilitating water infiltration and storage, and reducing erosion and run off. This makes UPA a crucial component of Integrated water(shed) management plans for the city region.

In Kesbewa (Sri Lanka) all abandoned low-lying urban paddy fields are subject to rehabilitation for food production. The city of Freetown (Sierra Leone) has also zoned all low-lying lands for urban agriculture. Supported by RUAF Foundation, the Sierra Leone Ministry of Land, Country Planning and Environment, the Sierra Leone Ministry of Agriculture, Forestry and Food Security, Freetown City Council (FCC) and the Western Area Rural District Council (WARDC) signed in 2010 an agreement to map and allocate land for urban and peri-urban agriculture in Freetown and Western Area Rural District. The above mentioned institutions agreed to the following:

1. To identify and map land currently used and/or land not used but suitable for urban and peri-urban agriculture in Freetown and Western Area, starting from lowlands and valleys.
2. To officially designate the identified sites for urban and peri-urban agriculture use.
3. To give the rights of use of the identified sites to groups registered with the Ministry of Agriculture, Forestry and Food Security and FCC or WARDC for a fixed renewable period of five years.

Demarcation of wetlands has started in 2011 and temporary land titles are being given to farmer groups. In this way the city aims to protect and preserve low-lying areas and help reduce flooding, while at the same time increasing localised food production (Dubbeling et al., 2011).

The New York City’s Department of Environmental Protection (DEP) recently funded three new urban agriculture projects: a rooftop garden at a settlement house, a vegetable garden
near the Gowanus Canal and a commercial rooftop farm atop a Brooklyn Navy Yard building, as part of an innovative green infrastructure program to turn impervious roofs, vacant lots and streets into spaces that soak up the rain and prevent water pollution. In total DEP has committed to investing $187 million in green infrastructure over the next four years, including “blue roofs” that hold rainwater, extra-large street tree planters, “green streets,” parking lots paved with porous concrete, and vacant paved lots turned into gardens. Over 20 years, the total cost for this green infrastructure will be $2.4 billion – $1.5 billion in public dollars (paid by water fees and state and federal funds) and $0.9 billion in private investments, plus $2.9 billion in cost-effective conventional improvements. The green expenditure is a bargain compared to the estimated $6.8 billion over the next 20 years that would otherwise be required for “bricks and mortar” infrastructure like underground storage tanks and tunnels. Moreover, green infrastructure reduces air pollution, cools the city during hot summer months, increases property values and provides other ecological and quality of life benefits valued at between $139 and $418 million. When the green infrastructure is a farm or garden, it supplies fresh fruit or vegetables as an added bonus. DEP’s green infrastructure program represents a unique opportunity for New York City to substantially expand its already robust network of urban farms and community gardens while simultaneously tackling the Combined Sewer Overflow problem. In locales such as the Bronx River watershed, in which CSO problems coincide with limited food access, the benefits to the environment and to public health would be substantial (see more on: http://bittman.blogs.nytimes.com/2011/11/21/breaking-new-ground/).

Next to waste and wastewater, urban agriculture can more efficiently use land resources as - to a large extent- it makes productive use of land that is not fit for construction (flood or earthquake-prone areas, land under power lines and in buffer zones) and adds value to land that might not otherwise have an economic output. It can generate income from temporarily idle land such as sites set aside for future building areas, and it is compatible with public parks and open space planning. In addition, new forms of vertical farming and farming on built-up areas (such as rooftops) are increasingly investigated and promoted as in Antananarivo (Madagascar) and Port-au-Prince (Haiti).

Open and green urban spaces can be designed for multifunctional use, with urban agriculture not only providing food but also other urban amenities and services such as tourism, education and recreation. In Beijing (China), peri-urban agro-tourism is being promoted both in the form of large agro-recreational parks as well as family-based agro-tourism. In this case, farmers are diversifying their activities by offering services to urban tourists (food, accommodation, sales of fresh and processed products, functioning as tourist guides, horse riding, etc.). The local government made agro-tourism part of municipal and district level planning; established an agro-tourism association and information dissemination service; assists interested farmers with business planning, tax exemptions and funding of infrastructure development, and provides subsidized water and electricity.

With energy demand escalating in urban areas, local governments must furthermore seek to become more energy efficient in order to avert chronic shortages in supply and combat energy poverty. Urban and peri-urban agriculture have a comparative advantage compared to rural farming due to proximity to urban consumers and lower transport and cooling costs, which is of particular importance for perishable products (green vegetables, milk, eggs, etc.) and in places where roads and other infrastructure like refrigeration are poor. Producing fresh food close to the city also contributes to reducing energy use and greenhouse gas emissions (less energy used in transport, cooling, storage, processing and packaging) and enabling synergic and cyclical processes between urban domestic and industrial sectors and agriculture (e.g. use of excess heat, cooling water or CO2 from industry in green houses); urban food production also contributes to reduction of the ecological food(t) print of the city (the energy and water needed to produce and transport the food consumed by a city). A 2010 study demonstrated that if all the 350,000 citizens of Almere (the Netherlands) would
produce and buy 20% of their food from local sources, energy reductions would equal the energy use of 11,000 Dutch households and the GHG emissions of 2,000 Dutch inhabitants (Jansma et al., 2012). This demonstrates the potential role that urban and peri-urban agriculture could have in creating more “climate smart cities”.

