

Introduction to Urban Agriculture

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General information about the module

Module n°1
TITLE: Introduction to Urban agriculture Authors: Giuseppina Pennisi, Elisa Appolloni, Ivan Paucek, Alessandro Pistillo
Introduction The following module will provide an overview of the urban agriculture (UA) sector. A general introduction to the background in which urban farmers will operate today will be given. This will be followed by an overview of the evolution of UA throughout human history and the purposes with which it has evolved. The analysis of the urban context, opportunities and challenges facing UA will be examined. It will also give a quick overview of the potential beneficiaries of urban agriculture activities.
Duration: 6 hours – The duration of this module is four hours of the lesson and two hours the practice of the exercises together with additional resources.

Learning outcomes

On successful completion of Learning Unit 1 participants should be able to...

Knowledge	Technical Skills	Soft Skills
- Understand the characteristics, evolution and key concepts of Urban Agriculture. - Know the different types of productive systems in urban environment. - List the opportunities and challenges of Urban Agriculture.	Be able to identify the best productive system depending on different social, environmental and economic conditions.	- Appreciate the role and history of Urban Agriculture for city environment. - Communicate the key concepts, opportunities and challenges of urban Agriculture.

Main content and resources

CHAPTER 1: Defining Urban Agriculture (UA)

Over the last decades, urban agriculture (UA) phenomenon has increased worldwide. UA refers to all agricultural activities within the urban fabric (urban) and around the cities (periurban) which include the cultivation of vegetables, fruits, and other specialized crops (e.g., medicinal plants, ornamental plants, herbs) and animal rearing. Moreover, UA embraces all the actors and interrelated activities (e.g., production and selling of agricultural inputs, postharvest handling, marketing) involved in UA initiatives (**Mougeot, 2000**). The apparent contradiction in using 'urban agriculture' term lies in a modern interpretation that areas are either rural or urban.

Complementary to rural agriculture, UA activities are integrated spatially and functionally within the urban system. The concept of UA is constantly evolving depending on the contexts and the period of time, but there are some key dimensions that characterize UA and distinguish it from rural one.

- **Location:**

UA takes place in all urban fabric, from the downtown areas to periurban areas. It is difficult to decide where to locate the urban-rural border, due to the gradual transition from urban to rural area. An urban farming activity has to adapt to the presence of the city and to the conditions that the city imposes, but it can also benefit from this location (e.g., easy access to infrastructure, close contact with markets, wealthy consumers).

- **Objective:**

UA can have different primary objectives than pure production, unlike most rural farms. Processing and marketing of food and non-food products produced in and around the urban area are an option, but also services such as landscapes management, education and recreational activities, and people care, may be considered parallel to production.

- **Motivation:**

Historically, agriculture in and around cities was for local consumption, a mean to safeguard the nourishment of laborers. With the increasing welfare of the cities, motivations other than subsistence have gradually developed. The motivation for urban farming activities moved on the desire to improve living conditions. This change of purpose is linked with many factors of modern cities, including concerns about the environment and nutrition, and the socio-cultural role of agriculture. Changes in the composition of city population leads to changes in the demand for food. The growing attention of consumers to food safety and food security leads to a greater attention to the way food products are obtained.

- **Market:**

Goods produced are distributed in a very different manner from rural agriculture. Rural agriculture operates on the trans-regional markets, while UA is oriented to local markets with more direct-marketing approaches. UA sector orients its market towards local residents, rather than the supply chains of the food industry, even if large-scale vegetable production emerging in derelict industrial areas may develop into industries oriented to international markets. The way food products are purchased is also subject to change, there is a progressive diffusion of online purchases or periodic delivery of seasonal food products, or even the diffusion of supermarkets selling more international products and small shops selling niche and typical local products.

- **Actors:**

Actors are all subjects directly and indirectly involved in urban farming activities such as producing, consuming, or promoting, financing, and managing UA initiatives. Actors range from non-professional to professional farmers, and potentially are different types of stakeholders, operating in the market, civil society, and government:

- Government:
 - International, national, regional, and local level
 - Government-led organizations
 - Government-led institutions
- Civil society:
 - NOGs
 - Non-profit farms/organization
 - Educational institutions
 - Individuals
 - Volunteers
- Market:
 - For-profit farming
 - Entrepreneurs
 - Distributors
 - Retailers

