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Growing food in the cities: Successes and new opportunities

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1. Context: More of the world is urbanised

Towns and cities in the world's developing countries are growing on an unprecedented scale. In 1960, the global urban population was 34% of the total; however, by 2014 the urban population accounted for 54% of the total and continues to grow. By 2050, the proportion living in urban areas is expected to reach 66% (UNDESA). Sub-Saharan Africa's annual urban growth rate is 3.6%, almost double the world average.

The rapid growth of cities in the developing world, coupled with increasing rural to urban migration, has led to a boom in mega-cities. In 1990, there were ten mega-cities with 10 million inhabitants or more. In 2014, there are 28 mega-cities, home to a total 453 million people. Six mega-cities are predicted to

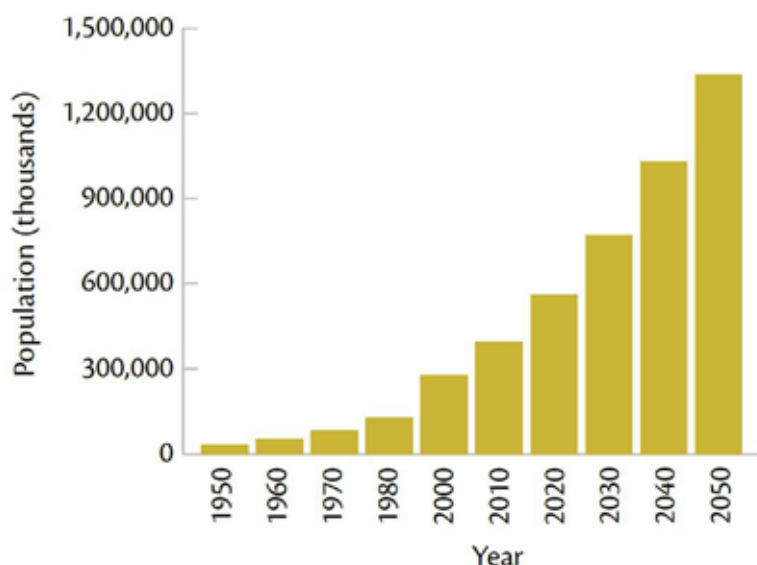
exist in Africa by the year 2030 – Luanda (Angola), Lagos (Nigeria), Johannesburg (South Africa), Kinshasa (Democratic Republic of Congo), Dar es Salaam (Tanzania) and Cairo (Egypt). There is one mega-city, Cairo, which has had a population of more than 10 million since 2000.

Currently, approximately one-third of the world's population is living in slums and informal settlements. If prevailing trends continue, this figure could reach 2 billion by 2030. Changes in climate, coupled with humanitarian crisis, add to challenges faced by cities and the urban poor. Agricultural production and urban food supply are increasingly affected by droughts and floods. More and more refugees and internally

displaced persons are seeking refuge in urban neighbourhoods and demands for urban food are increasing.

Accelerated urbanisation is profoundly affecting our world in economic, social and environmental dimensions and oblige us to rethink how cities are provisioned with food and water. Cities which host over half the world's population have a strategic role to play in developing sustainable food systems and promoting healthy diets, and because while every city is different, they are all centres of economic, political and cultural innovation, and manage vast public resources, infrastructure, investments and expertise.

Figure 1: Growth in the urban African population, 1950-2050 (Global Panel on Agriculture and Food Systems, 2017)



The task of feeding cities will face multiple constraints in terms of unbalanced distribution and access, environmental degradation, resource scarcity and climate change, unsustainable production and consumption patterns, and food loss and waste.¹

There has been an increasing separation between places of food production and those of consumption. Urban areas rely heavily on a multitude of food systems to meet their food needs. This makes them vulnerable to any crisis in the food supply chain. One corollary of this commentary is that cities will have to consider the issue of food security, including strategies on how to develop more localised food production systems, more carefully.²

Sustainable development cannot be achieved without significantly transforming the way we build and manage our urban spaces. One of the main challenges in making cities safe and sustainable is ensuring access to safe and affordable housing, and

upgrading slum settlements. It also involves investment in public transport, creating green public spaces, and improving urban planning and management in a way that is both participatory and inclusive (Sustainable Development Goal 11: Sustainable Cities and Communities).

The concept of “green cities” – designed for resilience, self-reliance, and social, economic and environmental sustainability – is usually associated with urban planning in more developed countries. It suggests high-tech eco-architecture, bicycle greenways and zero-waste, “closed loop” industries.

However, it has a special application, and significantly different social and economic dimensions, in low-income developing countries. There, the core principles of greener cities can guide urban development that ensures food security, decent work and income, a clean environment and good governance for all citizens. (FAO)



2. The multifunctionality of urban agriculture

2.1. What is urban agriculture?

Urban agriculture (UA)³ is defined as an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, reusing largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban areaⁱⁱ (Luc Mougeot 1999:10).

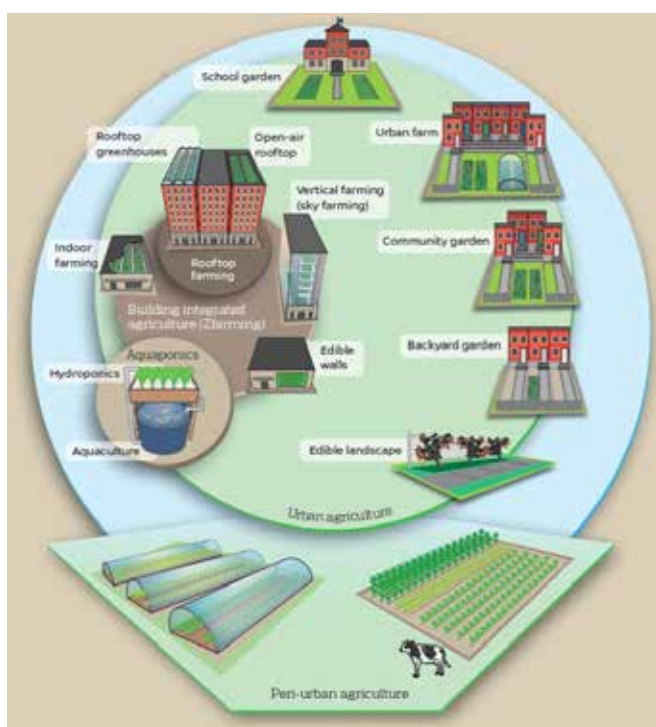
Urban and peri-urban agriculture is a complete value chain that encompasses the supply of inputs, production, agro-processing, distribution through various marketing channels, and the management of waste and waste water all along the value chain.

Typically, urban and peri-urban agriculture focuses on short cycle, high value and low input market crops; e.g. highly perishable leafy vegetables such as spinach, and cassava leaves; fruits and vegetables such as okra, eggplant, and mango. Looking at the medium and long term, productive returns can be

expected on fruit tree systems and other tree-based systems from five years after planting, provided that land and resources accessibility and tenure are secure. The sustainability of other non-wood forest products, and wood used as fuel, is very important for communities. While often managed by forestry, rather than agricultural institutions, they are nonetheless relevant here.⁴

UA⁵ still is in many countries an informal activity quite difficult to characterize with accurate data and trends. Urban agriculture includes vegetable and fruit tree cultivation, as well as other specialized crops

Figure 2: Scope of urban agriculture
(Source: Urban agriculture in Europe, 2017)



(e.g., medicinal and ornamentals), wood production, small-scale animal rearing (ranging from common, such as bovines and poultry, to local species, such as Guinea pigs), bee keeping, and also aquaculture (combined fish and plant culture). It is generally conducted near markets and occurs in limited spaces due to the high command. Urban agriculture uses city water and recycles organic discards. It has, therefore, a beneficial role in managing natural resources for a sustainable environment.

As cities expand, and people from rural areas move to cities, the frontiers between urban, peri-urban and rural activities blur and merge, presenting opportunities to extend beneficial linkages. As there are no fixed definitions, an FAO report observes, “The term peri-urban agriculture varies very widely, from the immediate city environs to up to 60km from a city. At the greater distances from a city, there is little or no difference between peri-urban agriculture and rural agriculture”.

2.2. The many forms of urban agriculture?

UPA has moved far beyond the old fashioned image of “backyard farming”. The industry has evolved from a largely informal activity into a more commercial and professional initiative in many countries, and there are often strong links with community improvement initiatives, and greening of the environment.

However, there are few national and municipal legal frameworks in place to develop it rationally. Urban and peri-urban farmers often have little or no security of tenure, little recourse in case of theft or crop slashing, and no access to agricultural extension

services. They often lack access to clean water for their agriculture, and systems for safely disposing of agricultural wastes, leading to negative implications for food safety, and public health. There is a lack of information on the types of jobs and working conditions that prevail in the sector and on the types of measures needed to strengthen labour markets and ensure good labour practices and conditions.⁶

Urban and peri-urban agriculture (UPA) takes various forms such as micro-gardens, micro-irrigated commercial gardening on urban peripheries, hydroponic micro-gardens in slum areas, green rooftops in densely populated city centres, organoponics and simplified soilless cultures.... UPA ranges from very basic family-type gardens to technology-driven top investments in vertical farming with high productivity and revenues.

Urban agriculture encompasses both “intra-urban” as well as “peri-urban” agriculture and includes a wide variety of production systems (including crop, fish and livestock production as well as of medicinal and ornamental plants for both home consumption or for the market).⁷ Urban and peri-urban agriculture encompasses a complete value chain running from field to fork, so in addition to cultivation, it includes food processing, marketing and distribution.⁸ Typically, urban and peri-urban agriculture focuses on short cycle, high value and low input market crops; e.g. highly perishable leafy vegetables such as spinach, and cassava leaves; fruits and vegetables such as okra, eggplant, and mango.

Vertical farms use high tech lighting and climate controlled buildings to grow crops like leafy greens or herbs indoors while using less water and soil. Because it is a closed growing

system, with controlled evaporation from plants, this farms use 95% less water than traditional farms. At the same time, most vertical farms do not need soil because they use aeroponics or hydroponic systems – these dispense nutrients needed for plants to grow via mist or water. This technique is ideal for meeting the challenges of urbanisation and the rising demand by consumers for high quality, pesticide-free food.

Commercialization of vertical farming is catching on in Asia, Europe, USA, Russia and now Africa. Many private companies are interested in growing crops in hydroponic, aquaponics and aeroponics systems in warehouses, greenhouses, containers and high scrapers. There is also a burgeoning interest in the production of medicinal plants in vertical farms.

Feeding Africa’s rapidly growing urban population will continue to be a daunting challenge, but vertical farming – and its variations – could be one of the most innovative approaches to grow fresh, healthy, nutritious and pesticide-free food for consumers. However, initial financial investments are very important as well as the need to have a reliable lighting (and electricity) power. Solar energy prototypes and low-tech versions are being developed.

2.3. Who are the urban and peri-urban farmers and producers?

While in most countries, urban and peri-urban agriculture is dominated by small-scale producers cultivating for daily consumption to achieve food security and earn some income for their families, there is no such person as a typical urban farmer.



Producers, for example, can be rich or poor, landed farmers or migrant workers.⁹ In most developing countries, however, it appears that the majority of urban farmers are in low-income groups and are women. Frequently, they farm on a small scale on land they do not own, and work less than full time. For many, urban and peri-urban agriculture is a relatively long-term economic activity.

The poor who have lived in the city for a number of years have better access to resources and greater familiarity with the market and the urban economy.” Some urban producers are workers hired on a permanent, seasonal, casual, or day basis. Urban and peri-urban farmers may also produce for barter or be directly contracted by a retailer or food processing business.¹⁰ Outsourcing of production is even becoming a feature of urban and peri-urban agriculture. As a report by the Agropolis notes, “higher income individuals and groups are increasingly engaging in urban agriculture, where they employ or out-source production to a poorer, often female-dominated work force.”¹¹

2.4. Challenges for UA

While UPA offers opportunities and alternatives in growing cities, challenges remain.¹²

- Tensions between ‘traditional farmers’ and ‘new style’ farmers: Traditional farmers (such as large-scale dairy farmers and farmers running mixed arable farms) considered those promoting new farming initiatives a threat. The former may have the perception that the city is giving the new farmers advantages and that urban initiatives receive more policy support.
- Pressure on open space and farmland: (i) land being irreversibly converted to urban use; (ii) counter-urbanisation, or migration from the towns and cities to the countryside (especially for new residential developments), which can have a significant impact on agriculture; (iii) within the agricultural sector itself, changes involving intensification, scale enlargement and diversification, as well as competition for land amongst farmers. There can be also competition from other building use, such as rooftop solar energy systems.
- Skills and competences gap: Farmers were found to be lacking in experience and specific skills in areas such entrepreneurship, networking and marketing, and to have limited access to strategic information.
- Lack of space and the poor quality of soils and unreliability of water supplies.
- Economic viability (e.g. high capital costs of large-scale rooftop greenhouses) but also dependency on public funds, grants, donations, etc.
- Potential impact on property values and displacement of marginalised low-income residents
- Potential health risks, e.g., pollution or soil contamination due to industrial activity.
- Legislation was identified as a source of complication in the development of urban-oriented farming initiatives. More particularly, this covered legislation relating to European competition policy, food safety as well as spatial planning.
- The traditional challenges facing agriculture are to be found in UA: high cost of inputs, lack of quality seed, unavailability of credit to buy equipment...Furthermore, farmers in UA are rarely organised (i.e. cooperatives, associations and networks) and have limited access to markets.
- Caution is also raised on the level of expectations that urban agriculture can realistically provide food for local communities, generate income for producers, and create jobs funded by profits from sales.

