RUAF Foundation
RESOURCE CENTRES ON URBAN AGRICULTURE & FOOD SECURITY

# Project IFQ1-1036
# Monitoring impacts of urban and peri-urban agriculture and forestry on climate change

## Report 1.2 Report on needs and requirements of (city)governments and international organisations (such as the World Bank, DFID and UN-HABITAT) for the monitoring of UPAF impacts and the use of such data in climate change programmes and strategies

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**This report summarizes contributions made by project partners on the interactive Huddle project discussion forum setup for this project.**

Contributions were made by – or in consultation with- the following project partners:

- The Institute of Geographic Sciences and Natural Resources Research (IGSNRR)/ Chinese Academy of Science, China;
- Ministry of Agriculture, Agrarian Development, Minor Irrigation, Industries and Environment, Western Province, Sri Lanka;
- Municipality of Rosario, Argentina;
- Ministry of Water, Public Services and Environment, Santa Fe Province, Argentina;
- The International Water Management Institute (IWMI) India , Ghana and Sri Lanka;
- The National University of Rosario, Argentina;
- Institute of Physics –CONICET Rosario, Argentina;
- Applied Plant Research International (PPO/PRI) of the Wageningen University and Research Centre, The Netherlands;
- Adaptify, the Netherlands;
- The School of Forestry of the University of Florida, USA;
- RUAF Foundation, The Netherlands;
- World Bank, USA;
- UN-HABITAT, Kenya.

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# 1. Introduction

Cities have an important role to play in climate change mitigation and adaptation and enhancing climate resilience of their slum and vulnerable residents. Climate change adds to existing challenges faced by cities. Climate change, together with a decrease in absorption capacity of greenhouse gasses due reduction in the amount of green cover, parks, trees and agricultural surfaces in urban areas, poses serious threats to urban infrastructure, access to basic services and quality of life in cities and negatively affect the urban economy (World Bank 2010). At the same time, rapid urban growth, growing urban poverty and increasing food prices raise concerns about urban food security, especially for the poor. Cities are highly vulnerable to disruption in critical (food) supplies and climate change exacerbates this vulnerability. The IPCC (2007) projects that agriculture will be severely affected by a combination of changes in rainfall pattern, extreme events and high temperatures.

International organisations and (city)governments increasingly recognise Urban and Peri-urban Agriculture and Forestry (UPAF) as having high potential for improving the urban environment and urban adaptation to climate change (UN-HABITAT 2009). For example, with the negative effects of climate change on rainfall patterns, UPAF irrigated with urban wastewater seems a possible strategy to increase agricultural productivity around urban areas and alternative to rain-fed rural agriculture. UPAF is furthermore often credited with providing the following benefits: Reducing “food miles” by producing fresh food close to urban markets; reducing fertilizer use and energy consumption by productive re-use of urban organic wastes; enhancing rainwater infiltration; reducing the urban heat island effect by increasing the surface of green areas; enhancing carbon sequestration (urban forests); providing better diets, urban food security, jobs and income. However, for UPAF to be promoted as an effective component of climate compatible development strategies and plans and for it to benefit from climate change financing, there is a need for greater empirical evidence and quantification of these benefits.

In order to jointly design a conceptual and methodological framework and project proposal for monitoring and quantifying the (potential) climate change mitigation and adaptation and other developmental co-benefits of UPAF; an interactive exchange among northern and southern research institutions and content experts, decision-makers and international organizations/networks was facilitated on an electronic platform (Huddle). Key questions asked in the period March 1-May 15, 2012 included:

- What are the needs and requirements of (city) governments and international organisations regarding the monitoring of UPAF impacts on climate change adaptation and mitigation?
- What monitoring data do they need in order to allow for decision-making on and possibly financing of UPAF interventions?
- How would they use UPAF monitoring data in order to integrate UPAF in climate compatible development strategies and financing?

This report provides a short summary of the main discussions and responses.

# 2. Level of current integration of UPAF into local and international climate change action plans and strategies

Few cities/countries and international organisations have already integrated UPAF in their climate change (or disaster risk management) strategies and programmes. Reasons for this lack of integration include:

- Many cities still lack a local climate change action plan.
- (Urban) Food security has for long not been given attention as part of urban vulnerability assessments. In the recent National Sri Lankan climate change action plan (2011-2016) for example resilient urban settlements and (rural) agriculture are two separate key areas for intervention. There is no mention yet of urban food security or urban agriculture; or its potential linkages to urban waste and water management.
- Lack of awareness and data on the possible role that can be played by UPAF in climate change adaptation and mitigation.
- Lack of international financing mechanisms for UPAF.