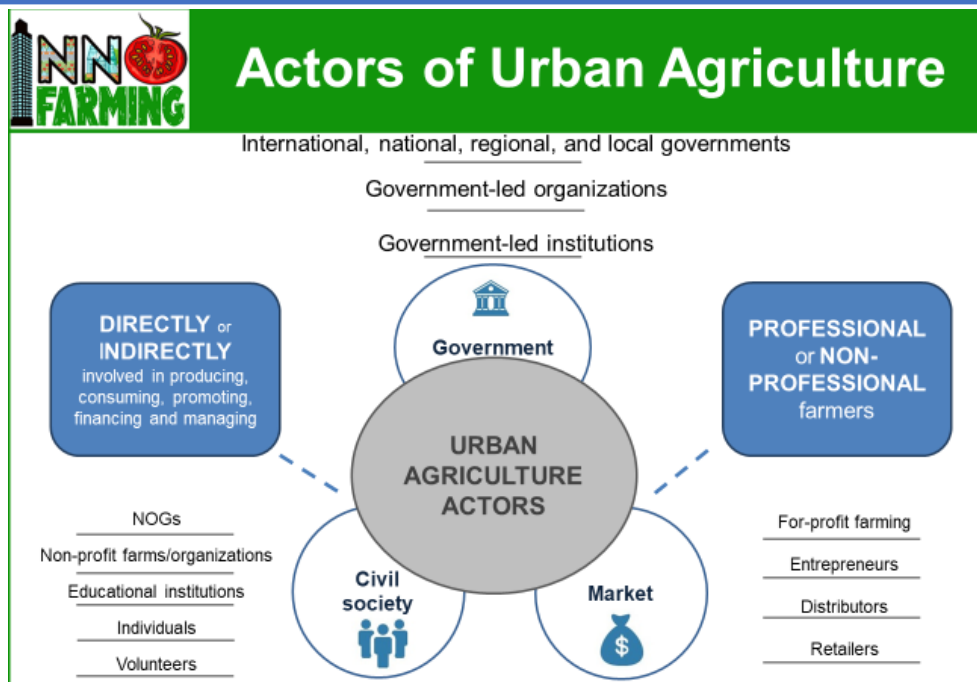


Figure 1. Actors potentially involved in Urban Agriculture activities.

Many people and professions are directly and indirectly involved in UA activities, and have a role in the production, processing and marketing of food and other agricultural services within or near urban areas. The levels of stakeholder involvement are different. We have directly involved actors (e.g., farmers, buyers, material suppliers, etc.) and indirectly involved actors (e.g., organizations promoting the development of urban agriculture projects). Many advantages, for the sustainability of urban agriculture projects, occur when the activities are carried out by groups or associations. It is essential to develop forms of interaction involving all these actors in order to create a dialogue that allows decisions to be taken that are useful for everyone. Furthermore, it should be considered that there are specific groups of vulnerable people to whom special attention should be paid when they are included in UA projects. Some vulnerabilities may be due to situations of poverty, gender, age (children and elderly), origin (ethnic groups, migrants, etc.), physical and/or mental deficits.

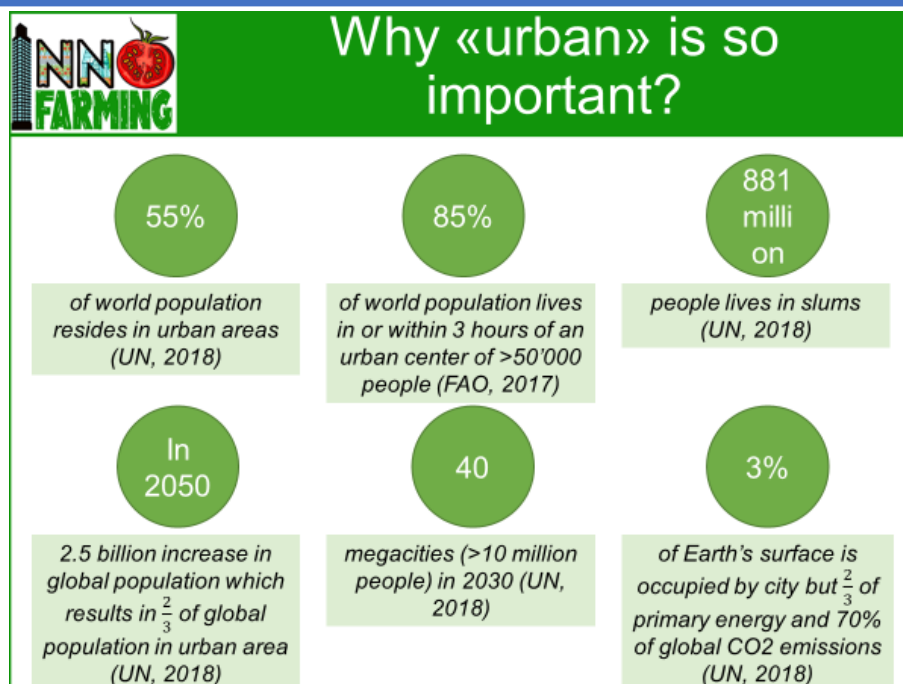


Figure 2. Urban demography and related natural resource needs (modified from **FAO, 2019**).

Urbanization influences all aspects of food production and consumption, and in urban context became necessary to ensure an adequate food supply. The improvement of UA is one of the major strategies that should be adopted to increase access to food and wellbeing of city dwellers, with activities that can take place within the urban fabric or in its immediate surroundings. UA activities are expected to become an integral part of urban development. The rural-to-urban migration lead to an increase in urban population. Some undesirable concerns of urbanization go from environmental questions (reduction of fertile areas, water and air pollution), to socio-economic problems due to the strong migration that generates peripheral areas with a high concentration of poor people. FAO estimates that about 800 million farmers are involved in urban agriculture activities and about 60 million hectares are cultivated worldwide within a 20 km range from urban centers.