In particular urban forestry, including agro-forestry, helps to improve air quality, sequester carbon (though in relatively small amounts), reduces urban temperatures and “heat island effect”, curbs erosion and enhances urban biodiversity. Urban forestry and green spaces also help reduce of the heat island effect by providing shade and enhanced evapotranspiration (and thus more cooling, less smog); and –as stated earlier- help reduce floods and impacts of high rainfall by storage of excess water, increased water interception and infiltration and keeping flood zones free from construction. So too, urban green spaces create opportunities for recreation and leisure, and enhance the wellbeing of citizens (Archarya, 2011).

Despite these potential positive contributions to enhanced resource recovery, efficiency and sustainable environmental management, urban agriculture, if not properly managed, may also have negative impacts on the urban environment and human health. Environmental and health risks to, or emanating from, UPA include indiscriminate use of pesticides, heavy metal deposition on crop productivity and food safety; soil, air and water pollution, risk and spread of zoonotic diseases. Where livestock production plays a central role in nutrition, health risks related to animal keeping is of primary concern.

More awareness and education is still needed on management of potential health risks and food safety aspects. This requires government involvement and proper (veterinary) control and regulation, private sector involvement and involvement of training and extension institutes. Ecological farming practices are highly recommended in urban and peri-urban agriculture to prevent such negative effects. Cities like Cuenca (Ecuador) and Rosario (Argentina) are therefore promoting agro-ecological production methods in their municipal urban agriculture programmes.

For urban and peri-urban agriculture and forestry and biodiversity protection to be sustainable, it should therefore enhance sustainable production practices, including efficient use of water and energy, e.g. preferential use of safe –treated– waste-water and rainwater thereby freeing available water for other higher-value uses; optimising productive re-use of organic wastes and nutrients; minimising energy needed for fertilisers, storage and transport; and minimizing food wastes along the entire value chain (promoting more sustainable consumption).

Also, for urban agriculture to keep playing a role in climate-optimized development, innovation of urban and peri-urban agriculture systems and practices is needed for urban agriculture itself to become more resilient to climate change, as increased rainfall/ floods/ temperature will affect production and yields. Strategies could include adjustment of production systems, cropping patterns, selection of adapted crop varieties, diversification of cropping and/or farming systems, improved water management, rezoning of urban agriculture etcetera.

**Policy frameworks**

For urban and peri-urban agriculture to better or more effectively utilize the resource opportunities that cities present, local and national policy frameworks are needed that address:

- The creation of an institutional framework for urban agriculture.
- The integration of urban agriculture into development, land use plans and zoning codes (in order to be able to use open spaces, built-up areas and temporarily idle areas).
land for agricultural production) as well as promote multifunctional use of green areas.

- The promotion of safe food (and human) waste recycling, wastewater and rainwater use and energy use (e.g. heat generated by industry for urban greenhouses) in urban and peri-urban agriculture.
- Removing restriction on certain urban agriculture production systems and practices.
- Innovative tax and fiscal policies to support urban agriculture.
- Financial and technical support for urban agriculture.

As mentioned above, in 2011, the government of India, in response to high food prices, launched a US$ 68 million project to stimulate peri-urban vegetable cultivation. Concurrently, the government of India is including urban and peri-urban agriculture in its 12th five-year agriculture plan for agriculture (2013-2017), in order to better address the special needs of the urban producers. The government of Beijing (China) included urban agriculture in its new five-year plan (2011-2015) aiming to increase urban food supply by its peri-urban areas to 40-80% for different agro-products. As per this plan, farmlands in Beijing will be protected and illegal land use transfer will be fined. New agricultural cooperatives, often closely linked to village-level management, have been created to facilitate innovative urban agricultural production and marketing projects.

The Municipality of Villa Maria del Triunfo (part of metropolitan Lima, Peru) created a sub-department on urban agriculture under the Department of Economic Development and reviewed and updated the Municipal by-laws on urban agriculture. In 2001, the city of Rosario (Argentina) set up its Secretariat of Social Promotion responsible for the coordination of the new Municipal Urban Agriculture Programme. In Bulawayo, Zimbabwe, an Interdepartmental Committee on Urban Agriculture was established (including the Departments of Town planning, Health, Finance, and others) to coordinate their activities in this field and to review existing by-laws and to develop a Municipal Policy on Urban Agriculture. In Kampala, an inter-departmental working group developed new municipal by-laws on urban agriculture and livestock through a process of intensive consultation with all relevant stakeholders. Multi-stakeholder Platforms on UPA have been established in various cities in the last few years, in which Municipal departments, NGOs, farmer groups, private enterprises, financial institutions, community organisations, universities collaborate in the development of policies and programmes on urban agriculture and urban food security, often with the support of RUAF Foundation or FAO. Outstanding examples are Belo Horizonte (Brazil), Villa María del Triunfo (Peru), Bogota, Kinshasa (DR Congo), Kampala (Uganda) Bulawayo (Zimbabwe), Accra (Ghana), Gampaha (Sri Lanka) and Amman (Jordan).