3. Favourable policies and planning in cities to encourage UA

Food policies are closely related to many other urban challenges and policies, such as poverty, health and social protection, hygiene and sanitation, land use planning, transport and commerce, energy, education, and disaster preparedness, it is essential to adopt an approach that is comprehensive, interdisciplinary and inter-institutional.

Although many poor households benefit from urban agriculture, land cultivation and livestock production are actually illegal in many cities. Urban agriculture often occurs on “unused” land. Farmers lack legal rights and thus have less incentive to make costly improvements. For example, instead of installing costly irrigation, farmers often use wastewater irrigation that, if polluted, can pose health risks to consumers.

Given the potential benefits of urban agriculture, government policies for urban planning need to address land tenure for farmers and provide access to clean irrigation water, while also protecting public health. Urban food policies and plans need allocation of appropriate resources within city administration regarding food-related policies and programmes, strengthened municipal regulations and increased capacities for a more sustainable, healthy and equitable food system balancing urban and rural interests.

Support for municipal public markets including farmers markets, informal markets, retail and wholesale markets, restaurants, and

other food distributors need to be supported. Some municipalities do facilitate the marketing of surpluses by poor urban farmers by providing them access to existing city markets, assisting them in the creation of farmers’ markets (infrastructure development, licenses, control of product quality), authorising food box schemes and/ or supporting the establishment of “green-labels” for ecologically grown and safe urban food.”¹³

There is a need to secure access and tenure to land for sustainable food production in UPA, including land for community gardeners and smallholder producers, land for local agricultural production and promote integration with land use and city development plans and programmes.

3.1. Policy initiatives

3.1.1. Global Agenda

Following the 2007-2008 food crisis, a **United-Nations high-level task force (HLTF)**¹⁴ called for a paradigm shift in urban planning to one that encourages urban and peri-urban food production and the professionalization of some of the actors involved.

Cities will be active in operationalising international processes such as Sustainable Development Goals (SDGs) and targets in the post-2015 Development Agenda.

The **New Urban Agenda** is the outcome document agreed upon

at the Habitatⁱⁱⁱ cities conference in Quito, Ecuador, in October 2016 by nearly 170 countries. It will guide the efforts around urbanization of a wide range of actors – nation states, city and regional leaders, international development funders, United Nations programmes and civil society – for the next 20 years. Inevitably, this agenda will also lay the groundwork for policies and approaches that will extend, and impact, far into the future.

The World Urban Forum (WUF)

is the world’s premier conference on urban issues. It was established in 2001 by the United Nations to examine one of the most pressing issues facing the world today: rapid urbanization and its impact on communities, cities, economies, climate change and policies.

Organized and convened by UN-Habitat, the Forum has become one of the most open gatherings on the international arena, for exchanging views and experiences on urban challenges. The inclusive nature of the Forum, combined with high-level participation, makes it a unique United Nations conference and the premier international gathering on urban issues.

The World Urban Forum has the following objectives:

- raise awareness of sustainable urbanization among stakeholders and constituencies, including the general public;
- improve the collective knowledge of sustainable urban development



through inclusive open debates, sharing of lessons learned and the exchange of best practices and good policies; and

- increase coordination and cooperation between different stakeholders and constituencies for the advancement and implementation of sustainable urbanization.

The Ninth session of the World Urban Forum (WUF9), taking place in Kuala Lumpur, Malaysia in February 2018, has been recognized by the General Assembly resolution 70/210 as the first session to have a thematic focus on the implementation of the New Urban Agenda adopted at the United Nations Conference on Housing and Sustainable Urban Development, Habitatⁱⁱⁱ.

Visit the WUF9 website in the next weeks for more information.

The Milan Pact is the result of a participatory process among 46 cities that worked together in 2014, under the guidance of a technical team of international experts, on the definition of 37 recommended actions structured into six integrated categories:

- governance;
- sustainable diets and nutrition;
- social and economic equity;
- food production, urban-rural linkages;
- food supply and distribution;
- food waste reduction and management;

Cities choose specific actions to develop and if and how to adapt them to their specific contexts.

The overall objective of the Pact is to develop urban food systems that are sustainable, inclusive, resilient, safe and diverse, that provide healthy

and affordable food to all people in a human right based framework. This ambitious goal can be achieved through urban food policies built on a comprehensive and integrated approach.

The Milan Pact gathers today 161 cities from 62 countries. The governance of the Pact is ensured by its Steering Committee, composed by 13 cities from different continents (Abidjan, Dakar, Nairobi, Athens, Milan, Valencia, Belo Horizonte, Buenos Aires, Sao Paulo, Baltimore, Toronto, Astana, Tel Aviv). The City of Milan is the chair of the 2016-2018 SC's mandate. The Milan Pact Secretariat, established within the Mayor's Office of Milan, guarantees the coordination of all activities of the Pact as well as its relations with cities, networks and international organizations.

Since 2016 different forms of regionalization stemmed, adding value and contents to other existing regional networks.

Milan Pact Awards: Sharing knowledge, transferring practices, monitoring progresses

One of the most important goals of the Milan Urban Food Policy Pact (MUFPP), is to stimulate the exchange of practices and learning between signatory cities. To foster this collaboration the MUFPP Secretariat, together with Fondazione Cariplo launched the Milan Pact Awards.

The first **Milan Pact Awards** was presented at the annual gathering of mayors hosted in Rome by the Food and Agriculture Organization (FAO) during the celebration of World Food Day in October 2016. Milan Pact Awards seeks to be innovative in the ways it supports cities' efforts to strengthen urban food systems and

adapt as needs of signatory cities change. The recognition and profile that comes with conferring awards for good practice has been shown to help catalyse change between cities that are more experienced and cities that are just beginning to work in the area of food as it relates to other priorities of mayors.

106 practices and solutions Milan Pact Awards (MPA) were launched in 2016 thanks to the support of Fondazione Cariplo. The two editions of the MPA (2016 and 2017) collected 106 practices on urban food policies developed worldwide. The goal of the prizes is to share the winning practices among Milan Pact cities: Baltimore (MPA 2016) is working on governance within the USCM; Mexico City (MPA 2016) on school canteens and nutrition with Tegucigalpa (Honduras); Toronto (MPA 2017) on food as a driver for social inclusion with Athens and Thessaloniki (Greece) and Antananarivo (MPA 2017) on urban agriculture.

Collected good practices will be showcased in the Urban Food Actions Platform, a tool elaborated by FAO and Milan Pact to share policies and knowledge. Monitoring framework and SDGs Milan Pact and FAO are developing the MUFPP Monitoring Framework to assess the progress made by cities in achieving more sustainable food systems.

The G7-Health and Global Nutrition Summit 2017 discussed urban nutrition policies, during the Global Nutrition Summit under the Italian presidency of 2017 G7-Health.¹⁵

3.1.2. Initiatives supporting UA across EU

The European Commission recognises that 'city farms' could have a positive impact on the environment, though this depends on the farming practices adopted. However, the EU rural development policy over the period 2007 to 2013 did not include any specific support for city farms, urban farms could be subject to support in the framework of that policy but only insofar as they were located on land fulfilling the respective eligibility criteria established by the Member States. These could potentially include aid for activities such as modernisation of agricultural holdings, development of new products, processes and technologies in the agricultural and food sector or for participation in food quality schemes, as well as other forms of aid, such as agri-environmental measures. The Commission also confirmed in August 2012 that support to urban farms was available under both pillars of the CAP so long as the eligibility conditions were met. The Commission has also acknowledged that urban farming could contribute to the objectives of sustainable development in an area, so long as the principles of sustainable farming were followed.

Agriculture and Rural Development Commissioner, Phil Hogan, has also indicated that the operations funded within the rural development programmes 2014-2020 could be used for the benefit of UA or PUA. These include: support to investments in agricultural holdings; agri-environmental measures; organic farming; quality schemes; co-operation actions, including assistance towards involvement in short supply chains; LEADER-type projects;¹⁶ support for fruit and vegetable growers through producer organisations; support for

young farmers; support through the Community-led local development tool (CLLD), which can address the issue of urban – rural linkages.¹⁷

For its part, the **European Economic and Social Committee (EESC)** has acknowledged the need for peri-urban areas across Europe to be given social, political and administrative recognition, at an early stage. The EESC recognises the role such areas play in the relationship between city and country, as well as the specific difficulties they face and that PUA presents unique characteristics which must be exploited to the full such as the proximity to consumer markets, growing demand for food quality and a social demand for new activities such as leisure, training, environmental education and ecotourism.

C40 Food Systems Network, is a network of the world's megacities committed to addressing climate change. C40 supports cities to collaborate effectively, share knowledge and drive meaningful, measurable and sustainable action on climate change.

The WHO European Healthy Cities Network consists of cities around the WHO European Region that are committed to health and sustainable development: nearly 100 cities and towns from 30 countries. Healthy Cities is a global movement, with networks established in all six WHO regions.

They are also linked through national, regional, metropolitan and thematic Healthy Cities networks. A city joins the WHO European Healthy Cities Network based on criteria that are renewed every five years.

Each five-year phase focuses on core priority themes and is launched with

a political declaration and a set of strategic goals. The overarching goal of the current Phase VI (2014–2018) is implementing Health 2020 at the local level.

The following two strategic goals of Health 2020 provide the overarching umbrella of Phase VI:

- improving health for all and reducing health inequities; and
- improving leadership and participatory governance for health.

Both strategic goals reinforce the strong standing commitment of the WHO European Network to addressing equity and the social determinants of health and striving to improve governance for health and promote health in all policies.

Phase VI is supported by Health 2020.

COST is an EU-funded programme enabling researchers to set up interdisciplinary research networks in Europe and beyond. A COST action (or 'COST project') funded under this programme ran from 2012 to 2016. Its publication, *Urban Agriculture Europe*, is the first comprehensive trans-disciplinary publication on the subject in Europe.

A pan-European network involving academics and professionals in the areas of urban development and agriculture, its objective was to gain a deeper understanding of Europe's different forms of urban agriculture including its potential from a European perspective. The project visited seven places exemplary of Europe's urban agriculture. These covered the urban regions of Barcelona, Dublin, Geneva, Milan, the Ruhr metropolis, Sofia and Warsaw. More than 200 case studies were



collected and made accessible online in an Atlas of Urban Agriculture Europe.

The COST project's working group 'Entrepreneurial models of urban agriculture' involving some 26 scientists, found that a range of business strategies had been adopted by the initiatives they examined. The strategies identified included those based on: (i) cost reduction, (ii) differentiation, (iii) diversification, (iv) shared economy, and (v) experiment and experience. Many cases were found where elements of more than one of these strategies were used. These findings demonstrate how urban agriculture has to adjust to the urban environments. Some businesses build on existing opportunities, such as proximity to customers. Others are able to differentiate their products from the main markets by distinguishing their product features from others, building on their direct links to the consumer. Urban farms can diversify their business by offering services for example: agro-

tourism, social care, kindergarten farms or nursery-school.

Eurocities is the main European cities association, founded in 1986 by the mayors of six large cities: Barcelona, Birmingham, Frankfurt, Lyon, Milan and Rotterdam. It is composed by 51 European cities. It brings together the local governments of over 140 of Europe's largest cities and over 45 partner cities, that between them govern 130 million citizens across 39 countries.

The objective is to reinforce the important role that local governments should play in a multilevel governance structure the debate around food and cities is particularly dynamic and focused.

The **Eurocities Working Group Food** was established as a 'creative hub' for sharing information, ideas, good practices and experimenting with innovative solutions related to urban food. It also focuses on priority EU calls for cities (policy development,

research and innovation, international cooperation, etc...); on advocacy to different European DGs (food and health, regional development, R&I, agriculture, international cooperation); on knowledge sharing during workshop and meetings (Brussels, Birmingham, Valencia, Utrecht, Amsterdam, Tel Aviv).

MADRE (Metropolitan Agriculture for Developing an innovative, sustainable and Responsible Economy) is a European territorial cooperation project (Interreg MED), which aims to change the metropolitan food supply model by capitalising on existing good practices, by empowering the different stakeholders in metropolitan and peri-urban agriculture, and by initiating a dynamic of transnational cooperation in the MED region.

Considered as an emerging phenomenon, metropolitan agriculture makes it possible to meet several urban challenges by

Figure 3: Distribution of COST Urban Agriculture Europe projects (Source: Urban agriculture in Europe, 2017)



contributing to food security, job creation, environmental quality or strengthening social ties and territorial solidarity between urban and rural areas. According to the FAO, a paradigm shift in both agricultural policies and urban planning is nevertheless required in order to ensure the optimal development and the sustainability of this activity.

The MADRE project capitalises on a set of knowledge, policies and pilot actions carried out on the topic and activate existing networks to enable effective transnational cooperation in the Mediterranean. The objectives are:

- To improve the innovation capacity of metropolitan agriculture in the Mediterranean territories;
- To identify and evaluate the economic, environmental and social performance factors of metropolitan agriculture;
- To identify and network metropolitan agriculture stakeholders;
- To assess the feasibility, conditions and means of creating a transnational cluster of actors in metropolitan agriculture.