CHAPTER 2: The Evolution of Urban Agriculture (UA)

UA activities have always accompanied humankind, the presence of agricultural areas within or in proximity of a city have different historical origins. It is more than just food production in the city, it is a highly dynamic phenomenon, constantly changing in terms of its composition, functions, and actors involved. The multifunctional potential of UA activities emerges going to analyze how its role has changed over the centuries. In a modern city, UA plays a different role than it did in a medieval city. A quick overview of the evolution of urban agriculture over the centuries is developed in the following paragraphs.

- **The garden in the ancient age**

- o Spiritual and recreational purpose:

Egyptian gardens built around 1600-1400 BC had an important spiritual role. In ancient Egypt the gardens had a strong and significant symbolism referring to the generation of life. In addition, there was a so-called 'ever-present lake' which, besides being a source of water, represented the primordial ocean.

- o Subsistence and local market:

During the Hellenistic period, in addition to the orchards and ornamental gardens of wealthy people, vegetable gardens began to develop within the cities and in the countryside. In these vegetable gardens, the families with available land cultivated plant species for their own consumption and also for the local market.

Hortus is a Latin word that refers to the idea of a space surrounded by a fence. The original Roman *hortus* was in fact a small land space near the main house (*domus*). It was strictly intended for the production of vegetable, fruits, flowers, and was an extension of the house, a sort of open-air pantry. In addition to domestic ones, a belt of vegetables gardens surrounded Rome and urban centers, supplying local markets daily.

Garden of Pompeii used a lot of shrubs and trees, especially evergreens, which gave shade (mites), a right background to the architecture, and a good smell. The presence of exotic species in the Vesuvius area (e.g., lotus flower, date palm, plantain, lemon, citron) confirm the existence of trade with distant regions. Adjacent to the orchard was the vegetable garden, it was used for family use and for sale. The gardens were also located around Pompeii and every day they supplied fresh vegetables to the city market.

- **The garden in the medieval age**

- o Social purposes:

The *hortus conclusus* ("fence garden") is the typical form of medieval garden, mainly included in monasteries and convents, where the church guaranteed civil and social organization. It was a green area, generally small in size, surrounded by high walls, where the monks cultivated plants and trees.

- o Aesthetic purposes:

The Arabic gardens are an example of agriculture with purely aesthetic, therapeutic and recreational purposes. They were developed with the aim of satisfying all five senses (view, smell, touch, taste, hearing) through the use of ornamental crops, trees and vegetables.

- **The garden in the modern age**

- o Experimental purposes:

During the Renaissance, great importance was given to all the scientific and artistic aspects of life. Gardens and vegetable gardens also became an expression of this period. During the government of the De' Medici family in Florence, Cosimo De' Medici founded the first botanical garden in the world in Pisa (1543). In France, in Versailles, very famous was the Jardin Potager

created by Jean Baptiste de La Quintine, within which, thanks to innovative cultivation techniques, were produced out of season products.

- ***The garden during contemporary age***

- o Food security:

With the industrial revolution, concepts such as garden cities and allotment gardens emerged, providing opportunities for the city dwellers to produce food themselves. The Industrial Revolution led a large number of workers and their families to emigrate from the countryside to the cities in search of work. Commonly, these families lived in conditions of misery, social exclusion and malnutrition. A remedy was found in the creation of the so-called "migrant gardens". These gardens, created in spaces owned by the local administration or religious communities, have helped to alleviate the situation of extreme poverty of migrants by allowing the cultivation of vegetables and the breeding of small animals.

During the Second World War, cultivation in and around cities ensured greater food security for citizens. But, at the end of the war, the desire to rebuild a destroyed Europe led to forgetting the crucial role played by urban agriculture until then. So, during the 1950s and 1960s, all free and green spaces in cities were used for the construction of buildings.

- o Social purposes:

An ecological turning point took place in the seventies with the birth of the first community garden, as a form of self-determination, self-management and independence from the market. Guerrilla Gardening is the act of gardening on land where gardeners do not have the legal rights to cultivate, such as abandoned sites, areas that are not being cared for, or private property. It encompasses a diverse range of people and motivations as a reaction to the indifference of public institution to the decadence and degradation of urban and peri-urban lands.

- o Facing new social, economic, and environmental challenges:

The levels of urbanization together with the world population, are constantly increasing and it is expected that more than 80% of global population will move to cities by 2050. The expansion of cities causes a progressive modification of rural landscapes that surrounds them. Rural lands, usually dedicated to extensive agricultural production, are progressively being allocated for urban development. These changes bring with them a number of challenges. Today, UA presents itself as a valuable tool for tackling new social, environmental and economic challenges. In recent years, progress in knowledge and technology has made it possible to practice this type of activity in all contexts, adapting it to specific needs.