More recently however, and as part of their "city-wide approach to carbon finance", the ***World Bank*** proposes technological and policy interventions in five sectors (see Figure 1- The World Bank, 2010), three of them with possible indirect and direct bearings on UPAF:

1. Solid waste recycling linked to UPAF: composting and anaerobic digestion is likely to arise in importance as municipal solid waste management options due to their ability to reduce methane and produce a useful soil conditioner.
2. Using rainwater and recycling (partially) treated wastewater in UPAF (while carefully managing potential health risks) in order to free up water sources for other uses (domestic and industrial consumption) and reduce treatment related GHG emissions.
3. Promoting urban forestry and green areas that can act as a carbon sink, reduce the urban heat island effect; improve storm water drainage and help improve the living environment.

*Figure 1: Sectors of intervention (World Bank, 2010)*


This new approach aims to expand the CDM (Carbon Demand Management) programme of activities, giving cities the flexibility to create their own GHG mitigation strategies and access carbon finance. Amman, Jordan, is the first city that actually included an Urban Forestry and Agriculture component in its CDM financed "Green Growth Strategy".

***UN-HABITAT*** has also recently integrated urban and peri-urban agriculture and forestry in its third phase of its Cities and Climate Change Initiative (2012-2013). The proposed project aims to demonstrate the value of UPAF as a responsible strategy for climate change adaptation, mitigation and financing. Concretely the programme will work in three partner cities to enhance the awareness of local authorities and other stakeholders involved in urban climate change programmes and other programmes bearing on UPAF (land department, agriculture and green spaces) regarding the potentials (and limitations) of UPAF for climate change adaptation and mitigation and to assist interested cities to integrate UPAF in local climate change and land use policies and strategies.

At the level of city governments, activities looking at the interface between UPAF and climate change/ disaster risk reduction have been implemented in the context of:

1. Projects financed by international donor agencies, such as the project "*Urban Agriculture as an Integrative Factor of Climate-Optimised Urban Development, Casablanca / Morocco",* a German-Moroccan research project of the German Federal Ministry of Education and Research (BMBF) within the megacity research programme "Research for the Sustainable Development of Megacities of Tomorrow, Focus: Energy- and climate-efficient structures in urban growth centres". In most cases however such projects remain limited to action-research and demonstration, while not having resulted (yet) in policy uptake of UPAF as part of climate change policies and programmes.

2. Cities that have included UPAF (or some forms of UPAF) in their city climate change action plans. These include:

- Toronto (Canada), where the city's climate change plan includes financial support to doubling the existing tree canopy by 2020; to community based UPA/F projects e.g. community orchards and gardens, home gardens; promotion of composting of organic wastes and rainwater harvesting; as well as to reduction of the City "Food print "by requiring shipping distance on food labels, promotion of regional products, supporting farmers' markets and preferential procurement of locally produced food.
- Seattle (USA) where reducing fossil fuel emissions is one of the reasons behind their Local Food Action Initiative that promotes community gardening, local food sourcing and increased food waste recycling. The action plan calls amongst others for better integration of food policies with land use and zoning policies, waste management programmes, transportation projects and disaster response plans.
- Durban (South Africa), that is promoting -as part of its climate change action plan- productive green rooftops for storm water management, biodiversity and food production; is testing possible replacement crops for maize to adapt to lower rainfall and is promoting community reforestation and management.
- Brisbane (Australia), where both urban agriculture and green roofs were included in the city climate change action plan to meet predicted global climate change challenges.

3. Cities that promote UPAF for reasons of food security, local economic development or environmental management. In some cases these UPAF projects have bearings on climate change, though they have not necessarily been designed for this purpose. In these cases UPAF is not supported by climate change programmes, actors or funding. One example is the city of Freetown (Sierra Leone) that 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 urban agriculture production for food supply and job creation.
4. Cities that promote sustainable urban and low-carbon development with potential connections to UPAF policy and implementation measures. An example is the city of Beijing (China) that as part of its Urban Master Plan (2005-2020) aims for the protection of farmland; the preservation of green spaces and designation of permanent green areas in city fringes and corridors; the promotion of waste water recycling and rain and flood water harvesting; the protection and promotion of forest areas and parks and the certification and subsiding of energy-saving production. In order to promote UPAF as part of the policies/plans, it could be made visible how UPAF can actually contribute to the mentioned policy objectives; how these measures relate to climate change impacts and what their possible effects on climate change mitigation or adaptation could be.

All these initiatives and examples help increase our knowledge on the possible inter-linkages between UPAF and climate change. In none of the cases however UPAF impacts on climate change adaptation and mitigation are monitored or quantified, underlining the need for development of a practical and locally applicable monitoring framework.