In Bogota, Law #128, regulates and promotes urban agriculture. This law intends to establish urban agriculture as a public policy for improving the quality of life, as well as to reduce malnutrition. The municipality of Rosario (Argentina) and Governador Valadares (Brazil) established fiscal and tax incentives for land owners who lease out vacant private land to groups of urban poor people willing to produce on this land. A Cape Town urban agriculture policy was formulated and approved in 2007 to support community gardening, access to inputs and technical assistance to urban farmers and direct marketing of produce.

As in Beijing, the Shanghai 12th Five year plan (2011-2015) includes urban agriculture. The Minhang (in Shanghai) District Agro-tourism Plan (2011-2015) promotes multifunctional peri-urban agriculture. In Bobo Dioulasso (Burkina Faso), urban agriculture was included in the “Programme de Développement Municipal – PDC” that was approved in 2007. The city also Bobo Dioulasso integrated UPA in its Schéma Directeur d’Aménagement et d’Urbanisme as a main component of park development and management of the peri-urban green belt.
Belo Horizonte has implemented a food and nutrition programme since 1993 and is often quoted as an example for other cities interested in developing a comprehensive food strategy. With support of many actors like the UN Urban Management Programme, FAO, RUAF Foundation, the State of Minas Gerais and the Federal Government (in the context of its Fome Zero programme), community groups, local and foreign NGOs, and Universities, food and urban agriculture projects were implemented, a city-wide multi-stakeholder forum on urban agriculture established, legislation on urban agriculture developed (including Law 274-09 to establish a Municipal UPA Policy -approved in 2011; Law 358-09 that creates a Municipal UPA Program and the Law on the Use and Occupation of Land (Law 9.959) that incorporates UA as an economic activity of Belo Horizonte and recognizes for the first time agricultural activity in urban areas as a permanent activity in the city), and a metropolitan urban agriculture association formed. Projects include the promotion of school and community gardens; the promotion of planting (orchards) in vacant public spaces, training and education on nutrition and promotion of direct sales in farmers markets, popular restaurants and shops. Urban agriculture was also integrated in larger programmes on Sustainable Water Management, in social policies and popular and housing programmes.

In Amman (Jordan), the amendment of municipal decree 5/1997 through act A-12/2009 now allows to sell agricultural produce outside the central market place in Amman. Prior to this amendment the central market was the only place to buy and sell agricultural commodities (also for taxation purposes). This amendment makes it possible for UA farmers to sell during public events such as the Friday market for example or at the farm gate in peri-urban areas (provided they are granted a special permit).

Greater Monrovia (Liberia), which covers the cities of Monrovia and Paynesville and a number of townships, has identified crucial issues in the promotion of urban agriculture and included these in a City Strategic Agenda on urban and peri-urban agriculture and food security in these cities. Collaboration is on-going, for instance, with the Ministry of Agriculture and FED/USAID and the newly developed Urban Farmers Association, on delivering agricultural extension to urban and peri-urban producers, with the Lands Commission on mapping of urban land use, and with the Ministry of Internal Affairs and the cities and townships on the inclusion of UPA in their new city ordinances (for more information see: http://upa-liberia.wetpaint.com or www.ruaf.org/node/2403).

The city of Ndola (Zambia) has included UPA in its Strategic Development Plan 2005-2015. A Ndola Urban Agriculture Policy was approved in 2011 that aimed to provide security of tenure for urban agriculture and direct assistance from the government for the 5000 urban farmers (De Zeeuw and Dubbeling, 2009).

Similarly cities in Northern America and Europe have been increasingly engaged in analysing their food systems and developing food policies and food policy councils (Toronto, Vancouver, London, Detroit and many more). Food strategies and legal frameworks have been elaborated to accommodate for a variety of urban agriculture production and support systems. Examples include:
-Modification of the Health By-law No. 6580 in Vancouver (Canada) to allow for and provide a list of guidelines for good management practices of urban apiculture; The Vancouver Park Board Community Gardens Policy that outlines the Park Board’s support for community agriculture; and

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7 In 2013, the **World Future Council**, as part of its project "The Model of Belo Horizonte - Sharing Food Security Solutions with African Cities", will start organizing study tours to Belo Horizonte for mayors and local government representatives of cities in Africa to learn about the key elements of the Belo Horizonte Food system (featuring an important component on urban and peri-urban agriculture) on site and exchange on it. Subsequently, Food Security Days will be organized in the participating cities. These will feature planning workshops for politicians and multiple stakeholders to plan and/or improve their own food security system taking as an example Belo Horizonte, as well as legal workshops to assist in the drafting of a law that guarantees the citizens their human right to food.
gardens and describes the conditions that apply to park land that is converted to community gardens. The policy also outlines procedures to be followed when establishing a new community garden;