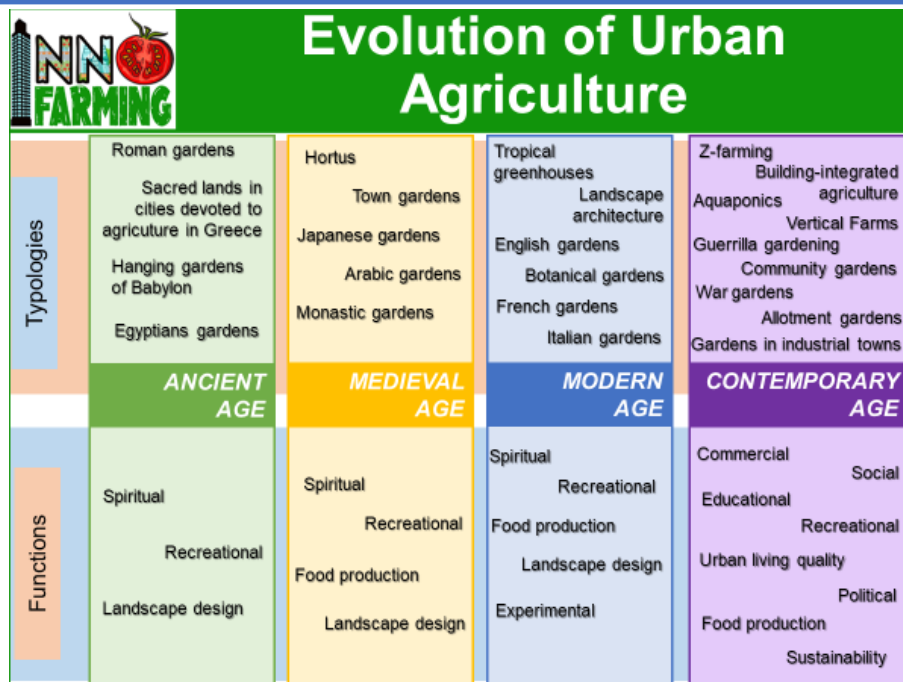


Figure 3. Evolution of typologies and functions of Urban Agriculture activities (modified from **Orsini et al., 2020**).

CHAPTER 3: Production systems typologies in urban environment

UA includes various production systems among which cropping activities are more common (**Zeza and Tasciotti, 2010**), and horticulture normally represents a major component. The choice of horticultural crops is also determined by the fact that, as compared to other agricultural activities, it presents a more efficient use of natural resources, such as soil and water. Moreover, horticultural crops provide better livelihoods (nutritional value) and additional incomes (higher economic value) to all major stakeholders involved in the value chain. Regarding the growing area, it is preferred to grow short cycle and highly perishable crops within the cities, while in peri-urban areas are mostly grown medium or long cycle crops and orchards. The localization near the market also reduces the need of conditioning and storage infrastructures and reduce the post-harvest losses. Since the products are highly perishable with a short shelf-life, UA offers to the urban producers a market niche that is not occupied by the rural production located far away from the urban centers (**Orsini et al., 2013**).

Compared to rural agriculture, urban and peri-urban farming are substantially different regarding two dimensions: land and human resources. Land availability represents the highest limiting factor to production in and around cities (**Orsini et al., 2013**). Therefore, sustainable intensification of crop production and cultivation of high value crops are recommended in the cities (**de Bon et al., 2010**). However, such intensification requires labor that also becomes limiting in skills and availability. As a general rule, it can be said that the risks of UA are those usually found in the rural

condition, although amplified by the proximity and density of the resident population and by the strong artificial context (Orsini et al., 2013).

Considering the multiple dimensions of UA (Simon-Rojo et al., 2016), it can be made a distinction between:

- Urban food gardening
- Urban farming
- Non-urban oriented farming

3.1. Urban food gardening

The interest in UA for performing activities focused on other goals than business is known as 'Urban food gardening'. Recreational, educational, health, social are some examples which provide other objectives from production. 'Urban food gardening' activities can be subdivided on those based on individual production as can be family gardens/micro-farming and allotment gardens, and on the other hand, on those based on collective schemes as community gardening (educational gardens, therapeutic gardens, and social gardens).

Micro-farming (family garden)

Also known as family garden, it is a type of UA which occurs in almost all cities and involves households. Economic, social and environmental context influence the purpose and the method in which this activity can be carried out. This production is non-commercial and there is no implicated any institution or organization other than the household. The main aim of this food-producing initiative is to provide with fresh food to their respective households and their families or friends.



Figure 3. Family garden in peri-urban area (Carol Norquist) and in city balcony (Source: Pinterest).

The urban setting highly influences the character of the gardens. In this way, in very dense urban areas, it is normally practiced inside houses, in which cultivation pots in balconies or rooftops are the most common growing method. Whereas, when there is garden availability, a part of the garden is allocated to growing vegetables, fruits, or herbs. Moreover, in many parts of Europe, family gardens are experiencing a trend characterized by the predominant cultivation of ornamental plants.

Access to land for cultivation can be a major problem for some people. Space-sharing programs can be implemented, which connect those who have space available with those who want to grow but do not have the possibility to do so. It is important to promote support-program for gardeners and landowners to build their horticultural skills, and at same time stimulate a grower-to-grower exchange in which producers can learn a lot from their colleagues, who are producing under the same circumstances and have the same production objectives. In the same way, it becomes essential the availability of places where farming households can buy tools and get advice on micro-farming production technologies, besides information on pest management and fertilizer applications.