3.1.3. Regionalization processes

In October 2009, representatives of city governments, ministries of agriculture, research institutes, NGOs and international organizations from 12 countries in Latin America and the Caribbean met in Medellín, Colombia, to develop strategies for reducing high rates of urban poverty and food insecurity across the region. They met as many countries were emerging slowly from the effects of global fuel and food price inflation, which had pushed the cost of living beyond the resources of many of the region's 160 million urban poor. The **Medellín meeting** proposed a new agenda for an urban transition toward social inclusion, improved quality of life, equity and sustainability. Its Medellín Declaration urged national, state and local governments to incorporate *urban and peri-urban agriculture, or UPA*, into their programmes for eradicating hunger and poverty, ensuring food and nutrition security, promoting local development and improving the urban environment.

In 2016 the Dakar Forum was held in Senegal. The forum was attended by six West African cities of the Pact: Dakar, Abidjan, Brazzaville, Douala, N'Djamena, Nouakchott and the city of Milan. Cities were engaged

in several working sessions and produced a statement acquiring the recommendations of the Pact helping them to keep on working on African specific challenges. Next forums will be organized by FAO in 2018 in Durban (South Africa) and by Italian NGOs in 2019 in Ouagadougou (Burkina Faso) and Niamey (Niger).



4. Urban agriculture supporting food production, dietary diversity and nutrition

With increasing numbers of urban consumers, there is also a growing commercial sector in urban and peri-urban agriculture. Urban livestock keeping and dairy farming, for example, has long been practiced in many towns and cities and is now expanding; it is often run by middle-income households as a response to growing urban demand and markets, and often using hired labour.

In addition, in some countries, the effects of the food crisis and global economic crisis pushed many middle-income households below the poverty line. As a result, these households have begun to produce their own food and in some cases have started up small and medium-sized enterprises in the sector.

4.1. Food production

Urban agriculture plays a significant role in feeding urban populations around the globe. The Food and Agriculture Organization of the United Nations (FAO) reports that 800 million people worldwide grow vegetables or fruits or raise animals in cities, producing what the Worldwatch Institute reports to be an astonishing 15 to 20 % of the world's food. It is estimated that 130 million urban residents in Africa and 230 million in Latin America engage in agriculture, mainly horticulture, to provide food for their families or to earn income from sales (FAO).

It is urgent to promote and strengthen urban and peri-urban food production and processing based on sustainable approaches

and integrate urban and peri-urban agriculture into city resilience plans.

There is a need to provide **services to food producers in and around cities**, including technical training and financial assistance (credit, technology, food safety, market access, etc.) to build a multigenerational and economically viable food system with inputs such as compost from food waste, grey water from post-consumer use, and energy from waste etc. while ensuring that these do not compete with human consumption.

- Improving (market) infrastructure, capacity strengthening and extension

In order to increase the income and employment benefits of urban agriculture, infrastructure needs to be improved so as to better connect local farmers to urban markets. Support is also needed to help increase the productivity and profitability of urban agriculture. Productivity in small-scale urban agriculture is still generally low as result of a lack of (or inappropriate) support services (extension, access to credit, infrastructure development), limited access to productive resources and secure land tenure. This would require improvement in technical capacity and extension capability in most case cities. Extension systems can also support the development of good crop and livestock practices among urban producers requires capacity strengthening and technical assistance.

- Strengthening producer organisations

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. All studies call for strengthening of existing producer organizations and promoting the formation of new ones, 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. Empowerment of women farmers requires priority attention, as highlighted in both the Lima and Bangalore studies. Formation of women farmer networks to deal with agriculture related activities can further strengthen the household economy. The strength of women's social networks and co-operative efforts offer opportunities for development strategies in the urban agriculture sector (Hovorka, De Zeeuw and Njenga 2009). 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.

4.2. Promoting market access

By shortening food chains, urban and peri-urban agriculture allows for substantial savings in energy and other post-harvest handling expenses. New marketing channels such as neighbourhood markets, producer-to-consumer networks and platforms, doorstep sales points and door-to-door marketing have evolved.

Urban farm produce can be sold directly to customers, to a wholesaler or intermediary, directly to local markets or retail outlets such as local supermarkets, processing facilities, restaurants, or street traders. Simpler distribution systems mean fewer intermediaries, and less complicated storage and post-production.

Food processing facilities are often located close to, or in, urban or peri-urban areas, slaughtering and canning facilities may purchase animals, fruits, and vegetables directly from local growers, or have a seasonal contract with outgrowers. Products that receive further processing have additional value added, particularly in cities where refrigeration is lacking in many homes.

In this context, further support is needed on **improved food storage, processing, transport and distribution** technologies and infrastructure linking peri-urban and near rural areas to ensure seasonal food consumption with an emphasis on diversified small and medium scale food businesses along the value chain that may provide decent and stable employment.

Stronger **food control systems** are key to ensure that food producers and suppliers throughout the food chain operate responsibly and

produce healthy food. Food safety trainings need to be delivered at scale.

Many urban agriculture policies still mainly focus on urban and peri-urban food production for reasons of food security, while commercial urban agriculture, agro-processing and value addition activities are often not well addressed (Dubbeling and Pasquini 2010). Further attention will be required from policy-makers to commercial agriculture.

- Promoting direct producer-consumer marketing

Several supermarkets and hypermarkets in the cities of Accra, Nairobi and Lima have started to link up with urban vegetable producers to source supply for their customers, including for organic vegetables in Lima. As this relationship expands, employment will be created and income levels of producers will rise. Results of a 2,5 year project to promote value chain development and direct marketing in 17 cities around the world (De Zeeuw 2010; Dubbeling 2011) show that local urban agriculture value chains do have a place in the urban food system, even though global products, markets and corporations increasingly dominate the system. Local, safe and healthy production are the main reasons for urban consumers to buy produce that addresses their social and health concerns. This is best done by establishing direct relations with consumers and selling products in the following niche markets:

- Vegetable box schemes to schools, international organisations and offices, as is done for example in Cape Town and Freetown, Sierra Leone

- Producer kiosks, fairs and markets as in Lima and Accra
- Sales to restaurants, traders and supermarkets, including use of marketing strategies that emphasise that the produce is local (or local varieties/breeds) and that make use of logos that stress product qualities, as in Bulawayo, Zimbabwe; Bobo Dioulasso, Burkina Faso and Beijing, China, Amman, Jordan and Sana'a, Yemen (an example is the "Responsible Production Protocol" used in Amman and Sana'a, which provides guarantees on production location, ecological quality and ethical production standards)

4.3. Increasing access to financing

Access to credit and other sources of financing (e.g. subsidies/grants) are crucial to further investment in agricultural production and/or processing and marketing activities. Government grant schemes should be revised so that urban producers can apply, as is proposed in the new Indian Government policy. Proper administrative systems need to be set up and special capacity building programmes developed.

Other needs include:

- 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
- Specific (municipal) guarantee schemes
- Establishment of a co-funding facility for multi-stakeholder urban and peri-urban agriculture projects to encourage local financing of UPA by local authorities, credit institutions and private enterprises
- Crop insurance schemes for producers and guarantee funds for credit institutions to reduce risk, 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 1600 urban farming households in 2007 (Dubbeling 2011).

4.4. Promoting healthy nutrition

Urban agriculture has the potential to promote **sustainable diets** through relevant education, health promotion and communication programmes, with special attention to schools, care centres, markets and the media, with a focus on poor communities. In this context, it can address non-communicable diseases associated with poor diets and obesity, giving specific attention to increasing consumption of fruits and vegetables and non-processed foods.

Horticulture helps empower the urban poor, and contributes to their food security and nutrition and can help grow greener cities. There are parts of the world where urban and peri-urban agriculture account for 50-75% of **vegetable consumption** within that city.

Family farmers and smallholder food producers play a key role in feeding cities and their territories, by helping to maintain resilient, equitable, culturally appropriate food systems and sustainable diets, reconnecting consumers with both rural and urban producers.¹⁸

Urban agriculture can offer another source of food as well as employment and income for urban dwellers. A recent analysis of 15 developing and transitional countries shows enormous variation in the share of urban households that participate in agriculture, ranging from 11% in Indonesia to 70% in Nicaragua and Viet Nam.¹⁹ Still, urban agriculture accounts for only 5% to 15% of total agricultural production in the studied countries, and most households consume the food they produce rather than sell it. Although the contribution of urban agriculture to income is generally low (less than 10% in 10 of the 15 countries), urban farming is linked with improved dietary diversity in two-thirds of the countries.

Urban households involved in UPA are generally more food secure and benefit from a more diverse diet. Urban and peri-urban food production also helps increase the availability of healthy and affordable food, mainly fresh fruits, vegetables, eggs and dairy products, for a larger number of urban consumers. In order to assure that UPA contributes to improved urban food security, support in terms of access to land, technical guidance and training on good production practices and farmers and consumers' education is required.

Sustainable dietary guidelines to inform consumers, city planners (in particular for public food procurement), food service providers, retailers, producers and

processors are needed as well as communication and training campaigns.

4.5. Providing extra income and jobs

4.5.1. Income generation

Urban and peri-urban agriculture provides an additional source of income that can help reduce poverty and food insecurity. Workers and their families can make important savings on their food bills by growing and consuming their own fresh produce and in addition be better nourished. While selling surplus produce can help workers and their families, especially poor households, generate much needed cash income.

Food production, processing and marketing contribute to generating income and employment for many poor urban households (income generated by the informal food sector is often equivalent to or higher than the official minimum wage). The sector specifically provides an opportunity for social and economic integration of women, urban newcomers and youth. It helps reduce their vulnerability by diversifying livelihood opportunities and functioning as a safety net in times of economic crisis.

Annually, urban farmers produce substantial quantities of economically valuable food for urban consumers. Secondly, food costs are lower than the same foodstuffs brought from rural areas due to proximity and direct marketing from producers to consumers. Thirdly, less transport, cold storage, losses, processing and packaging, leads to direct economic savings for urban residents. Finally, access to food for the urban poor is improved because

of lower prices, accessible location and distribution (FAO).

Some examples provided by ILO of income generation benefit from urban and peri-urban agriculture include:

- *Cuba*: from 1993 onwards, to tackle the country's growing economic problems following loss of Soviet support, the Cuban government authorized people to use state-owned vacant lots at no charge to grow crops. The support of local government organizations (People's Councils), social organizations and NGOs was also enlisted. As a result, by 2003, 12 % of Havana's urban land base was used for agriculture, and farmers had higher incomes; in some cases, higher than the average urban salary.
- *Tanzania*: The study by Foeken et al. found that: "Crop cultivation constituted a direct source of income for 30% of urban farmers in the towns of Mbeya and Morogoro." The same study found that: "Livestock keeping was generally considered more as an income source than crop cultivation, with two-thirds of the live-stock keepers in the two towns making an income out of it; and for a quarter of them it was a major income source."
- *Uganda*: In Kampala, the study by Prain et al. of urban and peri-urban agriculture in four areas found that, "70 % of farming households earned more than the national income per capita, equivalent to \$330, whilst 10 % earned five times as much, (\$1,680)."

4.5.2. Job creation

Issues in urban and peri-urban agriculture which most directly relate to decent work include²⁰:

- The need to strengthen urban labour markets by promoting the creation of new jobs and business development opportunities, based on principles of decent work, including through sustainable growth of urban and peri-urban agriculture.
- This sector has a high potential as an engine of job creation. Horticulture, raising livestock and dairying are very labour intensive, and as such, urban and peri-urban agriculture creates employment for the jobless, particularly for young people, and people newly arrived from rural areas. Low start-up costs, for example in vegetable and small fruit growing, short production cycles, and high yields relative to inputs of time, land and water, make work in the sector accessible. Finally, an important multiplier effect leads to the creation of jobs in other sectors.
- Urban and peri-urban agriculture offers many new business opportunities. The expansion of this type of agriculture is resulting in the creation of new micro, small and medium-sized enterprises including cooperatives. New market outlets are being created such as local farmers markets, local supermarkets, and street traders selling street foods. The demand for new support services such as provision of urban agricultural extension advisory services is also stimulating local labour markets.
- Gender is also an important aspect of urban and peri-urban agriculture as many, and frequently the majority of, urban farmers

and producers are women. Urban agriculture is not only offering women new opportunities but new ways of combining work, family and personal life.

Examples of job creation include:

- *Africa*: In cities like Dakar, Bamako, Accra and Kumasi, depending on crop and season, between 60% and 100% of leafy vegetables consumed are produced within the respective cities with employment figures ranging from 1,000 to 15,000 jobs.
- *Bénin*: Some 253 landless workers were growing organic vegetables along the runway at Cotonou airport.
- *Cameroon*: In Yaoundé, pigs and poultry livestock production employed between 10,000 and 20,000 persons, including producers, retailers, processors, animal input and feed traders.
- *Cuba*: in Havana, 117,000 jobs in Havana and income for 150,000 low-income families were directly provided by urban and peri-urban agriculture.
- *Democratic Republic of the Congo*: An FAO project estimated that the urban and peri-urban agricultural programme "has created some 40 jobs for every hectare, or 66,000 jobs, benefiting indirectly some 330,000 people." From a small plot, 100 to 250 people can get earnings, which exceeds the wage of a public employee.
- *Ghana*: 90 % of Accra's fresh vegetable consumption is from urban and peri-urban production.
- *Malawi*: A study of urban and peri-urban agriculture in Malawi's two main cities, Lilongwe and Blantyre,



revealed two predominant types of household engaged in urban farming: i) low income, less educated, often female-headed households, who use urban agriculture as an insurance against income losses and who can employ skilled workers to support their livestock activities; and ii) middle and high income, often male-headed households, that undertake urban agriculture for personal consumption and hire significant numbers of unskilled workers.