- The City of West Palm Beach Zoning and Land Development Regulations and Chicago zoning codes that were modified to permit Community Gardens and Urban Market Gardens in residential and commercial areas. Similarly on June 21, 2010, the Denver City Council unanimously adopted a comprehensive update to the zoning code, which took effect on June 25, 2010. The updated code is helping Denver meet its goals of increasing access to fresh, local food by allowing gardening in many urban and suburban residential districts;
- New York City that addresses the issue of urban agriculture in three main ways: (1) the GreenThumb program, administered by the Department of Parks and Recreation, (2) animal husbandry, governed by zoning ordinances and health codes, and (3) beekeeping, governed by the recently amended health code. According to the New York City Department of Parks and Recreation, GreenThumb is “the nation’s largest urban gardening program, providing assistance and support to over 600 gardens and nearly 20,000 garden members throughout the city.” The Department of Health and Mental Hygiene code of ordinances addresses the keeping of poultry and bees. In July 2010, the Department amended its code to remove non-aggressive honey bees from the “venomous insect” list, allowing for beekeeping within the city;
- The State of Maryland (USA) has adopted initiatives to promote urban agriculture statewide. The Maryland State Assembly passed a bill in 2010, allowing counties and the independent City of Baltimore to enact an “Urban Agriculture Tax Credit” for real property used for urban agriculture. (Goldstein et al., 2011).
- The city of Montreal (Canada) has made green and productive rooftops mandatory to buildings over a certain size. Concurrently many European Networks and Programmes also bring together cities and city regions around sustainable urban food production and short supply chains. Examples include support by the French and Catalonia government to short supply chains; and the development of food strategies by the cities of London, Amsterdam and Malmo.

Policy frameworks developed to link water and wastewater management to urban agriculture production include the national government of Peru that reviewed its legislation to promote grey water reuse in urban green spaces, forestry areas and production of ornamental plants and seedlings. In October 2012, The Metropolitan Municipality of Lima (Peru) approved two new ordinances that recognise and promote urban agriculture in the city: (1) Ordinance N° 1628 approves the Environmental Metropolitan Policy, and makes explicit reference to the promotion of urban agriculture and the re-use of treated waste water for urban greening; (2) Ordinance N° 1629, promotes the development of urban agriculture as a strategy for environmental management, social inclusion and local economic development in the Province of Lima and announces the creation of a Municipal Programme on Urban Agriculture.

In Accra (Ghana) byelaws on wastewater use in agriculture were reviewed to favour UPA farmers using wastewater for crop production. UPA farmers using wastewater for crop production are now recognized by city authorities. The city of Bulawayo (Zimbabwe) provides treated wastewater and training on its use to poor producers operating in a peri-urban scheme (Bulawayo, Zimbabwe). In Vaxholm, Sweden and Ouagadougou, Burkina Faso the Municipality actively stimulates the (re)use of urine. Urine collection is increasingly piloted in urban areas, especially by placing Urine Collecting Toilets in public buildings e.g. government offices, schools, railway stations (as in Ouagadougou, Burkina Faso; Tamale, Ghana). A pilot project implemented in Ouagadougou by the Regional Center for Low-Cost Water and Sanitation (CREPA), SIDA, the European Union, German Technical Cooperation (GTZ), and the National Water and Sanitation Authority (ONEA) showed that hygienized urine can replace urea as a fast acting nitrogen fertilizer while hygienized faeces can be used as base fertilizer instead of mineral NPK. Combining urine and faeces gave a very good
production. Public or private investments are needed to increase the number of urine collecting toilets needs (IWMI and SuSanA, 2010). Use of human waste for agriculture/food production is however often prohibited by legislation. There is a need to establish use of human wastes in local, regional and national legislation related to sanitation, housing, environment and agricultural sectors. The Swedish legislation is an example that embraces nutrient reuse. For instance the Environmental Code of 1998 of Sweden allows for the implementation of a closed sanitation loop, under the precautionary principle, using terms as the “polluter pays”, and “using best available technology”.

Local governments are also starting to integrate urban and peri-urban agriculture and forestry in their climate change strategies. As mentioned earlier, Freetown (Sierra Leone) has zoned all wetlands and low-lying valleys for urban agriculture to increase water infiltration, reduce flooding, keep the flood-zones free from (illegal)construction and promote production for food supply and job creation. Toronto’s (Canada) climate change plan includes financial support to UPAF projects; promotion of composting of organic wastes and rainwater harvesting; promotion of regional products, farmers’ markets and preferential procurement of food; and doubling the existing tree canopy by 2020. Seattle (USA) promotes community gardening, local food sourcing and increased food waste recycling in order to reduce fossil fuel emissions, while Durban (South Africa) is promoting productive green rooftops for storm water management, biodiversity and food production and Brisbane (Australia) included both urban agriculture and green roofs in an action plan to meet predicted global climate change challenges.
Annex 3 - Past and current involvement of research, international organisations, local government fora and UN agencies

Individual research and first UN surveys and support (1970-1995)
In the period from the nineteen seventies to around 1995, mainly individual researchers published a variety of (mostly social science) surveys on the presence and contributions of urban agriculture in large cities in the South. Institutional support was limited, as were networking and links with policy. Research done examined urban agriculture as an informal sector activity and linked it to discussions on urban migration, nutrition, tenure and livelihoods. First UN support to urban agriculture included examinations of the practice and encouragements to cities to take on urban agriculture as part of their environmental strategies. Between 1983 and 1987, the United Nations University Food-Energy Nexus programme produced 26 city/country reports on the growing practice of urban agriculture. In 1987, the UN Brundtland report called for promotion of urban agriculture as a strategy for waste recycling, while the UNCED Agenda 21 promoted urban agriculture for urban environmental management. UNICEF-sponsored studies in the late 1980s found significant correlation between urban household access to land and the absence of child malnutrition. A 1996 UNDP world survey and publication on urban agriculture stressed the multiple potential contributions of urban agriculture to urban food security, employment and environmental management.