Allotment gardens

These types of gardens consist on areas divided into small plots which are usually rented through a lease agreement by municipal initiatives on public land. Their regulation is highly formalized, sometimes following specific laws. They may be managed by an organized group or even through foundation of a garden association. Their functions have shifted from self-provision to a more leisure approach, and in the last decade they reinvented themselves focusing on healthy food, and social and physically active environments. The opening of these farms to social alternatives have resulted in allotments renting larger plots not only to individuals or families, but also to associations or groups that organize the allotment collectively.

Allotment gardens are seen as a good option for underused area or land classified as suitable for construction but not developed yet. In those areas where the public supply of allotment gardens is limited, private entrepreneurs and farmers have identified a niche and, consequently, increasing number of private allotments are emerging.

Community gardens

These kinds of gardens usually take place on public, vacant and open land areas in the city, located near participants' houses or adjacent to popular neighborhoods. This may include parks, lands that are temporarily excluded from residential development, vacant lots, grounds of community centers, churches and schools, among others. Land tenure is either informal or in agreement with the owner via temporal or permanent user-right agreements. All actors that are part of the urban community can be involved in the community gardens.

Food or even non-food can be produced, and the reasons for production can be the most varied: home-consumption, leisure, social interaction, community support. Many activities of social interaction and exchange may take place or be organized. Usually are managed by the gardeners themselves or by a non-profit organization/association. With reference to the main objective, we can distinguish:

- Educational gardens: they may be gardens located in educational institutions or in social centers, that provide garden-based learning and educational services to visitors. They aim to provide tools to understand the production, processing, and food consumption and their environmental impact, with a potential for raising public awareness and promote climate-friendly practices.

Educational managers often do not have an agricultural background or experience in gardening. They may need to receive training from specialist. School teachers will also need help in developing curriculum and training modules for their students in different grades.

- Therapeutic gardens: they are typically located inside the city, at physical and mental health care institutions. Through therapeutic gardens, patients receive benefits and healing effects from gardening and agriculture activities. Major benefits are derived from contact with varieties of plants and flowers carefully chosen to stimulate the sight, smell, and touch, awakening the senses and thus with them memories and emotions.
- Social gardens: they are not only about growing vegetable, but also growing social networks and establishing a sense of community. The collectivity is therefore essential, so the location become more critical. Most of them are embedded in the city fabric. The community itself establishes the rules and the organization. Educational and cultural activities are an essential part of the program.

Often community garden requires low investments, but an important component is represented by experience and knowledge. The rate of turnover of participants in community gardens varies greatly. Assistance in building leadership and group relations may be necessary for social organization around the garden, norms of behavior, and trust among various members. A fundamental aspect to consider in designing and establishing the gardens includes safety issues and easy access for all the people involved, while at the same time assuring an aesthetic design.

3.2 Urban farming

‘Urban farming’ farms follow a business model. These farms have adapted their business strategies to urban or peri-urban locations and can be subdivided into two main groups. One implies the provision of on-site services, being comprised in the term multifunctional farms such as leisure, educational, therapeutic, social, cultural, and experimental farms. The other includes local food production being covered by small-scale commercial farming and large-scale agro-enterprises.

Small-scale commercial farming

Small-scale farming is probably the most common type of UA found around the world, which can be managed by a diverse number of actors. It can comprise from low-income individuals to high-income entrepreneurs, being noticed a trend in millennial generation in which many new urban farmers are university educated and raised in cities.

Production systems in urban environments normally focus their production trying to meet the demands of specific products. These include among others vegetables, fruits, flowers, herbs, medicinal and aromatic plants, mushrooms and tree seedlings. Products can be sold as unprocessed (e.g., fresh vegetables and herbs, cut flowers) or processed (e.g., dried herbs, flower bouquets). Final production provides good

returns regularly to various actors in the value chain either as a principal or secondary source of revenue. Incomes are often favorably especially in the case when urban agriculture products are in high demand or present a comparative advantage over rural production, as in the case of perishable products.

Generally, it is a semi-intensive production, cultivated in open fields or in protected conditions (e.g., in greenhouse), with a strong tendency for higher-input use and technological innovation. Access to land by urban or peri-urban producers is often difficult and poses a major constrain to their activities. The uncertainty of land tenure has a strong influence on land use strategies and maintenance. Insecurity of land tenure may also inhibit investment in sustainable production technologies.



Figure 5. Small-scale commercial farming in open field cultivation and greenhouse (sources: Pinterest and Marblebytriangle.com).

Specialized producers tend to be innovative producers who are willing to take some risks and often have a higher level of education. Dealing with a market and customers puts demands on producers in terms of quantity and quality of production. To achieve proper results technical support is required. Selling high quality products to a niche market requires a process in which are needed steps such as quality control and certification, processing and packaging, transportation, further technical assistance to solve existing production problems and promote farmer innovation. Moreover, many producers may lack business management and marketing skills. These both abilities can be needed to negotiate when selling to distributors or directly to consumers in order to give a good potential to the product. Additionally, an important point to underline beyond this need for technical assistance and marketing capacity, is the access to credit or capital for investment purposes, either for starting up or expanding their enterprises.