## 3. Needs and requirements regarding monitoring of UPAF impacts on climate change adaptation and mitigation

Contributions made by representatives from Rosario (Argentina), Santa Fe province (Argentina) Kesbewa (Sri Lanka), Kathmandu (Nepal) and Beijing (China), UN-HABITAT, as well as from researchers from different organisations highlight that more knowledge and data are needed on:

1. The potential of UPAF to contribute to climate change mitigation and adaptation:

- mitigation of global warming and the urban heat island effect
- reducing air pollution
- reducing vulnerability and enhancing adaptation to climate change
- livelihoods and (sustainable) urban development (economic, environmental, social) at household and city level.

These potential climate change and (co)developmental benefits of UPAF should be compared to rural agriculture and forestry and to other potential climate change strategies (investments/measures in infrastructure, transport, energy). For example, cities' agglomeration advantages also allow for more cost-effective collection and recycling of waste into nutrients, which saves nitrogen and decreases GHG emissions. Adapting urban brownfields and built-up surfaces for agricultural use has much higher mitigation potential than disturbing natural habitats and their carbon-capturing soils; while also contribution to urban food security (especially in the face of climate change-induced disruptions in food supply).

2. The capacity of and strategies for UPAF to adapt to climate change by for example:
- selecting new crop and animal species (for example more drought-resistant species; or species resistant to salt water intrusion)
- changes in growing seasons
- changes in production and storage practices.

3. Policies and (spatial) planning measures for promotion of UPAF as a climate compatible development strategy: Which UPAF typologies (home gardens; community gardens; agroforestry) are working where (e.g. on rooftops; in backyards; in peri-urban fringes) and what are the related barriers and enablers (e.g. regulations, incentives, zoning)?

## 4. Monitoring data needed to allow for decision-making on and financing of UPAF intervention

To allow for integrating UPAF in climate change policies, programmes and financing, more quantifiable data on the following variables are required:

1. Data on the past, current and potential future presence of UPAF/different forms of UPAF:
- Various types of UPAF and species/practices used.
- Land (surface) area covered by (or that can potentially be used for): various forms of urban and peri-agriculture, trees and forestry, parks and green spaces.
- Area of land under specific UPAF systems in relation to the total built-up area in (various sectors in) the city and peri-urban zones. GIS-based land use maps can be developed calculating (changes in) the area of land (under various forms of UPAF) in relation to other land uses and built-up areas.
- The presence of certain UPAF systems/typologies in correlation with the wider urban context (e.g. population growth; density; spatial growth) and the presence or absence of land use and other regulations and incentives.

2. Data on UPAF production volumes:
- Its contribution to urban food security at household and city level
- Comparing the amount of food (or certain types of food) produced locally versus those that are imported (from rural areas or abroad).

3. Data on (reduction in) urban GHG emissions, energy use and air pollution (aerosols) over specific time intervals and in relation to population size:
- Including emissions related to fertilisers used; consumer transport for food; storage, distribution and transport of locally produced versus imported food
- Volumes of organic waste going into landfills and per capita waste treatment in relation to disposal and decomposition of organic wastes
- Changes in air pollution/ quality (e.g. SO2 ppm) and moisture
- Comparing situations before and after UPAF interventions (with or without UPAF)
- Comparing efficacy of different UPAF systems (horticulture, pasture; forestry)
- Comparing data from specific UPAF pilot sites to generic baseline emissions from producing the same amount of food on newly-cleared rural land away from the city.

4. Data on the reduced vulnerability (or increased resilience) to climate change:
- Looking at food availability and prices for different commodities in situations where climate change affects rural agricultural production

- UPAF impacts on rainfall infiltration and storm-water drainage; as well as  and ambient temperatures (urban heat island effect)
- Comparing UPAF and non- UPAF producer households
- Comparing before and after incidence/severity of climate induced events (landslides, flooding) with or without UPAF
- Measuring institutional capacity in managing climate risk (human and technical capacity, knowledge, funding, institutional policies and partnerships).

## 5. Use of monitoring data to integrate UPAF intervention in climate change action plans, strategies and financing

It is felt that if research would plausibly demonstrate attribution between UPAF, climate change mitigation and reduced climate vulnerability, while identifying appropriate indicators and tools to do so- then this would raise the profile of UPAF as an mitigation and adaptation instrument and increase political and financial support as well as demand for UPAF.

Data –as mentioned in &4- could be effectively used to:

1. Develop plans to reduce GHG emissions and  air pollution, considering UPAF as well as other interventions
2. Develop local food system strategies or urban afforestation/reforestation programmes (selecting species that can adapt to changing climates)
3. Integrate UPAF in urban planning as an appropriate use for physical vulnerable sites and viable response to climate change effects such as excess storm-water
4. Enhance awareness of citizens, private sector and policy makers on UPAF and climate change
5. Obtain national and international support and funding for mitigation and adaptation measures involving UPAF
6. Mainstream UPAF in the international agenda by showing that UPAF is- and has always been- part of urban infrastructure and that this can be enormously improved with clear social, economic, environmental and climate change benefits.