In this period, local government forums also started to include urban agriculture on their agendas, including IULA's 1993 Congress in Toronto and the UNDP Colloquiums of local government officials in New York (Declaration on Social Development, 1994).

The UN-Habitat's Sustainable Cities programme funded an urban agriculture component of the SCP Sustainable Dar es Salaam Project on participatory urban environment management (1992-2003). This first experience linking research to policy processes, set the ground for an intensive collaboration between IDRC and the UN Habitat/UNDP Urban Management Programme (UMP) on policy research and training for urban agriculture in Latin America and the Caribbean (1997-2004). UN Habitat also supported urban agriculture actions in its Localising Agenda 21 Programme (1995-2008) and Lake Victoria Development Initiative (2002-2010).

In this period, the World Health Organisation-WHO promoted urban and peri-urban intensified horticulture for home consumption and neighbourhood marketing; to increase availability and access of fruits and vegetables for all.

An international Support Group on Urban Agriculture was formed in 1996, bringing together international and donor organisations working in the field in order to enhance sharing of information, gathering further information on the presence and impact of urban and peri-urban agriculture and increase funding for this field of activity.

Large increase in networking, research and policy making; several UN agencies develop projects and programmes on urban agriculture (1996-2007)
This period was characterised by large increase in capacity building, networking and advocacy for research and policy initiatives on urban agriculture (see also above).

The Support Group on Urban Agriculture (1996-2003) brought together many organisations working on urban agriculture. As a result urban agriculture was included in the programs of

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many bilateral and UN agencies (including IDRC, GIZ\(^9\), DGIS, SIDA, CGIAR, CIRAD, UNDP, UN Habitat, UN FAO, WHO, Swiss corporation), a mayor research initiative on urban and peri-urban agriculture (Urban Harvest, 2000-2008) was set up in the CGIAR and in 1999 the first global information, training and advocacy network on urban agriculture (RUAF Foundation) was formed. Donor agencies like the European Union and USAID started supporting urban agriculture from about 2000 onwards.

The UNDP Governance group supported urban agriculture in these years, mainly through the joint UNDP/UN Habitat Urban Management Programme (UMP). The UMP, IDRC and regional and city partners co-funded various city consultations on urban agriculture in Latin America and the Caribbean, designed policy and planning guidelines, organised a training course for city staff, surveyed world-wide experience with credit and financing for urban agriculture, supported cities in the integration of urban agriculture into land use planning and developed policy briefs and various other information materials.

The World Health Organisation-WHO and the International Development Research centre-IDRC revised norms and standards for treatment and re-use of grey water in urban agriculture; and together with UN Food and Agriculture Organisation-FAO and the International Water Management Institute-IWMI developed producer guidelines for managing potential health risks. Specific information is included on re-use of waste and waste water in urban agriculture.

The UN Food and Agriculture Organisation-FAO recognised urban agriculture in 1999 and launched in 2001 the multidisciplinary initiative Food for Cities programme, which aims at ensuring the access of urban populations to safe food and to healthy and secure environments (http://www.fao.org/fcit/en/). Since 1999 it has supported a large number of projects on urban and peri-urban agriculture, forestry (http://www.fao.org/forestry/urbanforestry/en) and fisheries. It has also developed programmes dealing with waste(water) re use in urban agriculture. FAO's Programme for Urban and Peri-urban Horticulture (UPH) is a key component of the Food for the Cities initiative and helps governments and city administrations to optimize policies, institutional frameworks and support services for UPH, to improve production and marketing systems, and to enhance the horticulture value chain (http://www.fao.org/ag/agp/greenercities/). It promotes a five-point approach to the sustainable development of the sector (1). Ensure political and institutional commitment; (2). Secure land and water for horticulture, (3). Ensure product quality while protecting the environment, (4). Ensure participation by all stakeholders in the UPH sector and (5). Secure new markets for fruit and vegetables. It has promoted irrigated commercial market gardening on urban peripheries, simple hydroponic micro-gardens in slum areas, and green rooftops in densely populated city centres (see for examples: http://www.fao.org/ag/agp/greenercities/en/projects/index.html). They also facilitate North-South and South-South cooperation.

The UN Habitat's Dubai International Award for Best Practices was granted in 2004 to the Rosario Urban Agriculture programme and in 2008 to the Dakar micro-gardens project (supported by the City of Milan and FAO).

Municipal and national policy and normative instruments and frameworks were tested including several declarations, budget provisions, regulations, incentives and the opening of urban agriculture departments/programmes and positions in public administrations. The RUAF Cities Farming for the Future programme (2004-2008, http://www.ruaf.org/node/448) supported over 20 cities around the world in the implementation of a multi-stakeholder policy

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9 For example the BMZ/GIZ funded Project: Vegetable Production on Open Spaces in Dar es Salaam, Tanzania (1992 – 1999)
and planning process on urban agriculture and food security. The CGIAR supported similar processes in Lima, Kampala and Nairobi.