Large-scale enterprises

Large-scale farms contribute to local economic development and urban food security being able to produce a large part of the city's food needs. Opportunities offered by city in terms of market potential and access to inputs and infrastructure may also trigger the development of large-scale agro-enterprises. They are mainly located in peri-urban areas around the cities, in areas with good transport facilities, both for input supply and for marketing produce. These farms are either driven by traditional farmers or urban investors, being the main objective to generate a high return on

capital invested. A variability of products such as vegetables, flowers, mushrooms can be produced in large units in these farms.

The principal limiting factor is the large amount of investment required for this type of production. It is characterized by high infrastructure investments (e.g., buildings, greenhouses), use of more advanced technologies, and a higher use of industrial agrochemicals. These intensive production systems may cause environmental pollution, such as soil and groundwater contamination associated with the chemical application for plant fertilization and pest management. Moreover, a high energy requirement is generally needed due to the mechanization and heating of these large-scale farms.



Figure 6. Greenhouse facility in New York (Source: Wheatfield Gardens)

The proper management of this farming can generate significant revenues due to the proximity to the urban area and, therefore, a reduction in transportation requirements. Sustainability is considered an important point to improve production efficiently and environmentally friendly. Strategies such as the capture and reuse of waste heat from buildings and industrial operations to heat greenhouse production or optimization of urban-waste streams for compost production are cases of sustainable plans in large-scale farms.

Normally peri-urban producers are lacking of training and technological transfer, being the support in terms of technical issues and farm planning and management of particularly importance for them. Additionally, source of financing is crucial for development of this farming enterprises. Emphasis should be made in give access to information in advanced technologies and technical assistance to developing innovative methods and protocols to enhance sustainability and improve profitability. The promotion of local food production from the city or regional policy can also benefit the local economy and the development of this large-scale farming.

Multifunctional farms

The urban demand for 'rural' services represents a driving factor to adapt farming activities in a multifunctional way. UA activities can serve manifold urban purposes, in addition to pure food production. Multifunctional urban agriculture combines different

purposes beyond food production within an area to better integrate themselves into urban environment. Multifunctionality in urban areas has been associated with farm diversification strategies. They are doing by addressing urban demands for recreational activities, the provision of educational and health care services, landscapes planning (green zones) and environmental measures, as well as direct marketing (food security and accessibility). The importance of diversification and pluri-activity refer to the functionality of this farming.

Based on entertainment purposes, leisure farms meet the recreational urban demand by offering a wide range of events linked to farm. Most of them are located in peri-urban areas ranging from activities such as 'hands-on' experience or 'pick-your-own' fruit schemes to a more gastronomic or agritourism approach. Pick-your-own theme is a good example of recreational services provided by farms that deal with a crop that is grown in abundance and have limited seasons (e.g., strawberry and pumpkins). Farm restaurants and farm shops are also extremely popular for visitors and can contribute to the experience that the farms want to give. It also is an important way for farms to add value and diversify their income sources.

Educational farms can offer the possibility to make agriculture as a teaching resource and 'natural laboratory'. Examples such as the integration of educational programmes for schools' students or training for community residents involve learning experience for their users. Educational farms have a dominant pedagogical component and often offer specific teaching programmes to visiting school classes (**Simon-Rojo et al., 2016**).

Therapeutic farms use farming activities to promote well-being as well as physical and mental health. They usually provide a structured programme or job position to specific vulnerable groups as part of the therapy. Elderly, mentally, psychologically and physically handicapped people can benefit from the stimulating activities that farming provides.



Figure 7. Therapeutic garden (Healthjade.net)

Social farms are aimed at promoting disadvantaged people's rehabilitation and the integration of people at risk of exclusion by offering them job possibilities. This farming tries to reach social engagements between the targeted groups. Management of social farms is normally performed by private farmers, foundations, non-profit enterprises, or local communities and institutions.

Cultural farms intentionally contribute to preserving and transmitting the tangible and intangible cultural heritage related to agricultural practices and landscape, through the maintenance of traditional materials and architectural styles, crop and breed varieties, and techniques of cultivation. These farms can contribute to a better quality of urban space and an increase on the identity of the urban population. Maintaining cultural heritage may be attractive also for tourists and enhance the economy through the tourism.

Finally, experimental farms can involve the testing of agricultural technologies, production methodology, variety selection and economic interactions with the urban environment. This range of activities is normally performed in urban experimental fields or structures which belong to the university or scholar sector. Experimental farming has been known since the foundation of agricultural science, being nowadays focused on a more social and economic innovative approach.

3.3 Non-urban oriented farming

These farms keep conventional farming activities and are normally located in peri-urban areas, but also in urban spaces. In the early beginning, non-urban oriented farms were located in rural lands, however, due to the continuously urban growth, these farms have resulted to be displaced to new urban and peri-urban areas. Production is normally oriented to national or international markets, being perceived the proximity to the cities as a threat rather than an opportunity.

In this farm typology, a wide number of agricultural practices can be developed (e.g., industrial, traditional, conventional, organic, etc.), in which regulation policies in terms of the agricultural sector have to be considered. At the same time, financial support from subsidies may be of great importance for this farming activities.

CHAPTER 4: Challenges and opportunities of urban agriculture

UA impacts on the economic, social and environmental aspects of cities and all those who live there. It can positively contribute to many of the problems affecting the urban environment. Consequently, guidelines on appropriate urban and peri-urban agricultural practices are required, which can be properly understood and followed only with a higher awareness of the population (consumers, actors of the food chain, and policy makers as well) and a better education.

