

# Urban and peri-urban agriculture and forestry as a strategy for climate change adaptation and mitigation

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The current challenges posed by climate change and its interaction with cities, urban poverty and food security are recognized globally. In its 2010 report, the World Bank makes a plea for innovative “outside-the-box” solutions to climate change adaptation and points out that environmentally sustainable solutions for food, water, energy and transport as integrated components of a city climate change adaptation and disaster risk management plan are needed (World Bank, 2010).

Urban and peri-urban agriculture and forestry (UPAF) is one of these “outside-the-box” solutions currently being considered. UPAF can play a strong role in enhancing food security for the urban poor, greening the city and improving the urban climate, while stimulating the productive reuse of urban organic wastes and reducing the urban energy footprint. A review of the literature indicates that UPAF helps cities to become more resilient in the following ways:

- a. *UPAF reduces the vulnerability of the urban poor and enhances their coping capacity by:*
  - Reducing the incidence and impacts of floods and landslides on the urban poor (see b.)
  - Enhancing access to nutritious food and diversifying food sources and thereby reducing the impacts of disturbances in food supply from rural areas or imports and increases in food prices
  - Diversifying income opportunities; creation of “green jobs”; safety net in times of economic crisis
  - Enhancing community building and acting as a source of innovation and learning
- b. *UPAF reduces the impacts of higher rainfall (average/extremes)*
  - UPAF can keep low lying zones free from construction so that floods have less impact, storm water runoff is reduced, and excess water is stored and infiltrating in the green open spaces.
  - By applying (agro-)forestry on steep slopes, landslides (and their impacts) are reduced and building on risk-prone slopes may be disincentivized.
  - UPAF reduces the heat island effect by providing shade and enhancing evapo-transpiration; also CO<sub>2</sub> and dust are captured
- c. *UPAF contributes to reduction of the urban energy use and green house gas emissions*
  - UPAF produces fresh food close to the city (hence less energy use for transport, cooling, storage, packaging)
  - UPAF enables productive reuse of the organic wastes which will reduce methane emissions from landfills and reduce energy use in production of fertilizers
  - Reuse of urban wastewater in UPAF will free fresh water for higher value uses and reduce emissions from wastewater treatment.

## City strategies

Metropolitan, municipal and other local government institutions directly concerned with urban and regional planning and development can play a proactive and coordinating role in enhancing urban food security and city resilience by including UPAF in local climate change adaptation and disaster risk reduction strategies.

In order to strengthen climate change adaptation in urban areas, city governments may take measures like the following:

- Protecting and stimulating of sustainable UPAF in flood zones and wetlands to prevent construction in such areas in order to reduce the effects of floods and enhance storm water storage and infiltration;
- Promotion of (agro-)forestry on steep slopes to reduce landslides and to enhance biodiversity and landscape management;
- Facilitating (safe) reuse of urban wastewater and organic wastes in order to reduce waste disposal into landfills (thus reducing GHG emissions) and promote recycling of nutrients. Urban wastewater can be recycled and safely applied in a number of uses including floriculture and fruit crops irrigation, irrigation of forest plantations, combating desertification and providing fuel wood<sup>1</sup>.
- Promotion of productive rooftops to reduce heating and cooling requirements and thus reducing emissions and save costs, reduce run off and enable water collection, improve aesthetic value and air quality.
- Integration of UPAF in social housing and slum upgrading programmes by including space for home gardens or community gardens, street trees for shade and fruits, “productive parks” combining productive with recreational and educational functions to diversify food and income opportunities for the urban poor.
- Preferential municipal food procurement from family- and community-based farms located within the city and its environs for its government canteens, school feeding programmes, and school curricula and facilitating direct marketing of fresh and ecologically produced food from local producers to urban consumers (e.g. establishing farmers markets, community-supported agriculture, special labels, support for infrastructure development) to enhance local production and reduce emission and energy costs for transport, storage and packaging.

RUAF Foundation ([www.ruaf.org](http://www.ruaf.org)) and UN–Habitat have embarked on a joint programme to support three cities in the implementation and monitoring of pilot projects and in policy lobbying to integrate UPAF in local and provincial climate change policies and action plans. They include:

- Bobo Dioulasso, which is reconverting open vacant areas within the city (so- called Trames Vertes) into areas with multifunctional land use, promoting agroforestry and recreational land uses. Effects on urban temperatures, diversification of food and income sources and urban greening will be monitored.
- Kesbewa, Sri Lanka, where abandoned paddy lands in urban and peri-urban areas will be rehabilitated for salt-resistant paddy growing combined with vegetable production on raised bunds. Effect on water infiltration and reduction of flash floods, diversification of income and reduction in food miles by replacing imported foods with locally grown produce will be monitored. In addition, also semi-commercial low-space home gardens will be promoted in denser urban areas, Kathmandu, Nepal, where rooftop gardening will be promoted and different vegetables and herbs will be grown. Harvesting rain water and recycling urban organic wastes will be further enhanced and the potential for emissions reduction through composting will be monitored. Effects on temperatures and diversification of food and income sources will also be monitored.

In view of these cities, development of UPAF should thus go hand in hand with the development of a clear urban development and zoning plan. Such plans may promote urban densification in certain zones (which may partly take place in the current green zones), while protecting other zones (where

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<sup>1</sup> In many cities attempts to decrease pressure on wood energy (fuel wood and charcoal) by subsidizing gas or electric technologies have not succeeded. The prognostic for many regions, such as in Africa, is that wood energy will continue to be the main source of energy for cooking and heating of the majority of their population.

urban agriculture is or could be located) to arrive at a clear and sustainable urban structure. It is therefore that the design of a “green mosaic” plan is proposed, in which home gardening, agroforestry, roof gardening and paddy preservation are all complementary forms of productive green land use.

### **Innovating urban agriculture**

For urban agriculture to play a role in climate-optimized development, innovation of UPAF systems and practices is needed for UPAF itself to become more resilient to climate change. How will increased rainfall/ floods/ temperature affect UPAF and what innovation could be promoted? Strategies could include adjustment of production systems, cropping patterns, selection of adapted crop varieties, diversification of cropping and/or farming systems, improved water management, using bio- and solid waste and rezoning for urban agriculture. Cities can also be instrumental in the establishment of continuously productive urban landscapes by transforming frequently ignored ‘waste’ spaces such as roadside verges, car parks and temporarily vacant land.

### **The way forward**

To better integrate UPAF in city climate change adaptation and mitigation strategies, it will be important to make available planning guidelines and “best practices” manuals for different types of UPAF to understand which are most appropriate UPAF models (eg farming in flood zones; agroforestry on steep slopes; community gardening; promotion of aquaculture etc) for specific cities. Other important components would be to train staff of municipalities and local organizations involved in the integration of UPAF in the city climate change strategy and land use planning; support design and implementation of demonstration projects and locations where UPAF would have the highest climate change impacts; and facilitate “learning in/from practice”. Next to assessment as outlined above, there is also a need for development of indicators and tools to monitor the adaptation & mitigation impacts and co-benefits of UPAF activities.