Research and policy also shifted from proving benefits only to also tackling risks and constraints such as access to resources, health and safety issues (see amongst others the work done by WHO, FAO and IWMI; the CGIAR also ran various research programmes on health issues of urban agriculture from 2002-2008; see also ILRI work on zoonosis and urban livestock keeping and the policy brief they published on this subject in 2012), financing (UN Habitat and IDRC financing in 2002 the first global survey on financing for urban agriculture which was further developed by RUAF Foundation in 2009 and 2010), regulatory frameworks, support to producer organisations (a FAO-IDRC programme in 2002 led to the publication of a guide on strengthening producer organisations, the Institute Africain de Gestion Urbain-IAGU and IDRC did a similar study in Francophone Africa and RUAF developed from 2009-2011 a field guide for strengthening producer organisations), urban design (IDRC and McGill University worked from 2004-2006 on a project looking at integrating urban agriculture into slum upgrading and social housing projects) and business development (see further below).

Professional and city networks on urban agriculture were established in Latin America, Francophone Africa and the Middle East and North Africa. The African Food Security Urban Network (AFSUN), a network of Southern African Universities and cities, published in the past 3 years several research publications on urban food security and the role of urban and peri-urban agriculture in African cities (www.afsun.org). Urban agriculture became a regular item on the agenda of UN summits such as the World Urban Forum (2002 to 2010) as well as other international conferences and events.

Resurge of interest for urban agriculture linked to the global food crisis, climate change, the green economy and debates on resilient cities (2008-present)

Fuelled by the international food and energy crisis in 2007-2008 and 2011, world-wide steep increases in food prices, and increasing acknowledgement to address climate change impacts in urban areas, there was a new surge of interest for urban agriculture and its potential role of urban agriculture in food security, livelihoods improvement and building of more resilient cities.

Such re-surved interest is not only visible in developing countries, but also in European and Northern American countries and cities, illustrated by the large variety of new projects and networks that include:

- The Thematic Network "Sustainable Food in Urban Communities" (2012-2015) which focuses on developing low-carbon and resource-efficient urban food systems. The network will focus on food production and delivery in a more sustainable and less carbon intensive way (EU funded).
- The 2011 launch of a UK-wide Sustainable Food Cities Network which will help cities develop and promote healthy and sustainable food programmes. The Network will be crucial as these cities work to tackle a growing epidemic of diet-related ill-health and the negative economic and environmental impacts of the UK’s current food system. It will be supported by the Soil Association alongside a number of other national NGOs including Co-operatives UK, FareShare, Food Matters, Garden Organic, Plunkett Foundation, and Sustain.
- The EU-funded FOODLINKS project (2011-2013) that aims at developing and experimenting with new ways of linking research to policy-making in the field of sustainable food consumption and production. The project partners are organized in Communities of Practice, one of them dealing with urban food strategies, communicating especially through use of new technologies such as social media (www.foodlinkscommunity.net)
The EU-funded PUREFOOD project (2010-2014) that is focused on fundamental scientific research. The objective of PUREFOOD is to train a pool of early-stage researchers in the socio-economic and socio-spatial dynamics of the (peri-)urban and regional foodscape (www.purefoodnetwork.eu).

As food security is also very much related to income levels and as the focus expanded from household food security to urban food security, attention has shifted from only pro-poor agriculture (with a strong focus on home consumption) to more market oriented urban agriculture (income and job creation, also feeding non-producer households) and short supply chains (linking local production to local consumption). Examples include the global From Seed to Table Programme implemented by RUAF Foundation (2009-2011) that supported the creation of over 30 social micro-enterprises by groups of urban producers and youth and the financing of such more commercial activities in 18 cities around the world. The RUAF approach is also advocated in 2 EU funded programmes in post-conflict areas (Sierra Leone and Liberia) as a complementary strategy to the promotion of urban agriculture for self-sufficiency.

The Overseas Development Institute -ODI and IDRC conducted a review in 2009 on the links between urban agriculture and poverty reduction via expenditure substitution, income from marketing, income from labour and price impacts. From 2010-2012 the World Bank supported an assessment in 4 cities of the contribution of urban and peri-urban agriculture to livelihoods of the urban poor. The Bank is currently editing a publication on the survey results. Beyond this publication urban agriculture is not really a priority for the Bank’s urban programme as resources are scarce and the Bank does not have a staff expertise nor comparative advantage in this area.

In July 2013, the Swiss Development Cooperation-SDC will start funding a large programme on market-oriented agriculture in the Gaza Strip, to be jointly implemented by OXFAM and RUAF Foundation. Another example is the EU funded SUPURBFOOD project (2012-2015), coordinated by Wageningen University (The Netherlands) which will look at SME involvement in short food supply chains, multifunctional agriculture and waste recycling in agriculture in 7 European city regions.

The European Union is also increasingly supporting urban agriculture as a value chain and market-sector, in its country programmes in Sierra Leone and Liberia, but also more recently in Madagascar.

Next to food security and income, there is renewed interest in resource management and land tenure systems (FAO, UN-Habitat), and resource recovery by means of waste and water management in urban agriculture.