- *Senegal*: 60 % of the country's vegetable consumption and 65 % of its poultry consumption comes from the city of Dakar. Within the city itself, 60 % of the milk consumed originated from urban and peri-urban farmers.
- *Tanzania*: In Dar Es Salaam, at least 60 % of the informal economy was made up of urban agriculture, accounting for 20 % of jobs, making it the second largest urban employment sector.
- *West Africa*: it is estimated that urban and peri-urban agriculture is practised by some 20 million urban dwellers in West Africa, mostly for subsistence. Market gardeners were mainly located in the open spaces in West Africa, and changed crops according to seasonal supply and demand, as well as market prices.
- *Uganda*: in a vast urban slum area either side of the Kampala-Jinja highway, poor people used a variety of production strategies: growing cocoyams for food and income; keeping poultry and cattle for income; growing green vegetables, beans, maize and cooking bananas for food.

As the agriculture chain is long and complex, urban and peri-urban

farming has a **wide multiplier effect**, generating employment in related and supportive activities in production, input supply (i.e. production of compost from urban organic wastes, bio-pesticides), marketing, processing and equipment, and value addition from producer to consumer (packaging, marketing).

Youth and women's employment

The rapid growth of urban populations is outpacing the creation of employment opportunities, resulting in rising youth unemployment and underemployment. For a growing number of youth, in the face of rising school costs and shrinking formal employment, market-oriented urban and peri-urban agriculture provides a relatively accessible entry into the urban job market. They can earn an income, save on food, learn another trade and, perhaps later, set up a small business.²¹

It is important not just to promote urban youth involvement in more traditional production activities (with strong association to rural field farming) but to involve the youth also in more "modern" types of urban agriculture with a stronger link to agro-enterprise: mushroom growing, organic horticulture and hydroponics, growing and processing medicinal herbs, vermiculture, aquaculture, raising small animals, etcetera as well as in non-farming activities related to urban agriculture like running a soup kitchen, a visitors service and restaurant, arranging for marketing and transport, waste collection and recycling and production of compost or biogas, amongst others. Experiences with youth in Nairobi in the production of briquettes using agricultural and other wastes demonstrated the potential (Njenga

et al 2009). In this way "urban agriculture" may become a vibrant field of a variety of agriculture related, food and income earning activities for young people with varying interests.²²

Women often practice urban and peri-urban agriculture combine with childcare and other household tasks. UPA allows women to earn income, improve household diets, perform household chores, and exert greater control over household resources, budgets, and decision-making.²³

Studies in *Dakar, Senegal*, have shown that micro-garden projects have succeeded because of social networking between previously isolated housewives.²⁴

4.6. Environmental benefits: promoting greener spaces

Multifunctional landscape management, integrating agriculture, trees and forests help to make cities more resilient. It does so not only by diversifying urban food sources and income opportunities, but also by maintaining open green spaces, enhancing vegetation cover and water infiltration, and contributing to sustainable water and natural resource management. Urban forestry, including agro-forestry, especially helps to improve air quality, reduces urban warming, curbs erosion and enhances urban biodiversity. As water becomes increasingly scarce, UPA provides an ideal opportunity to productively use urban organic wastes and wastewater as well as collected rainwater; and official guidelines are currently acknowledging the use of untreated wastewater as long as sufficient risk reduction strategies are applied. Appropriate techniques and practices as well as health

risk reduction measures should be promoted to ensure safe production and healthy environments.

Urban agriculture has ecological benefits by reducing the city waste, improving urban biodiversity and air quality, and overall reducing the environmental impact related to both food transport and storage. Urban and peri-urban agriculture offers opportunities to protect and integrate biodiversity into city region landscapes and food systems, thereby contributing to synergies across food and nutrition security, ecosystem services and human well-being.

Potential health hazards caused by use of wastewater and agrochemicals, poor food handling, urban pollution and the raising of animals close to people in combination with poor sanitation should be reduced.

Producing locally also reduces the need for long distance transportation of food, and thus reduces fossil fuel use and greenhouse gas emissions. Urban farming cuts back on food miles – the energy required to get food to your plate –, which can be significant especially when fresh or packaged food is imported.

4.7. Land use planning

Urban agriculture needs to be understood in terms of the dynamics of city- or metropolitan-regions, embracing both urban and rural areas, in order to reach sustainable solutions to agriculture and food systems. The concepts of local and city-regional food systems however need further operationalisation. Metropolitan regions run across existing political boundaries, encompass various 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.

There is need for more regional food systems studies that analyse the potential of specific regions to reduce their ecological footprints, optimize localized food supply and examine comparative advantages of food production and supply in different parts of the region. This includes more research on the complementarity and interaction between rural and urban food supply and food markets.

In order to build more resilient city-regional or local food systems, land planning policies need to be developed that are favourable for urban and peri-urban agriculture and preserve existing agricultural areas in intra-urban, peri-urban in transition and peri-urban areas. Formal recognition of urban agriculture as a legitimate use of urban land and of its value to city livelihoods and liveability is a crucial step towards effective planning for as well as regulation and facilitation of the development of urban agriculture. Inclusion of urban agriculture as a separate land use category in municipal development, land use and zoning plans is equally important (Dubbeling, de Zeeuw and van Veenhuizen 2010).

4.8. Social function of UA

Stakeholder participation at the city level and development of a UPA multi-stakeholder platform, education and awareness raising are key. This will help to promote **local**

initiatives and civil society food movements and share best practices.

Often urban and peri-urban agriculture is community driven through community initiatives, projects and networks. It exemplifies people banding together for food production, amenity gardening, to cultivate personal and community links.

Local organizations and networks of urban producers and distributors

can improve access resources, services and markets, practise more sustainable and profitable forms of UPA. As in other forms of agriculture, producers' organizations can assist in collective purchase inputs (seeds, fertilisers, pesticides, tools); group finances (savings funds and loans); access to services, training and advice; access to credit through the organization's own funds or through other sources with the support of the organization; joint marketing of produce; representation of groups to government and other organizations; and exchange of ideas and information".

Research also highlights the potential social impact of urban agriculture for recreation and leisure time, social interaction, for education or health issues, or for disadvantaged people (i.e. migrants).



5. New opportunities for Urban Agriculture

Urban and peri-urban agriculture is used as a strategy by many urban dwellers to improve their livelihoods and overall well-being. Firstly, UPA improves a household's access to food during times of shortage, instability or uncertainty (Bush, 2010; Zezza & Tasciotti, 2010). Secondly, UPA can act as an income generating activity as farmers produce for markets or sell surplus, which contributes to a household's income security (Cohen & Garrett, 2010; Mougeot, 2005). Lastly, UPA contributes to improved health among the urban population by providing highly nutritious and fresh foods (Zezza & Tasciotti, 2010).

Despite these positive aspects of food security, livelihoods and access to nutritional foods, there are downsides to UPA. Some major problems are the increased risk for the spread of diseases from animals to humans as well as sanitary and environmental problems related to waste, water and manure (Bonfoh, et al., 2010; Menzi et al., 2010).

The major challenge with UPA in low-income countries as a driver for positive human development is to balance the pros and cons by wise regulations and incentives.²⁵

5.1. Successes across ACP

While many of the other activities are most of the time transitional, urban agriculture is likely to become a permanent feature of most cities, both in developing and developed countries. The rate of urban population involved in agriculture is estimated at about 50 % in Accra, Ghana, 80 % in Brazzaville (Congo),

68 % in the five biggest cities of Tanzania, 45 % in Lusaka (Zambia), 37 % in Maputo (Mozambique), 36 % in Ouagadougou (Burkina Faso), and 35 % in Yaoundé (Cameroon). In Kenyan cities, about 29 % of the families are employed in urban farming. From a study of Zezza and Tasciotti (2010)—using survey data from fifteen countries across the four principal development regions, i.e., Asia (Bangladesh, Indonesia, Nepal, Pakistan, and Vietnam), Africa (Ghana, Madagascar, Malawi, and Nigeria), Eastern Europe (Albania and Bulgaria), and Latin America (Ecuador, Guatemala, Nicaragua, and Panama)—the shares of urban households that earn income from agriculture vary from 11 % in Indonesia to almost 70 % in Vietnam and Nicaragua. In 11 of the 15 countries in dataset, the share of households participating is over 30 %.²⁶

Many urban dwellers tend home-based gardens primarily for household food, especially horticulture and animal products, improving the nutritional status in children. For example, in Cameroon, almost all the leafy vegetables consumed by poor urban residents in Yaounde are grown in the valleys surrounding the city.

To assess the state of urban and peri-urban agriculture in Latin America and the Caribbean, FAO conducted a survey in 2013 in 27 countries. Data was provided on agriculture in 110 cities, municipalities and towns. Data confirmed that UPA is widespread in the region, practised, for example, by 40 % of households in Cuba, and 20 % in Guatemala and Saint Lucia. Cuba's policy dates back to 1997, when the government decided to promote

urban agriculture nationwide. Its UPA programme has established in Havana a network of agricultural supply stores, municipal seed farms, composting units, veterinary clinics and centres that breed biological pest control agents. Urban farmers are entitled to agricultural insurance and production loans. In Havana, the use of synthetic fertilizer and pesticide is prohibited by law. To keep soil healthy, the UPA programme provides green manure and vermicompost, and links gardeners to sources of manure, household wastes and agro-industrial residues for making compost. Havana's gardens are so productive and cost-efficient that the national Ministry of Agriculture promotes agro-ecological production in rural areas as well.

In Brazil, support to UPA is part of the national Zero Hunger policy. Implemented by local authorities, it includes the building of farmers' markets, training for school gardeners, the allocation of vacant urban spaces for agriculture, and reduced taxes on land used for the purpose.

UPA includes large farming areas that produce, vegetables and root crops, grazing land for goats and sheep, dairy farms and intensive livestock production units. The main benefit is improved access to food. Urban food producers and their families enjoyed a more diverse diet than other urban dwellers, and were more likely to consume fruit and vegetables regularly.

Women are the driving force behind urban agriculture in many countries, and particularly in the Caribbean, Bolivia, Colombia, Ecuador, Honduras

and Nicaragua. A high proportion of urban farming families are female-headed: 90% in Managua, 86% in Haiti, 70% in Belize City and 25% in Quito.

Urban farmers come from all age groups but most of them are from low-income households and they take up farming as means of reducing their spending on food and making extra income from sales which allow them to pay school fees, medicines, and consumer goods.

Another strong support for UPA is that national governments in Caribbean countries regulate and support urban areas. In Antigua and Barbuda, support to backyard gardening includes the supply of seeds, seedlings, fruit trees and inputs, free of charge or at minimal cost. In Guatemala, the Ministry of Agriculture, Livestock and Food has created a Department of Urban Agriculture, which provides producers with training, tools and inputs. In some countries, UPA is promoted by national research institutions. Argentina's *Pro-Huerta* gardening programme has been operational for more than 20 years under the National Institute of Agriculture and Livestock Technology, and has helped to establish 8 000 community gardens, 7 000 school gardens and half a million family gardens.

*Vertical farming*²⁷

In Uganda, for instance, faced with lack of financial resources to build a modern vertical farm and limited access to land and water, urban farmers are venturing into vertically stacked wooden crates units. These simple units consist of a central vermicomposting chamber. Water bottles are used to irrigate the crops continuously. These stacked simple vertical gardens consume

less water and allow urban farmers to grow vegetables such as kale to supply urban markets. At the moment, 15 such farms have been installed in Kampala and they hope to grow the number in the coming years.

In Kenya, sack gardens represent a local and practical form of a vertical farm. Sack gardens, made from sisal fibres are cheap to design and build. One sack costs about US\$0.12. Most importantly, they use local materials and fewer resources yet give yields that help farmers achieve the same outcomes as vertical farms in the developed world. As a result, many have turned into sack gardening. In Kibera, for example, over 22,000 households have farmed on sacks.

Also in Kenya, Ukulima Tech builds modern vertical farms for clients in Nairobi. At the moment it's created four prototypes of vertical farms; tower garden, hanging gardens, A-Frame gardens and multifarious gardens. Each of these prototypes uses a variation of the vertical garden theme, keeping water use to a minimum while growing vegetables in a closed and insect free environment.

The continent has unique opportunities for vertical farms. Future innovators and entrepreneurs should be thinking of how to specialise growing vegetables to meet a rise in demand of Africa's super vegetables by urban consumers. Because of their popularity, startups are assured of ready markets from the urban dwellers. In Nairobi, for example, these vegetables are already becoming popular.

5.2. Africa

Increased immigration into urban centers in the recent past was largely

due to expectations of better lives in cities across the world, especially by unemployed youth. This coupled with general expansion of the population in Africa has caused immense pressure on food security and incomes of urban and peri-urban dwellers. This is exacerbated by low wages paid to both public servants and those employed in the private sector, even though recent reports suggest an expansion of the middle class. In order to meet these needs, there has been an expansion of urban and peri-urban agriculture to produce 15–20% of food consumed globally.

The major driver for this type of agriculture appears to be the need to meet individual household food requirements and as an income generating activity by selling to other urban dwellers. However, the individual urban farmers' motives relates to domestic and export markets as well as to the organization of various value chains. Also, the balance between, and importance of, UPA for income generation and subsistence of food varies by gender, wealth and area of residence. Obviously, the issues for UPA also vary by these settings. There is limited information about the contribution of UPA to the export market.