The German Federal Ministry of Education and Research has launched a German-African research partnership (2012-2016) on African-German partnership to enhance resource use efficiency in urban and peri-urban agriculture for improved food security in West African cities. Starting from a general assessment, the UrbanFoodPlus network of scientists, NGOs, and private sector representatives aims at developing, testing and implementing, together with stakeholders, a number of site-specific, farmer-tailored technical innovations and interventions for improved agricultural production, waste(water) management and value chains.

The IWMI research division on Water Quality, Health and Environment is focussing on water quality challenges due to urbanization and poor sanitation and how this is affecting urban and peri-urban food production, in particular food safety. The division works closely with WHO and FAO on safe wastewater irrigation. For example, IWMI, the FAO together with the WHO, UNEP, the United Nations University Institute for Water, Environment and Health (UNU-INWEH) and the UN-Water Decade Programme on Capacity Development
(UNW-DPC), in collaboration with the International Commission on Irrigation and Drainage (ICID), are joining hands in a capacity building project (2011-0213) on safe waster reuse in agriculture which is organizing workshops around the globe reaching out to representatives of about 100 countries (www.ais.unwater.org/ais/course/view.php?id=6).

IWMI is also leading the new CGIAR research program on Water, Land & Ecosystems (2012-2017) to which more than 10 CGIAR centres are contributing, and which has five research divisions. One of them is on Resource Recovery & Reuse focussing mostly on nutrient and water recovery from urban waste for urban and peri-urban agriculture, applying a business modelling approach. Partners include amongst others specialised research institutes such as the Department of Water and Sanitation in Developing Countries (SANDEC) at the Swiss Federal Institute of Aquatic Science and Technology (EAWAG). In this context, IWMI and the WHO also collaborate in an SDC funded project on Resource Recovery and Reuse: From Research to Implementation (2011-2014). The overall goal of the intervention is to implement globally and at large scale recovery and safe reuse models of resources generated from liquid and solid waste streams in order to promote food security, cost recovery in the sanitation sector, and livelihood opportunities, while safeguarding public health and the environment.

Another large IWMI programme centres around will look at Efficient water and land management in peri-urban areas. Objectives of this new programme are: (1) To contribute to urban food and water security through sustainable natural resources management in the rural-urban interface and (2) To support irrigated urban and peri-urban farming while reducing the negative urban footprint on ecosystems and livelihoods. Partners in this new programme are City authorities, RUAF Foundation, UN-Habitat, FAO’s ‘Food for the cities’ Program, Investors, (social) entrepreneurs, public health entities, business schools, WHO, NGOs and specialized research institutions (see further: wle.cgiar.org/rrrwww.iwmi.org/Topics/RRR).

The Netherlands’ Directorate-General for International Cooperation-DGIS is funding a 5 year (2011-2015) WASH programme (Water, Sanitation and Hygiene) that is amongst others testing models for the productive use of waste(water) in urban agriculture in countries such as Nepal, Ethiopia, Uganda, Kenya and Ghana.

In the past years, but mainly since 2012, urban agriculture is also increasingly linked to debates on resilient urban food systems and resilient cities, the greening of the economy (green jobs), climate change adaptation and mitigation and disaster risk reduction.

Through its World Secretariat in Bonn, Germany, ICLEI hosted the Resilient Urban Food Systems forum at the Resilient Cities 2013 Congress (4th Global Forum on Urban Resilience and Adaptation, Bonn, Germany) on 1 June 2013. The full day forum was created for cities with a view to create outcomes for political commitment to strengthen resilience of food systems in local governments.

Metropolis is also calling attention of its member cities to the topic of urban food security pay attention by organising a workshop on “the hungry city” as part of its upcoming world conference in Johannesburg in July 2013.

From 2007-2013, German Ministry of Education and Research funded a large research project in Casablanca, Morocco on urban agriculture as a climate-optimised strategy as part of its Megacities programme.

In 2012, UN Habitat entered into a partnership with RUAF Foundation to include urban and peri-urban agriculture and forestry in city climate change strategies. The 2-year programme foresees in the implementation and monitoring of pilot projects in the cities of Kathmandu
(Nepal), Kesbewa (Sri Lanka) and Bobo Dioulasso (Burkina Faso) that will promote one or more specific UPA models with expected impacts on climate change adaptation (and to a lesser extent mitigation). The project will also promote the inclusion of urban and peri-urban agriculture and forestry in city and provincial climate change strategies. The project will interact with another project funded by DFID through the Climate Development Knowledge Network-CDKN in which a monitoring framework for monitoring urban agriculture’s impact on climate change will be tested and validated in 4 partner cities.

UNEP and START embarked in 2011 on a 9 city assessments on urban and peri-urban agriculture after urban agriculture came up in a series of science-policy dialogues on climate change. The assessments are conducted through a wider partnership between START, WMO, IPCC, UNEP, University of Ghana, University of Dar es Salaam and the Bangladesh Centre for Advanced Studies, in support of a European Commission/UNEP-funded project ‘Understanding the Findings of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, Climate Change 2007 - Integrating Climate Change Adaptation and Mitigation in Development Planning’.

The USAID funded CityLinks programme (2011-2016), managed by the International City/County Management Association-ICMA has a three pronged approach which foci on climate change-related governance and systems in targeted urban areas, increased resiliency of cities in Feed the Future focus countries, and improved water supply and sanitation access in urban communities in Global Health Initiative countries. Each of these areas is addressed through city to city partnerships that enable municipal officials in developing countries to draw on the resources of US counterparts to find sustainable solutions tailored to their needs. ICMA considers urban food security a technical area that both USA and international cities will have to tackle. They expect that their input in this area will incorporate municipal strategies for effective urban food value chains, urban food policies, local economic development, creating pro-poor strategies, addressing the needs of vulnerable groups, and innovative urban agricultural solutions that will contribute to each of the thematic focus areas mentioned.

The International Labour Organisation-ILO implemented in 2012 a first study on green jobs and decent work in urban agriculture and forestry for urban farmers and workers, and is currently developing an implementation and user guide that will be pilot-tested in Zimbabwe the latter half of 2013 (after which wider replication is foreseen). Partners will be urban farmers and workers, workers organisations and the (local) government to look at improvement of employment- and income-generation opportunities for urban farmers & workers; skills training; improvement of working conditions; social dialogue; organization of urban farmers & workers; specific support to vulnerable groups and creation of green jobs. As part of its Decent Work for Food Security programme, ILO also looks at strategies to increase access to food by (undernourished) urban workers. Local/ national partners in this programme include urban workers and enterprises, workers organisations and (local) government, and international partners such as the FAO and UN High Level Task Force on Food Security. Starting in Malawi and Indonesia, activities will address the decent work deficits in the food system in each locality, inter alia, safety & health; organization of workers; skills training, increase in food production (through decent work) in areas with a food deficit etcetera. Implementation tools will be produced and used in wider replication.

The United Nations Development Programme-UNDP and the United Nations Peacebuilding Fund (UNPBF) supported in 2012 a number of vocational training courses for urban youth in Sierra Leone. Courses included electronics, car mechanics, masonry, metal work, catering, urban agriculture, tailoring and carpentry.

Although the United Nations Centre for Regional Development- UNCRD does not have programmes directly related to urban and peri-urban agriculture and urban food security, it
has different programmes that have linkages with UPA issues. These include 1) the Disaster Management Planning Programme (the role that urban agriculture can play in building livelihoods and food security resilience of the urban poor in and enhancing adaptation to climate change); 2) Sustainable production and consumption/ 3R - reduce, reuse and recycle (looking at the potential of urban agriculture to productively re use urban wastes and waste-water) and the 3) Economic and Social Development Programme (supporting job and income creation in urban agriculture, agri-food enterprises and value chains). In the context of the first programme, the UNCRD LAC Regional Office has been involved with CEPAL in the organization of a workshop on food security in Santiago, November 2012. UNCRD’s Disaster Management Planning Unit integrates productive activities such as urban and peri-urban agriculture supporting food and livelihoods security as part of the pro-poor gender-sensitive risk and vulnerability reduction strategies of its new Programme, which particularly focuses on disaster risk reduction and resilience building of communities living in urban slums and informal settlements of developing countries.

Overall, there is an increasing tendency to steer away from promoting urban agriculture “in its own right”, to embedding it more and more in broader policies and programmes dealing with food security (resilient urban food systems), youth training and employment, waste management, climate change adaptation (“climate smart and resilient cities”) and biodiversity, amongst others. Many of the respondents are of the opinion that urban agriculture should not be supported as a stand- alone activity, but –in order to have higher impacts and be successful- as part of a more integrated and transversal approach considering its economic, social, environmental and productive functions and impacts in their interaction. This is noticeable in the shift in IDRC policies and funding that ended its Cities Feeding People programme in 2005 as well as its research grant programmes on urban agriculture (Agropolis and Ecopolis) in 2004 and 2010 respectively and now supports urban agriculture and peri-urban agriculture research (but with reduced funding) under its climate change, water and food security and eco-health programmes.

As part of its Local Action for Biodiversity Programme, ICLEI’s Cities Biodiversity Center (which is coordinated by the ICLEI Africa Secretariat) supports since 2006 activities on (peri-) urban agriculture in the context of integrated ‘agro-ecosystems’ and landscape management. More broadly, ICLEI’s Strategic Plan, Preparing for Tomorrow - Strategy 2012-2018, with its eight agendas offers the framework for peri-urban agriculture and food security under various headlines, especially “Biodiverse City”, “Resource-efficient City”, “Smart Urban Infrastructure” and “Green Urban Economy”. Within this, a programmatic and strategic approach for peri-urban agriculture and food security within cities will be taken by ICLEI’s offices depending on the needs of the respective city or region. ICLEI promotes a holistic approach to the topic of city-region food systems (including initiatives that address the water-food-energy-climate change nexus), encouraging cities to mainstream strategies across existing plans and activities in order to strengthen the city-region food system.

GIZ-the Deutsche Gesellschaft für Internationale Zusammenarbeit is also positioning urban agriculture as part of their Nexus approach (Food, Water, Energy), a position that they are further outlining in an upcoming policy brief on urban and peri-urban agriculture. They may include urban agriculture from the nexus perspective as an optional component in their projects on Sustainable Development of Metropolitan Regions (2012-2015) and Integrated Resource Management in Asian Cities (starting from 2013).