The importance of UPA cannot be overlooked. Farmers are engaged in various enterprises involving crops (especially fruits and horticulture crops), dairy and small ruminants, pigs, poultry as well as aquaculture. Products from these enterprises provide urban dwellers with more food that is also of a higher nutritious quality to meet their health and growth requirements. Furthermore, UPA improves a household's security in times of uncertainty through having access to more stable food sources.



While each of these enterprises comes with their own opportunities, the challenges facing production systems have also been clearly identified. Specifically, they include chemical and microbial hazards in horticulture diseases of livestock, shortage or unavailability of low cost feed products, lack of technological knowledge on various aspects of aquaculture production, as well as environmental and health concerns arising from poor waste management systems, to mention a few.

Land access remains a major factor in urban and peri-urban production systems with a clear gender dimension and the uncertainty of land rights is an obstacle for long-term farming strategies. Land is becoming largely expensive and unavailable, leaving it to the rich who use it for capital developments and not agriculture. There is a need therefore to use intensification methods where more is produced from less land. This calls for use of fertilizers in crop production to increase land productivity as well as intensified poultry, piggery, small ruminant animal and dairy production methods; for example, the use of crop wastes to feed animals makes for a more efficient UPA system.

Environmental and human health concerns take centre stage and have been a source of conflict between city authorities and urban farmers. Several of the current farming and handling practices contribute to negative environmental externalities. Similarly, there are many diseases and pathogenic agents that can find their way into the food chain and cause harm to humans, for example via vegetables, eggs and milk. Hence, it is crucial to further explore the options to reverse the negative environmental impact and how to control the spread of pathogens in UPA.

Consequently, waste management has also been raised as an important area that needs to be addressed. All of these production systems generate waste and wastewater that is not fully collected and treated, resulting in major impacts on the environment and health. There is need to develop low cost and simple treatment systems resulting in safe end products.

i. Urban and Peri-Urban Agriculture in Ghana²⁸

The majority of farming in the urban areas in Accra is located away from the house, 22% of it on highly insecure public spaces with eviction risk, whereas in the transition areas, farming is predominantly done in homestead gardens, with less commercial focus. Vegetable and maize production is the most important production system in urban Accra, with a smaller percentage of the producers growing staples or keeping small livestock. Crops produced by the respondents in peri-urban areas are mainly staples (maize, cassava, plantain and pineapple), while over a quarter of the respondents keep sheep and goats and/or poultry for commercial purposes. Livestock production is more dominant in the peri-urban areas as the free-ranging system of animal rearing can more easily be practiced there, while on the other hand theft and restrictive city bye-laws limit livestock keeping in urban areas. Farming plots range from very small plots (1 m²) to very large plots of 10 hectares or even larger. Nearly half (42%) of the first and second plots reported were less than 500 m² with about 70% of plots smaller than 8000 m². Farm sizes generally increase along the urban-peri-urban transect.

Tamale, the capital of Ghana's Northern region, is a fast-growing metropolis situated in the Guinea

savannah. Its area has increased seven-fold in the past 30 years and population has approximately doubled since the year 2000. Urban and peri-urban agriculture (UPA) is an integral part of Tamale's structure. This is a result of many factors. Tamale is a fairly young city, so dense infrastructure does not extend across its whole area, and, as mentioned, it is situated in a region where the majority of the population has historically been engaged in farming as a major livelihood activity.

UPA in and around Tamale takes many forms, with various crop farm types characterised by different spatial and tenure arrangements and access to irrigation facilities. These can be broadly categorised as open space intra-urban sites, open space peri-urban sites, intra-urban backyard farms, isolated farms in interstitial intra-urban spaces, formal peri-urban irrigation schemes and peri-urban non-irrigated farming. Leaf vegetables are the major crops grown in urban areas, whilst maize dominates peri-urban rainy season production. Animal rearing is not particularly market oriented, and is based around ubiquitous ownership of fowl and a greater extent of peri-urban than urban ruminant keeping.

Farmers access land in multiple ways including through inheritance, borrowing, squatting and self-ownership. One of the most critical concerns in the sector is the decrease in available lands as chiefs allocate plots to developers. Lack of irrigation means that cultivation is concentrated in the rainy season. Farmers who cultivate in irrigated open space sites and those with access to piped water can crop in the dry season, but overall, poor water availability is a major constraint. Piped water is a common irrigation source, although it is not intended for such commercial use.

Growing food in the cities: Successes and new opportunities

Wastewater irrigation by a minority is a health concern. Soil fertility amendments entail a major financial outlay for farmers. Most currently use manure or inorganic fertiliser, but there is a receptive attitude towards use of co-composted products.

Much production is market-oriented, including that in backyard farms. This means that backyard farmers do invest in their enterprises, for example with fertilisers, irrigation and labour. Seasonal water availability influences prices of goods. Value addition through processing and packaging is very limited.

The benefits of UPA in Tamale, as elsewhere, relate to the maintenance of a livelihood through food production and income generation. Besides this, UPA may act as a sink for municipal solid and liquid wastes and promote the development of infrastructure and community cohesiveness. However, challenges face the sector. Probably the most pressing and contentious concerns in Tamale are farmers' access to land and water in a situation of rapid urbanisation. Institutional advocacy for land law reform is seen as an answer to the issue of allocation and sale of agricultural land. Use of wastewater poses a health risk, and piped water is in short supply. Animal encroachment is a serious source of contention between crop farmers and animal rearers. Access to storage facilities, credit and extension services are limited.

Urban and Peri-Urban Agriculture Policy in Nairobi, Kenya²⁹

In Nairobi, almost 300,000 households translating to 1.18 million people partly depend on urban agriculture for food and nutrition security and income. It is estimated that more than 650 ha. of land in Nairobi is under urban and

peri-urban production (Kangethe et al, 2008). Agriculture in peri-urban areas is mainly practised on privately owned land (though not always with a formal land title). Main crops produced include maize, beans, potatoes, banana and leafy vegetables. Poultry, goats, sheep and dairy are forms of commercial livestock raising. Agriculture in the urban areas is mostly off-plot, mainly on public or private institutional land and non-constructed municipal or state owned land destined for public use or for future industrial or housing development. In urban areas the median area cultivated is 150 m², though with a number of larger plots which pushes up the mean to 916 m². Average areas cultivated by women headed households were considerably less than men (300 m² versus 500 m²). Where no land is available as in the densely built up slum areas, container farming is widely practiced by poor urban households. The most frequently grown crops in the urban area include: vegetables, tomatoes, beans, cowpeas, maize, Irish potatoes and sweet potatoes. About 15% of the urban producers also keep some small livestock, principally poultry.

In August 2015, the Nairobi City County Assembly passed the Nairobi Urban Agriculture Promotion and Regulation Act, marking a complete U-turn over urban agriculture in the Kenyan capital, from hostility to active promotion and regulation. The Act is intended to boost food security by facilitating food production in the city, to promote job creation, value addition and value chain development, to protect food safety and environmental health, and to regulate access to land and other resources (Nairobi City County, 2015).

Now, the Nairobi City County Government is explicitly responsible for training farmers, for ensuring

their access to organic waste, and for developing marketing infrastructure. It must also monitor and regulate quality and hygiene standards, and promote animal welfare and traceability. The Nairobi Urban Agriculture Promotion and Regulation Act falls under the remit of the Agriculture, Livestock, Fisheries, Forestry and Natural Resources Sector, and implementation is led by the Executive Committee Member for Agriculture, Livestock and Fisheries, currently Dr. Bernard Mugenyi, who is charged with preparing a strategic plan for urban agriculture. The Act establishes the Nairobi City County Urban Agriculture Promotion Advisory Board to advise the executive member on promotion and development of the sector (Nairobi City County, 2015).

A key enabler for developing the Nairobi Urban Agriculture Promotion and Regulation Act has been strong civil society activity over a sustained period of time, which led to a groundswell of community and media support and the establishment of trusting relationships with civil servants. This bottom-up pressure and preparatory work made the promotion of urban agriculture a powerful idea that captured the public imagination, and was critical for generating political commitment to promote and regulate urban agriculture once a conducive institutional environment was established.

The policy process was participatory, involving NGOs and consultations with urban farmers, the latter having been empowered to defend their interests by being helped to organize into a collective lobbying group and through training.

Supportive civil servants who had been re-assigned to Nairobi's



new agriculture department, as well as some politicians, served as champions for the policy through the County Assembly.

While delivery is still in its early stages, it will be enabled by measures to educate civil servants within the city government and to break down prejudices around urban agriculture, as well as by drawing on the experiences of other cities to demonstrate the value — and improve the safety — of urban agriculture.

Urban and Peri-Urban Agriculture in Dakar, Senegal³⁰

In Senegal, 60% of the country's vegetable consumption and 65 % of its poultry consumption comes from the city of Dakar. Within the city itself, 60% of the milk consumed originated from urban and peri-urban farmers.³¹

Urban and peri-urban agriculture (UPA) is a prominent feature of the Dakar Region, which includes the metropolitan area of Dakar, the towns of Pikine and Rufisque and the traditional villages of Thiaroye, Yeumbeul, and Malika. The vast majority of UPA occurs in the Niayes, a geological depression with a high water table that runs through the region. Farming in the area meets approximately 60% of total demand for vegetables in Senegal while also supplying vegetables for export to the West Africa region and beyond. Urban agriculture absorbs a significant portion of manpower and provides economic resources to different categories of actors—producers, farm employees, traders and middlemen. Physical space for UPA is in high demand for non-agricultural purposes and is the subject of disputes, negotiations and renegotiations.

Urban and peri-urban agriculture (UPA) in the Dakar region is

well developed and contributes significantly to the city and region's food basket, and to the economic vitality of the urban food system. Extensive areas of vegetable production primarily occur in the Niayes, a geological depression with a high water table that runs through the region. UPA is linked to domestic and overseas markets, with production systems encompassing a range of small and large-holding producers that provide seasonal employment for urban and temporary rural migrants. Despite UPA's economic significance, the sector is subject to many constraints, particularly with respect to the availability of appropriate land, uncertainty about land ownership, inadequate access to quality irrigation water, inadequate policy protection and weak investment. These factors undermine the sustainability of the sector and contribute to health and environmental hazards, such as those linked to use of untreated wastewater for vegetable production.

In particular, the lack of suitable land and water presents a major challenge to the long-term sustainability of UPA in Dakar. With the reduction of urban agricultural space and a decline in the supply and quality of ground and surface water, more intensive technologies—irrigation networks, drip irrigation and trailer pumps, etc.—are becoming increasingly necessary, which could further drive up costs of production and reduce profitability. The current challenges associated with land and water resources will become increasingly acute as urbanization pressures and climate change intensify in the coming decades.

The socio-economic importance of UPA in the Dakar region is linked to the fact that 200 000–250 000 people derive a portion of their income from market-garden farming (Fall et al., 2003). While economic

activities in the Dakar Region are predominantly generated from the industrial and service sectors, Sueur (2011) estimated that 26% of the population derives revenue from agricultural activities, 6% of whom depend exclusively on agriculture. The Households Senegalese Survey (ESAM II) states that farmers, farm workers and fishing represented only 2.6 % of the population of Dakar in 2004.

The two main urban agricultural sites are those of Pikine and Patte d'Oie, which have a total cultivated area of 137 ha of intensive farming, 23 % of which is irrigated with wastewater. Anne Guèye Girardet (2010) estimated the cropped area of Pikine and Patte d'Oie to be around 137 ha, covering sites of Pikine, Patte d'Oie and also other sites of Pikine department like Malika and Thiaroye.

Export of horticultural produce has experienced significant growth between 2000 and 2008 in the Dakar Region, increasing from almost 10 000 tons to more than 23 000 tons. In terms of volume, green beans accounted, on average, for 57 % of horticultural exports; tomatoes for 13 % and mangoes for 10 %. In 2008, green beans, tomatoes, mangoes and watermelons represented 95 % of total exports (ANSD, SES Dakar, 2008) and in 2009, fruit and vegetable exports exceeded 30 000 tonnes (Horticulture Directorate, 2012). A significant portion of these exports come from peri-urban areas of Dakar where some producers have obtained farmland size exceeding 20 ha.

The economic value of UPA extends to broader employment opportunities for the poor in related activities. It employs a host of people as sowers and gardeners, employed on either a temporary or permanent basis, and is also an important source

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of urban and rural secondary and tertiary employment in the transport, marketing, storage and processing sectors, as well as urban waste sorting activities, where very low-income people in such parts of Dakar as Croissement Cambérène and the Mbeubeusse retrieve and sell organic waste, which flower farmers use for soil amendment.

Farm managers are predominately men who are in charge of crops and are also responsible for bulk and semi-bulk sales and transportation of products from one region to another. In Dakar and Thiès, some women manage farms but their number is quite small (around 10 % of total farms) relative to men (Pre-census peri-urban farming, 1999/2000). Generally, women are engaged in distribution, marketing and sale of agricultural products in rural and urban markets. In the fruit and vegetables commodity systems, women play a particularly important role in establishing marketing networks (Mbaye and Moustier, 2000). Recently, women have begun participating in agricultural exporting where they are actively employed in the harvesting, sorting and packaging of groundnuts, tomatoes and green beans.

The emergence of an informal land market, combined with weak or non-existent enforcement of land use regulations, drives urban/peri-urban land-use conversion in the Dakar region. While Senegal has developed an action plan for protecting the Niayes, non-compliance with zoning regulations, overlapping and ill-defined regulatory authority between state and local governments, and the strained coexistence of customary law with constitutional law undermine protection of agricultural lands in the Dakar region, and further marginalizes agricultural production activities.

Senegal has a policy framework for protecting the *Niayes* in the Dakar Region (PASDUNE) and other policy mechanisms that are conducive to the mainstreaming of urban agriculture in urban planning master plans that could help to meet policy goals related to urban agriculture. As part of any effort to mainstream UPA into policy frameworks, there is a critical need to organize urban farmers under an umbrella organization that can work with municipalities to mainstream the horticultural zones of Dakar into town planning master plans or into the detailed urban plans of those areas that fall under the PASDUNE and ATADEN frameworks. Lack of access to appropriate credit mechanisms is often cited as a key impediment by farmers for managing risks and adapting to change, including climate change (Di Falco et al., 2011; Di Falco and Marcella, 2012). There is a need to create dialogue between the various actors—farmers, policy makers, financial institutions and researchers—in order to find relevant and operational strategies for funding UPA.

The practice of urban or peri-urban agriculture is undertaken even when there is considerable instability of residence, in fact, in the case of Nairobi for example which has some of the highest levels of instability of the four cities examined in a RUAF study of urban agriculture including Accra, Bangalore and Lima (Prain G. and Dubbeling M. 2011), farming may be the stable factor in the livelihoods of many households, continuing to be practiced on public spaces or other off-site locations even as they need to relocate to other leased or squatted accommodation.

Nevertheless, though the practice of agriculture seems to provide some stability to households with unstable residence, plots themselves,

especially in urban areas of Nairobi and Accra, are without secure tenancy and significant numbers of producers identify a risk of eviction. Nevertheless, large numbers continue to farm even under these circumstances, which indicates its central importance for the livelihoods of these poor households. With stronger policy support to increase security of tenure there could well be greater investment and higher productivity.

Floriculture is increasingly gaining ground in urban and peri-urban Dakar. Since producers often do not have access to land, they squat on lands adjacent to major roads and in residential quarters. Floriculture is an important informal activity occurring in unclaimed areas with thick vegetative cover, which contrast sharply with the relative desert landscape of urban Dakar. These sites are better maintained compared to public green spaces that the municipal authorities struggle to keep and maintain. To counter risks of flooding, flower producers have developed raised earthen platforms and have resorted to filling soils with gravel in order to improve drainage.

Non-soil micro-market gardening is beginning to emerge in the Dakar area due to the unavailability of land. Practised by women and young people, it consists of growing crops in prefabricated containers (boxes, small wooden tables or basins) covered with a plastic layer and containing macro-enriched water and mineral oligo-elements or an inert solid bedrock composed of gravel, rice balls or groundnut shells (Mandiany, 2002). Micro-gardening practices also include growing vegetables in wooden boxes with liquid nutrients with or without bedrocks. Micro-gardening is a way of popularising gardening in urban



households, though it is currently in an experimental phase and there have been no estimates of its potential to address household food needs.

Policy support for urban and peri-urban farming

*The Participatory Urban Agriculture Project in Quito, Ecuador*³²

The Participatory Urban Agriculture Project, founded in Quito, Ecuador in 2002, supports more than 12,000 individuals (86% women) and 380 community-based organizations in urban and peri-urban farming. It is inclusive of all community members, including those who would often be excluded or marginalized – older people, single mothers, abandoned children, migrants and refugees and people with disabilities. More than 1,000 active gardens have been established, including 140 community gardens. Annual food crop production is estimated at 400 tonnes, with 47% of produce sold and the remainder kept for home consumption. Participants earn at least US\$55 per month from the sale of surplus produce and make a further saving of at least US\$72 per month on food purchases by consuming what they grow. The programme has helped to diversify the diet of urban farmers and their families and support the establishment of produce markets across the city.

*Government support in the Democratic Republic of Congo for urban and peri-urban horticulture.*³³

In the Democratic Republic of the Congo, government support for urban and peri-urban horticulture since 2000 has created over 16,000 producers across five cities. It is has generated about 60,000 jobs and produces 150,000 tonnes of

vegetables per year for a total urban population of 11.5 million. Between 2000 and 2010, the project disbursed loans worth US\$1.08 million to market gardeners for investment in crop production and other income-generating activities. Most of that credit was channelled through “microbanks” managed by development NGOs and growers’ associations. Each microbank serves 50–75 growers, who contribute 20% of the loan amount for approved activities. Loans, averaging US\$60 per grower, are used mainly to buy inputs and farm tools, or are invested in small-scale enterprises, such as seedling nurseries, composting units and small-scale animal production.

*Enabling urban agriculture through constitutional change and civil society activism in Nairobi, Kenya.*³⁴

Like many East African cities, urban agriculture has been practised by many poor residents of Nairobi since the late 1970s and 1980s. Yet, for many years, the city government vigorously opposed it and farmers’ efforts to feed their families were regularly disrupted by law enforcers on public health and land ownership grounds. The Nairobi Urban Agriculture Promotion and Regulation Act 2015 represents a major reversal in municipal attitudes to urban food production. By training farmers, ensuring their access to organic waste disposal, developing marketing infrastructure and monitoring and regulating quality and hygiene standards, the Nairobi City Council has been able to boost food security in the city, promote job creation and value chain development, protect food safety and environmental health and regulate access to land and other resources.

5.3. The Caribbean³⁵

A FAO study has confirmed that UPA is widespread in the region. It is practised, for example, by 40% of households in Cuba, and 20% in Saint Lucia.³⁶

In Haiti, 260 ha of land in and around Port-au-Prince and other towns are cultivated by 25 500 families. Among capital cities, the “greenest” is Havana, where 90 000 residents are engaged in some form of agriculture, whether backyard gardening or working in the city’s commercial gardens and on livestock farms.

Urban agriculture in the region encompasses a wide range of activities suited to small spaces, from backyard vegetable gardening to intensive production of flowers and the raising of small animals for eggs and meat. School gardens and backyard family horticulture are the dominant forms of urban food production. Family gardens are common in urban areas of Cuba and in most Caribbean countries. They produce eggplant and okra in Antigua and Barbuda, carrots and coriander in Tegucigalpa, broccoli and quinoa in Quito, and spinach and strawberries on Bolivia’s *altiplano*.

Urban farmers come from all age groups and walks of life. But most are from low-income households, and they take up farming as a means of reducing their spending on food and making extra income from sales. The main benefit, however, was improved access to food. Urban food producers and their families enjoyed a more diverse diet than other urban dwellers, and were more likely to consume fruit and vegetables regularly. Women are the driving force behind urban agriculture in many countries, and particularly in the Caribbean. A high proportion of urban farming families are female-

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headed: 86 % in Haiti and 70 % in Belize City. The main challenge facing farmers in the cities was lack of space, followed by the poor quality of soils and the unreliability of water supplies. For those interested in producing bigger surpluses for sale, the main constraints were the high cost of inputs, the lack of quality seed, and the unavailability of credit needed for buying tools and processing equipment. But higher yields were no guarantee of higher earnings – most producers had very limited access to markets.

A strong trend in many UPA programmes in Latin America and the Caribbean is toward agricultural technologies and practices that produce more, and better quality, food while optimizing the use of natural resources and reducing reliance on agrochemicals.

In Havana, the use of synthetic fertilizer and pesticide is prohibited by law. To keep soil healthy, the UPA programme provides green manure and vermicompost, and links gardeners to sources of manure, household wastes and agroindustrial residues for making compost. Havana's gardens are so productive and cost-efficient that the national Ministry of Agriculture promotes agro-ecological production in rural areas as well.

Many people practising UPA for home consumption also sell surpluses. The proportion of “commercial producers” was 26 % in Antigua and Barbuda, 40 % in Cuba, and 68 % in Dominican Republic. Cities with successful UPA programmes usually have well-organized marketing systems. Havana has fruit and vegetables sales points located within 5 km of production units and throughout the city's urban neighbourhoods, where producers sell directly to consumers.

In 2013, sales amounted to 26 500 tonnes.

Many urban and peri-urban farmers have been tapped as suppliers of institutional feeding programmes. In Havana, UPA provided in 2013 some 6 700 tonnes of food to almost 300 000 people in schools, public health centres, hospitals and other institutions in the city.

i. Urban and Peri-Urban Agriculture in Havana, Cuba

The total area under agriculture in Havana is estimated at some 35 900 ha, or half the area of Havana Province. Production in 2012 included 63 000 tonnes of vegetables, 20 000 tonnes of fruit, 10 000 tonnes of roots and tubers, 10.5 million litres of cow, buffalo and goat milk and 1 700 tonnes of meat. In addition, 89 000 backyards and 5 100 plots of less than 800 sq m are used by families in the city to grow fruit, vegetables and condiments and to raise small animals, such as poultry and guinea pigs, for household consumption. In densely populated areas, food is produced in containers on rooftops and balconies. In all, some 90 000 Havana residents are engaged in some form of agriculture. Product marketing is based on direct exchange between the producer and the consumer. Fresh produce is marketed through a wide range of outlets, including sales points located within 5 km of production units and throughout Havana's urban neighbourhoods. In 2013, sales amounted to 58 000 tonnes. Almost half of that – 26 500 tonnes – was sold to the public through local sales points, while state markets and fairs handled 21 000 tonnes. A further 6 770 tonnes were supplied through daily deliveries to almost 300 000 people in “priority destinations”, such as schools, maternity homes, public health centres, hospitals and other

institutions in the city. Many farmers, especially in the cooperative sector, market processed products, such as spices, and processed meats, fruit and vegetables, and have supply contracts with the tourist industry, which accounted for 3 500 tonnes of sales made in 2013.

Agricultural production in Havana is implemented under two national programmes, one for urban and one for peri-urban areas. It is strongly encouraged by the Cuban Government, which created the Havana Provincial Office of Agriculture, seven provincial technical departments and 15 municipal offices to assist the sector. The government has also introduced measures to grant vacant land free of charge for agriculture and to encourage the participation of women and youth. Crop and animal production is recognized as a legitimate land use in the city's strategic plan, which allows agriculture in areas where construction is not foreseen, while its Land and Urban Management Scheme of 2013 sees peripheral areas as highly suitable for agriculture.

UPA is supported by a Technical Advisory Board, representing 11 agricultural research institutes, by a network of agricultural supply stores, municipal seed farms, composting units, veterinary clinics and centres for the reproduction of biological pest control agents, and by the city's College of Urban and Suburban Agriculture, which coordinates the training of producers and technicians, and helps to introduce new technologies, crop varieties and animal breeds.

Innovations such as organoponics, along with technologies for the production of bio-fertilizers and the processing and conservation of seed, have been transferred abroad



through technical assistance to urban agriculture programmes in more than 10 Latin American countries, including Colombia, Mexico and Venezuela and other countries of the Caribbean. The Ministry of Agriculture's national Institute of Fundamental Research in Tropical Agriculture (Inifat) has developed a three-year master's degree course in urban and peri-urban agriculture that has attracted students from Europe and Japan.

ii. Urban and Peri-Urban Agriculture in Antigua and Barbuda

Backyard gardens accounted for about 280 tonnes, or 7 % of the country's vegetable production. Another 620 tonnes came from peri-urban vegetable growers who have expanded their acreages and, thanks to the use of improved seed, integrated pest management and packaging, are supplying lettuce, spinach and other high-value crops to hotels and supermarkets, and making high-volume sales in public markets.

Home vegetable production is also seen as a food security bulwark in case of extreme weather events. When Hurricane Earl struck Antigua in August 2010, flooding "drowned" large fields of vegetables in rural areas and caused crop losses of around 20 %. However, backyard production was not significantly affected, since home gardens are smaller in size, more intensively managed and quick to regenerate.

Total annual vegetable production has shown an increasing trend over the last 5 years. In 2010 there was a decline in production caused by the effects of hurricane on the Agricultural sector. In the same year however, production from UPA / backyard was not significantly affected as the home gardens are

smaller in size, more manageable and quick to regenerate. Since 2008, UPA / backyard production as increased steadily due mainly to the expansion of the participant base across all parishes, which now include the religious organizations, community groups, para-military services and the schools. Lawyers, doctors, pilots, accountant, nurses, civil servant, businessmen, house wife and others in the program.

In Antigua and Barbuda, there is no class distinction as to participation in the home-based food production and no issue of gender. But in reality, there are more women participants. Home-based production was dominated by females; they outnumbered their male counterparts by more than 3:1 ratio.

The gardens are used to grow traditional local vegetables, such as eggplant, cucumbers, okra, thyme and chives, as well as tropical crops that are also imported, such as tomatoes, carrots, sweet peppers, onions and cabbage. Most vegetables are consumed fresh, with little or no processing, although hot peppers are often sundried or refrigerated, okra and spinach are blanched, and fruit is processed into drinks.

The amount of land being used for backyard gardening cannot be easily quantified. Most gardens are very small, ranging from 1 to 10 sq m, and many producers grow vegetables in recycled containers of various shapes and sizes. However, using an average productivity coefficient, the Extension Division calculates that urban and peri-urban gardening occupies a land area equivalent to about 20 ha.

Of the 2 500 households engaged in backyard gardening, more than two-thirds consume most of what they

grow, and give some away to friends, colleagues and neighbours. The main benefits are savings on food purchases, and improved household nutritional status. Around 650 also use their gardens as a source of income, by selling produce at local markets and shops.

Home production has also created jobs in the processing of produce into sauces, jams and jellies the production of seedlings, and grafting trees. As well as promoting vegetable gardening, the Extension Division encourages poultry keeping in schools and apiculture in backyards.

Currently, UPA produce is divided up by how it is used:

- Cash sales at the local markets and shops in the communities. This is a source of income to participants.
- Home-based consumption which contributes to improved nutrition of families.
- Gifts and donations among families and friends at workplace as well as within the communities.

It is important to create a networking group to share experiences, technology, information as well as organizing trips for participant to see what others are doing and to be able to improve and make innovations at the home level more sustainable.

Main technologies (e.g. hydroponics, micro gardening, etc.) used and types of crops and animals produced In Antigua and Barbuda, high level technology has been introduced to food production at the UPA / Backyard. Irrigation technology is being used, hydroponic using the table pallets, used tires, cut drums and many other local innovations at the home level. In Antigua & Barbuda

wastes are centrally managed. But at the homebase, farmers are taught how to make compost by using leftover food and other decaying organic materials from the kitchen.

Most areas where the UPA / Backyard is being practised are lacking good quality soil for production and lack of space, therefore, and hence the use of containers where it has to be filled with soil that is transported from another area of the Island. This practise has introduced diseases and pests. One method of managing this problem is the for soil sterilization. During the UPA / Backyard program a local innovation using the old barbecue pot to sterilize the soil before use was employed and resulted in improved production. The picture below is shows how this is being done for use at the home level.

5.4. Successes in the EU³⁷

In mapping out the pattern of urban agriculture across Europe, the COST project notes the following findings in relation to urban farming:

- There is a zone of urban farming running from the Benelux countries to Italy. Subject to a form of controlled urbanisation, urban farming has reacted to the different demands of the city, starting with food supply and then moving onto recreational, environmental, social and other purposes.
- In contrast, the process of adaptation did not occur to the same extent in eastern Europe. Socialist economic systems and the restriction of private investment held back the development of small-scale entrepreneurship. As explained in the study, despite an

end to the Cold War, opportunities for farmers could not be turned into successful businesses. In short, the farming that did develop was 'non-urban adapted'.

- In terms of examples of urban agriculture innovation, these are mainly drawn from western Europe, such as the agricultural parks found in Barcelona and Milan.
- It is reported that between 2006 and 2014, the number of plots in allotment and community gardens in Spain increased by a factor of six. Similarly in Rome, the number of small urban plots of land tended to by single households has risen considerably. Overall, as the COST project suggests, the economic crisis has helped to promote these trends.
- Greater cooperation is taking place between municipalities and chambers of agriculture. France is one such example: there, professional urban farmers and citizens are brought together through the organisation Terres en Villes.
- Though the COST project considers that urban farming in former socialist countries lags behind other parts of Europe, it does not mean the situation is static. For example, in the Czech Republic and Poland, a network of educational farms have been established.

In terms of trends, the COST project points to:

- (i) a rise in community gardens as a new type of urban food gardening reflecting a form of 'active citizenship' (see box below on urban community gardens in Prague);

(ii) a renaissance in the form of allotment gardens.

In terms of impact, a case study from Bologna, published in 2015, suggests that rooftop gardens in cities could potentially provide more than three quarters of all vegetables consumed in them. If all rooftop gardens in Bologna were utilised they could supply around 12 500 tonnes of vegetables a year. Based on actual consumption data, this could meet 77% of residents' needs for vegetables.

In the case of the Amsterdam area, research has found that 12.5% of the surface area (without counting roofs, ecological spaces or private areas) of the city is easily transformable into food productive space. This could provide 25 % of the population of Amsterdam with vegetables, herbs and fruits. If this result was combined with potential roofs, underground spaces, private areas and space inside buildings, it has been estimated that the number would rise to 90 %.³⁸

Research findings on the potential offered by an elevated aquaponic food system spanning the top floor and exterior roof space of a disused mill in Manchester have been extrapolated across the whole city. They show that if the total surface area of Manchester is taken into account, 33 % is capable of growing food.

An analysis of land use in Rome shows that it is the most agricultural municipality in Europe. In the context of the rise in the number of gardens there, a number of best urban agricultural practices have been identified. One of them is the Agricoltura Nuova multifunctional agricultural cooperative, occupying some 250 ha in two locations to the south of Rome. Established by



a group of young people in 1977, the cooperative is viewed as one of Italy's first experiments in social agriculture and has been described as 'an exemplary agricultural model that uses educational and environmental activities to restore a strong bond between the territory and the citizens who live there'. It sells all of its food directly to local markets. It is also involved in the social integration of marginalised individuals. Educational gardens linked with the municipality are reported to be increasing, involving school groups and young people.

i. Barcelona Metropolitan Area³⁹

The Barcelona Metropolitan Area (BMA) represents 2% of the Catalan region area while gathering 42.8% of its population. With 3.2 million inhabitants over 636 km², BMA is composed of the City of Barcelona and 35 adjacent municipalities. It is a diverse and heterogeneous territory where the seaside, rivers, coastal mountains and urban areas are difficultly connected. Lower-income areas are located mainly in the periphery along the Llobregat and Besos river valleys. Forests, parks, agricultural and natural areas make up 55% of the BMA surface, against 20% for residential areas.

Agricultural production and economic potential

Due to urbanization around the City of Barcelona, cropland has become increasingly fragmented and isolated. The most important agricultural area in terms of land and crop production values is the Llobregat lower valley and delta. Yet, partly because of the economic crisis, which led to unemployment rate reaching 24.1% (52% for young people), interest in agriculture is rising in BMA, with an increase of graduate studies and training options despite the low revenues

earned in the sector. Besides, global consumption of bio and/or "km 0" products has increased, leading the Barcelona Municipality to start planning for the transformation of its food distribution system and for a new policy based on the principle of food sovereignty.

Metropolitan agriculture and regulations on land use

No specific laws govern urban and peri-urban agriculture in the BMA, except the ones defining and regulating land use at the regional, metropolitan and municipal levels. At municipal level, the Urban Municipal Plan sets the basis for the use and protection of agricultural areas and defines two levels of protection: ordinary agricultural land and protected agricultural land. Moreover, some organisms monitor specific areas with a special natural value. Among them, the Baix Llobregat Agricultural Park represents a new way of perceiving metropolitan agriculture, with 3.3 ha of protected land spread over 13 municipalities, a Special Protection Plan and a Development and Management Plan. Finally, the Catalan Council of Ecological Agriculture Production was created in 2001 with a regulatory mandate on technical norms for agro-ecological production and labelling.

ii. Montpellier Méditerranée Métropole

Montpellier Méditerranée Métropole (Montpellier3M) is located in the plain of Lower Languedoc in the Occitanie Region. Created in 2015, the metropolis comprises 31 municipalities and 434,101 inhabitants spread over 423 km². Due to its status of capital of the former Languedoc-Roussillon Region, recently merged with Midi-Pyrénées Region, Montpellier3M is an important economic, cultural and

academic centre, which hosts 29,000 companies and 60,000 students in 2017. The area also has one of the most rapid demographic growth in France, and half of its population is below the age of 34. Despite positive trends, the unemployment rate remains high (16.7% of people between 15 and 60), in particular in the Hérault Department where one third of young people under 25 was unemployed in 2012.

Agricultural production and economic potential

In 2011, only 1% of employees in Montpellier3M were working in the agricultural sector, against 87% in services, 7% in construction and 6% in industry. The Hérault Department has more than 2,000 farmers (excluding wine growers), 73,000 ha of cultivated area (horticulture, fruit orchards, cereals, livestock, poultry) and some fish breeding businesses. Agricultural lands in the outskirts of Montpellier are progressively disappearing due to urban sprawl, creating a significant pressure on available agricultural land in the Metropolis and, to a greater extent, in the entire Occitanie Region. However, the rate of land artificialization is slowing down since the mid-2000s.

Metropolitan agriculture and regulations on land use

Since 2015, Montpellier3M puts into force an agroecology and food policy which aims at providing healthy and local food to large numbers, supporting agri-food activities, conserving landscape and natural resources, adapting to climate change, fostering city-nature and rural-urban links, and consolidating the agro-ecological farms' network by supporting direct sales. Adopted in 2000, the Montpellier3M Territorial Coherence Scheme (ScoT) defines agricultural areas to be protected for a period

of 15-20 years. This document has a new approach to urban development in that it takes the preservation of agricultural and natural spaces as a condition for new projects.

iii. Metropolitan City of Bologna

The Metropolitan City of Bologna is a thriving urban area of more than 1 million inhabitants, whose population has been growing steadily over the past 15 years. It is the largest city of the Emilia-Romagna Region and a strategic hub for freight and human flows in Italy. The Metropolis is famous since the 17th century for its food industry and culinary arts. It is also a global reference for the cooperative movement, with a strong tradition of civic engagement, and one of the most virtuous cities in terms of environmental performance, with about 2,700 urban gardens.

Agricultural production and economic potential

Emilia-Romagna has been particularly resilient economically considering Italy's economic crisis of the past ten years. Employment has been growing more than national average (+2.4% vs. 1.4%), mainly due to the tertiary and agriculture sector (+16%). Agriculture is the main driver of Bologna Metropolitan Area's growth (+3.3%), ahead of industry (+2.6%) and services (+0.7%). Despite past decline in the number of farms (-24% in ten years), the trend is reversing, led by women and above all young farmers (9.3% increase in 2015). Besides agriculture, food and hospitality are driving forces for Metropolitan farming and food processing, leading to changes in consumers' perceptions and practices. As an answer to their demand for quality and healthy products, organic farming is growing rapidly (+9.4% in 2015).

Metropolitan agriculture and regulations on land use

The Metropolitan Agriculture Project, part of the Metropolitan Strategic Plan, aims to direct, organize and strengthen the agricultural sector with a new focus on the urban-rural relationship. It identifies the peri-urban area as a buffer zone between urban and rural needs, with the promotion of typical and quality production at "km 0", direct sales, development of a sustainable mobility system to connect the city with the nearby countryside, educational farms, etc. It also provides for the creation of the Bologna Agricultural District as a governance tool for the metropolitan agricultural sector and a single interlocutor to the public administration.

iv. Tirana Metropolitan Area

Tirana is the capital and largest city of Albania. With 800,986 inhabitants in 2015 (expected to reach 1 million by 2025) spread over 1,110 km², it is also the largest political, economic, academic and cultural centre of the country. Since the 1990s, the city has been experiencing rapid demographic growth, driven by internal migratory flows. Former rural areas in the periphery have become urbanized, in particular those of Paskuqan, Kamëz and Kashar. They are therefore included in the territory covered by MADRE.

Agricultural production and economic potential

In 2015, 499,123 tonnes of field crops, 115,974 tonnes of vegetables and 15,447 tons of fruits were produced in the District of Tirana. The latter also has 114 milk processing units and 55 olive oil mills. Agriculture and food processing are a major economic sector in terms of businesses, jobs and exports. Yet, rural areas of the District contribute

to only 7% of Tirana's total food supply. Systematic supplies from other areas of Albania or imports from neighbouring countries (Greece, Macedonia and Italy) are required. For instance, 60% of fruits and vegetables sold year-round are imported from other countries. In response to urban expansion and the loss of productive land, personal gardens have emerged in peri-urban areas, where households grow fruits and vegetables for their own consumption.

Metropolitan agriculture and regulations on land use

The General National Plan defined in Law no. 107/2014 «On the Planning and Development of the Territory» has the objective, among others, to balance the effects of residential systems and economic activities, and protect green spaces and other cultivable areas. The Integrated Inter-Sectoral Plan for Economic Zone Tirana-Durres 2015 is the only political instrument that explicitly addresses urban agriculture. It aims to stimulate pilot projects, create small parcels for individual urban agriculture and develop green and healthy districts. The Rural Development Strategy, which is one of the main legal documents related to agriculture at the national level, considers urban agriculture as a key element of the rural-urban partnership but doesn't provide for any specific measure.

v. Thessaloniki Metropolitan Area

The Thessaloniki Metropolitan Area (TMA) is situated in Northern Greece, on Thermaikos Bay. It consists of 11 municipalities, with a total population of 1,012,297 inhabitants and a total area of 1,286 km². It is mainly composed of the Thessaloniki Urban Area (TUA), a contiguous densely built-up area around the municipality of Thessaloniki, the 2nd largest city in



Greece. Thessaloniki has the largest youth and student population in the Balkan area. On the other hand, the labour force represents only 43.7% of total population of the TUA and more than 24% of inhabitants belong to vulnerable social groups, with the predominance of unemployment, obesity and malnutrition cases.

Agricultural production and economic potential

TMA is a dense area, with less than 3m² of green space per inhabitant, mostly abandoned by public authorities. It has been suffering from a prolonged economic recession that touched the entire country over the last decade, leading to severe austerity measures and a strong deterioration in people's living conditions. As a result, the use of open spaces in and around cities for experimenting urban agriculture practices has been flourishing recently. The participation of the municipality of Thessaloniki in the Milan Urban Food Policy Pact and 100 Resilient Cities network shows local authorities' willingness to incorporate urban agriculture in their food agenda, to deal with future challenges and to increase the number of dedicated allotments.

Metropolitan agriculture and regulations on land use

Yet, there is no legal framework for metropolitan, peri-urban and urban agriculture at metropolitan, regional and national level. The first spontaneous and rather sporadic gardening initiatives stemmed from new civic movements of radical democracy in Athens and Thessaloniki. Then, as of 2011, municipal authorities started to develop community gardens to improve citizens' quality of life and help vulnerable populations. In 2013, municipal gardens were included under a mixed Public-Private Partnership scheme established by the Ministry of Labour and Social Solidarity, within the National Strategic Reference Framework. This scheme legitimises and fosters the development of community gardens in Greek cities.

6. The way forward

Urban and peri-urban agriculture has wide benefits. Cities in developing countries are often unable to create sufficient employment opportunities. Investment in urban agriculture could help to reduce urban poverty and malnutrition, and contribute to local economic development and greening of urban spaces.⁴⁰

Urban and peri-urban agriculture offers opportunities for productive employment in a sector with low barriers to entry. Intensive horticultural and livestock production employs workers in the production of high value-added products that should yield reasonable incomes and returns. Commercial peri-urban greenhouse production and livestock rearing are fast-growing sub-sectors. Urban and peri-urban agriculture also has an important multiplier effect, stimulating job creation in many other sectors.

The results of the study by Prain G. and Dubbeling M. (2011) show that the advantage of agriculture in combining with other occupations also enables producers to benefit from more diversified income sources reducing vulnerability and enhancing the economic resilience of low income households, even if producers do not obviously benefit from overall higher incomes.

Among the most pressing challenges faced by urban and peri-urban producers is urban expansion itself, which has already led to considerable conversion and disappearance of peri-urban cropland. Recent projections show that, by 2030, urban expansion will result in a 1.8%–2.4% loss of global croplands, albeit with substantial regional differences. About 80%

of global cropland loss from urban expansions projected to take place in Asia and Africa (especially in China, Nigeria, and Egypt).⁴¹ In both Asia and Africa, much of the cropland that will be lost is more than twice as productive as national averages. By 2030, projections also show a 3%-4% decrease in agricultural production, 80% of which will be in Africa and Asia. Managing the expanding boundaries of cities into peri-urban areas should therefore be given greater policy attention in some areas, especially when they could provide opportunities for intensive agriculture that would contribute high-nutrient-quality (fresh, perishable) foods to adjacent urban markets.

There are several ways urban local governments can facilitate local food production, which is compatible with surrounding uses.⁴² Municipalities around the world are increasingly incorporating land use for urban and peri-urban agriculture in their city planning. However, the contribution of urban food production to total food consumption remains very small. Finding ways to scale up production and productivity represents both a challenge and an opportunity in the decades ahead.

Ideally, governments and policies should identify their priority goals when promoting urban agriculture. For example, a local government concerned about growing food insecurity or malnutrition among the urban poor in intra-urban areas may specifically support forms of backyard gardening, forms of low space gardening (as practised by many households in Kibera, Nairobi) or promote the production of crops and livestock that are nutritionally

and culturally important. Another city – mainly interested to boost local economic development and employment creation – may focus on the development of small-scale commercial urban agriculture in larger open spaces in the intra-urban, peri-urban in transition or peri-urban areas, input-supply, processing or marketing enterprises and seek to stimulate well performing subsistence farmers to move into the market sector.

Priorities for policymakers include:

- Developing land use policies to enable urban and peri-urban agriculture to be recognised as an important use of land and viable economic activity, and promoting its integration into national and local agricultural development strategies, food and nutrition programmes and urban planning.⁴³
- Ensuring that water supplies used for agricultural production are not contaminated by urban run-off or poorly managed sanitation systems.
- Identifying ways to incorporate private organisations in strategic planning and in achieving common goals.

Many urban agriculture policies still mainly focus on urban and peri-urban food production for reasons of food security, while commercial urban agriculture, agro-processing and value addition activities are often not well addressed (Dubbeling and Pasquini 2010). Though general agricultural policies and plans do focus on articulating production with (urban) markets, these aspects are dealt with in a general way and do



not differentiate different types of production systems, such as rural, peri-urban and intra-urban. They therefore easily underestimate the contribution of urban and peri-urban production to income and employment generation.

Urban policies need to acknowledge the role of urban and peri-urban agriculture in urban development, ensure urban food supply and strengthen livelihoods of poor urban producers. This includes removing barriers and providing incentives for urban and peri-urban agriculture (UPA) as well as improving natural resource management in urban and peri-urban areas.

In order to be sustainable and attract youth, the sector needs further enterprise development and entrepreneurial skills development, improved processing and marketing capacity, access to finance, identification of lucrative markets (i.e. organic...).

There is a need for capacity building of producers' organisations in order to professionalise the sector as well as facilitating access to land for urban production. Even when the urban farmers are not the owners of the land, they should feel encouraged through medium- to long-term investment strategies as contributors of multifunctional green infrastructure of the cities.

Food safety issues and traceability are key for all the actors of the chain and the end consumers.

Increased recognition of the role that food can/does play in responding to various urban sustainability concerns provides new market and engagement opportunities for the private sector. Private sector players can fulfil an important role in speeding up and implementing

scalable urban food system innovations. Because of their large consumer markets, more direct consumer relations, and close collaboration between various players in the food supply chain, city regions offer traditional and new private sector players some unique opportunities.⁴⁴

The greatest impact is achieved when a food system approach is advocated and support is provided to the entire network of city region producers, wholesalers, processors, caterers and shopkeepers. Integration with other sectors (logistics, recycling, urban planning) and various innovations in food production and marketing will drive the biggest change.⁴⁵

- To feed growing cities in a sustainable way, both public and private actors need to speed up design and implementation of innovative food system strategies at a city region scale.
- Business opportunities exist in traditional food services (production, processing, retail), and increasingly also in resource recycling, development of new products and services, and technological innovations. This generates new opportunities for urban- and rural-based water, energy and other nonfood sectors.
- Small and medium-sized enterprises (SMEs) seem to have the highest potential for supplying city region markets and providing or sourcing city region products, while at the same time ensuring local job creation and social inclusion.
- Local small-scale farmers and SMEs need to be supported in adopting specific business strategies to be competitive, through

product aggregation, sharing of infrastructure and resources, pooling of consumer demand, and/or integration of their products into mainstream distribution channels.

- Interventions and policy instruments by governments and the larger and international private sector can vary from direct technical and financial support to creating favourable business environments in the city region. Local/regional sourcing and procurement possess potential for support. These interventions should address environmental and social sustainability criteria.⁴⁶

Mobilising public and private sector investment

Support mechanisms include legal and regulatory instruments, setting of procurement standards and targets, zoning and agricultural land protection. They also include financial instruments (public or public-private investment funds, taxes, subsidies). Communication and education, direct implementation or support to urban food systems projects (like urban farmer markets) and provision of business support services (granting access to land, markets, infrastructure; offering training and advice) are complementary strategies delivered by many governments and larger (inter)national private sector.

Governments and the larger private sector can also generate large buyer demand for city region products through their own public procurement. Further business support would need to evolve around the setting up and improving of separate or shared processing, storage centres or food hubs, ICT services, commercial and logistics training.

Up-to-date information on food supply sources, retail market and consumption trends is necessary. Businesses also need better knowledge of the availability of local products, the businesses that can help them with sourcing and support for these practices. Consumer awareness and education are also needed on the benefits of city region food supply. Catering certification schemes are proven mechanisms for driving systemic change. In order to enhance impact in various domains, it is important that – beyond provenance criteria – emphasis is given to aspects of health, social justice and inclusion, regional and youth employment and environmental sustainability.⁴⁷

In policy terms, there has been a call for greater recognition to be given to urban agriculture. In June 2013, the COST Action project issued the Barcelona Declaration⁷¹ on Urban Agriculture and the CAP. This made the point that urban agriculture had been largely neglected in Europe's policies and especially in the CAP. It had neither been institutionalised

within the EU administration level nor within the Member States. As a consequence, the declaration asked for a 'stronger consideration of urban agriculture' and its recognition as a 'driving force for innovation...'. Looking to the future, it remains to be seen how the current modernisation and simplification of the CAP and the ongoing discussions on the future of cohesion policy post- 2020 will impact on future prospects for urban agriculture in Europe. A key challenge for urban agriculture is how to achieve the necessary integration across all EU policy areas.⁴⁸

Monitoring of interventions

It would be important to monitor the impacts of the various proposed policy measures once they are put in place. The goals set for urban agriculture development in the various policy documents and plans should be regularly monitored to see if targets are achieved and to adjust intervention strategies were necessary.



Glossary

Aeroponics: the growing of plants by suspending their roots in the air and spraying them with nutrient solutions

Allotment: A legally fixed form of (here: urban) gardens, tended individually by plot holders and their families

Aquaponics: A system combining aquaculture and cultivation of plants in water

Backyard garden: A private garden that could include balconies or terrace gardening.

Building integrated agriculture (BIA): the practice of locating high performance hydroponic greenhouse farming systems on and in mixed use buildings to exploit synergies between the built environment and agriculture.

Commercial Urban Farm: land used for agricultural purposes within an urban area from which the resulting products are sold for profit

Community garden: Any piece of land (publicly or privately held) that is cultivated by a group of people rather than a single family or individual.

Community Farm: land gardened collectively by people for personal use, donation or sale.

Container Garden: plants grown in vessels rather than directly in the ground.

Farmer's Market: two or more farmer-producers that sell their own agricultural products directly to the general public at a fixed location, which includes fruits and vegetables, meat, fish, poultry, dairy products, and grains.

Greenhouse: a building or structure whose roof and sides are made largely of glass or other transparent or translucent material and in which the temperature and humidity can be regulated for the cultivation of plants for personal use and/or for subsequent sale. A greenhouse may or may not be a permanent structure.

Hoophouse or High Tunnel: high tunnels, also called high hoops or hoop houses, are temporary structures that extend the growing season. These covered structures are constructed in the field in order to protect crops from the weather (rain, wind, cool or warm temperatures), as well as in some cases, pests.

Hydroponics: A method of growing plants without soil, using mineral solutions in a water solvent.

Indoor farming: Often done to foster a controlled environment for whatever plants are being grown. It is a great method for growing all year all year around and hydroponics is often employed.

LED Farming: The use of light-emitting diode technologies to support indoor farming.

Peri-urban: of or relating to an area immediately surrounding a city or town.

Passive hydroponics: semi-hydroponics or passive subirrigation is a method of growing plants without soil, peat moss, or bark. Instead an inert porous medium transports water and fertilizer to the roots by capillary action. Water and fertilizer are held in a reservoir and conducted to the roots as necessary, reducing labor and providing a constant supply of water to the roots. In the simplest method, the pot sits in a shallow solution of fertilizer and water or on a capillary mat saturated with nutrient solution. Since routine maintenance is much simplified, passive hydroponics can reduce the labor required to maintain a large collection of plants.

Permaculture: a method of horticulture that utilizes renewable resources in order to create a self-sustaining ecosystem.

Rooftop farm/garden: A **roof garden** is a garden on the roof of a building. Besides the decorative benefit, roof plantings may provide food, temperature control, hydrological benefits, architectural enhancement, habitats or corridors for wildlife, recreational opportunities, and in large scale it may even have ecological benefits. Rooftop farming is usually done using green roof, hydroponics, aeroponics or air-dynaponics systems or container gardens. It is organised privately or collectively.

Soil-less agriculture: broadly refers to, and is based on the concept that plants do not require soil to grow. A variety of methods are employed, all of them allowing for significant environmental benefits (see hydroponics).

Underground farm: a subset of BIA. This type of farm is located below-grade, usually in urban centres. These farms utilize no natural light.

Urban agriculture/urban farming: the practice of cultivating, processing, and distributing food in or around a village, town, or city. Urban agriculture can also involve animal husbandry, aquaculture, agroforestry, and horticulture. These activities also occur in peri-urban areas as well.

Urban agricultural architecture (UAA): is the practice of integrating organic, hydroponic, aeroponic or aquaponic farming technologies into buildings of all types. An example can be as small as building a lean-to-greenhouse on a single-family home and using it as a kitchen garden.

Urban/city farm: Within the city or urban fringe of a city, operated by innovative entrepreneurs or charity organisations. Can provide social or environmental services, such as training and school gardening, as well as food production.

Vertical Farming: vertical farming is the practice of growing food and/or medicine in vertically stacked layers, vertically inclined surfaces and/or integrated in other structures.

Sources: FAO, RUAFA, Association for Vertical Farming.



Acronyms

COST	Cooperation in the field of scientific and technical research	PDU	Plan Directeur d'Urbanisme (Urban Master Plan)
EFCF	European Federation of City Farms	PUA	Peri-urban agriculture RDP: Rural Development Programme(s)
FAO	Food and Agriculture Organization	RUA	Resources centres on urban agriculture and food security
ILVO	Institute for Agricultural and Fisheries Research	RUAF	Resource Centres on Urban Agriculture and Food security
MADRE	Metropolitan Agriculture for Developing an innovative, sustainable and Responsible Economy	UA	Urban agriculture
NGO	Non-Governmental Organisation	UN-HABITAT	United Nations Human Settlements Programme
OECD	Organisation for Economic Co-operation and Development	UPA	Urban and Peri-Urban agriculture
PASDUNE	Programme d'Action pour la Sauvegarde et le Développement Urbain des Niayes et zones vertes de Dakar	WHO	World Health Organization

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