One of the largest challenges is how to manage UA. UA faces with a number of key issues including food (security and safety), land (use and access), urban ecosystems and environment, health, education, and cultural practice. Appropriate land use planning and the development of strategic plans are necessary to deal with the urban farm activities and access to evolving markets, including supply people with adequate and healthy food. New forms of UA are emerging, partly reflecting current societal changes. One of the results of these changes is that UA is increasingly

seeing as a natural part of the city, that plays a central role for city life quality because of the wide range of services that it provides to the city and its inhabitants.

In general, UA has to modify itself in relation to:

- The socio-economic systems and their evolution
- The political systems and its role in management and planning

4.1. Challenges

UA activities are affected by a number of internal and external factors. Internal forces that influence UA initiatives are:

- The financial situation of participants involved:
We can classify the farmers involved in UA activities according to their Socio-Economic Status (SES) which include both income and educational level:
 - o Low SES (low income, low educational attainment): they can cultivate for personal sustenance or income generation.
 - o Medium SES (medium income, medium educational attainment): agricultural activity can be a supplement to earnings that can be unstable, an opportunity to supplement the family diet.
 - o High SES (high income, high educational attainment): urban farming activity can become a source of recreation.
- Their level of knowledge and own skills.
- Their adaptation capacity.

External forces that affect UA are:

- Urban government programs and local or regional initiatives:
policies can significantly influence UA activities both directly and indirectly. The policies characteristics are influenced by urban context, external governance characteristics (e.g., partnerships, legitimation process, and public policies), and internal governance characteristics (e.g., initiative's objective, time frame, stakeholders, and resources (land, funding, knowledge)).
- The environmental conditions (climate change and variability)
- The possibility to market access and competition
- Availability of resources and useful information:
the availability of land and water are essential to carry out UA activities. When we talk about soil, however, we do not have to think exclusively of the soil, but we refer in general to any surface that can be used for cultivation: roofs, walls, balconies, indoor spaces and of course land. Cities are rapidly growing, with higher requirement of building areas and consequently increase in the land value. In this context, land access for the urban farmers becomes quite difficult and represent the most important limiting factor for their activity. Consistently, producers often occupy marginal lands with low fertility that reduce the choice among species to be cultivated. The uncertainty of land availability also limits

the choice of cultivated species to short-cycle crops (e.g., leafy vegetables). The availability of a space where cultivate, the accessibility, and the ownership of the location, are considered among the greatest challenges for urban agriculture. Appropriate land-use planning and the development of strategic plans are needed to address the activities of urban farms and access to changing markets, while providing safe and healthy food.

- Community support:
there are many indirect actors that have a role in influencing UA activities. These include agricultural associations, non-governmental organizations, governments and public authorities, public institutions and research institutes, private sector entities.
- Food safety:
the greater risks, both for consumers and producers, are related to heavy metal, pesticides, and microbiological contaminations. The microbiological risk – bacteria, viruses, protozoa, etc. - are the consequential risks for producers and consumers which occur when using contaminated water or organic fertilizer inopportunely processed (e.g., fresh animal dejections or non-composted urban wastes) that are in direct contact with edible parts of the plants, and for poor hygienic practices during post-harvest and handling activities. However, the agricultural production in polluted areas of the cities may pose a serious threat to public health.

The concerns of heavy metals mainly occur when cultivations are placed in former industrial areas or nearby factories, on lands irrigated with water and/or, on solid contaminated industrial or mining wastes. As a general rule, leafy vegetables are stronger accumulators. Pesticide residuals in the food products are caused by both the phytochemicals adopted during the cropping cycle and contaminated soils or waters. The risk of urban agriculture also lies in the possibility of causing soil erosion and groundwater pollution due to inappropriate use of fertilizers and pesticides, with also high risks for those who use these products. Several studies have addressed strategies for reduce contamination risks in urban grown vegetables (**Orsini et al., 2020**). For example, move the cultivation 25 m away from the main roads or the adoption of trees or brush barriers reduce contamination from heavy metals. The identification of past land uses or the background geology may help understanding the contamination source, and the adoption of soilless cultivation system is a strategy to avoid soil contamination. Use of plants with elevate accumulation capacity allow to clean-up target contaminants in soils.

4.2. Opportunities

Urban agriculture has the potential to provide not only food products, but also guarantee the provision of other ecosystem services, including regulating, supporting and cultural services (see **Module 3**). Urban agriculture activities have a series of opportunities:

- Intercept the market needs and trends
- Use the multiple functions of urban agriculture to garner sustenance
- Social and economic integration:
Urban farming is an important mean for the integration of underserved social groups (e.g., immigrants, indigent, unemployed, elders, disabled, etc.) since it promotes their participation in the social texture and provides them with better living conditions. Urban farming also plays a crucial role in recreational and educational activities. Urban farming is a source of income and creates jobs opportunities and stimulates the growth of enterprises in the related activities (e.g. farming inputs, food processing, packaging, marketing, etc.).
- Contribute to urban dwellers well-being:
in an urbanized environment, outdoor recreational activities become important for health and quality of life for urban dwellers.
- Urban regeneration:
UA is recognized as an excellent way for the regeneration of unused land (even only temporarily) or under-utilized areas in the city. Moreover, UA activities represent a valid alternative to the use of marginal areas in the city (e.g., river banks, near railway tracks, near highways, etc.) or even the refurbishment of abandoned areas. In addition, when practiced within the city, UA allows the regeneration of abandoned buildings.
- Sustainable environment:
Urban farming activities can reduce the pressure cities exert on the environment. The three main types of city waste that have an impact are inorganic waste, wastewater and municipal solid waste. Through the production of compost from organic waste and the recycling of inorganic waste to be used as cultivation material (e.g. plastic bottles for soilless cultivation systems), it is able to keep the urban environment cleaner. Urban grey water (domestic water, excluding "black water") is seen as a resource for urban agriculture. It must be treated to make it safe to use, but the treatment requires the presence of adequate infrastructure.

Many institutions see UA only as a marginal and leisure time activity and many regions lack adequate mechanisms for getting citizens involved in planning. Furthermore, a mere recognition of UA activities as only for food production, risks omitting other potential benefits (social and ecological) and consequently the opportunity to obtain support from additional sources. Overall, as UA initiatives mature over time, emphasis is put on the economic potential in combination with social goals. Partly because growing in size and in experience, these initiatives can

sell surplus produce or offer a series of services that result in financial contributions. Initiatives can be very diverse in terms of the size of the cultivated area and amount of food produced, depending on the focus on social or on economic goals.

The time frame for an initiative influences its functions. Temporary or undefined time frame, makes uncertain the initiative and makes it less likely that stakeholders will risk investing time and resources in it. By contrast entrepreneurial UA initiatives are usually set up with an indeterminate time frame, but with clear future development plans. Short-term initiatives are more flexible and respond quickly to local need of the immediate neighborhoods, while long-term initiatives become more established and as a result have a potentially greater social impact.

For the sustenance of urban agriculture initiatives, three crucial resources are needed:

- Land (public and private)
- Funding
- Knowledge

The purchase of urban land is in many cases not possible, due to lack of land or excessive land prices, and thus obtaining a lease become the second-best option. However, this involves more uncertainty of initiatives. In the case where the land is owned by the initiative, there is more flexibility regarding time frame and type. The resources of knowledge have different layers, scientific, non-professional, and professional. All the initiatives that start from civil society initially involve the diffusion of non-professional notions, then scientific and professional knowledge are integrated.

Summary of the chapter

Module 1 provides an overview of Urban Agriculture (UA), defined as any activity of farming or livestocking within or in proximity of cities. UA has very ancient roots, starting from the Egyptian gardens of 1600-1400 B.C. up to the most modern commercial urban farms of contemporary times, going through the medieval *hortus conclusus* ('fence garden') in monasteries and convents and the aesthetic-scientific gardens of Renaissance. Cultivation in city context can be developed by applying different techniques, depending on the farming location (e.g., downtown or on urban-rural border), the set objectives (e.g., social, education, commercial, recreational purposes), the motivations beyond cultivation (e.g., concerns about environment and nutrition), the actors involved (e.g., entrepreneurs, NGOs, volunteers, hobby farmers) and the final destination market (e.g., local or wholesale markets). Depending on these characteristics, we can distinguish different types of production systems in the urban environment, which include: *urban food gardening* such as micro-gardens or small allotments for family use; *urban farming* applied both as small-scale or large-scale enterprises with main commercial objectives; *non-urban oriented farming* represented by rural traditional agricultural systems although close and connected to the city. UA can present specific challenges and opportunities. Among these, the main challenges are represented by the financial situation of farmers involved, the level of agricultural and business knowledge and the adaptation capacity. Furthermore, constraints may also come from the outside, as in the case of governmental or municipality limitations (e.g., safety and health codes), extreme climatic conditions, market access and competition, community support and availability of cultivation resources (e.g., irrigation water). On the other hand, many opportunities can be encountered, such as social and economic integration, mitigation of urban microclimate (e.g., heat island effect and stormwater management), improvement of urban biodiversity and regeneration of urban abandoned areas, just to name some.

Key concepts and vocabulary

Urban Agriculture: refers to all agricultural activities within the urban fabric (urban) and around the cities (periurban), which may include the cultivation of vegetables, fruits, and other specialized crops (e.g., medicinal plants, ornamental plants, herbs) and animal rearing.

Hortus: Latin word that refers to the idea of a space surrounded by a fence. In ancient Rome, it was strictly intended for the production of vegetable, fruits, flowers, and was an extension of the house, a sort of open-air pantry.

Hortus conclusus: ('fence garden') is the typical form of medieval garden, mainly included in monasteries and convents, where the Church guaranteed civil and social organization.

Food security: is a measure of the availability of food and individuals' ability to access it.

Micro-farming: or family garden, it is a type of UA involving households. The production is non-commercial, the main aim is to provide with fresh food to respective households and their families or friends.

Allotment gardens: types of gardens consist on areas divided into small plots usually rented through municipal agreements. They may be managed by an organized group or even through foundation of a garden association. Their functions have mainly a leisure approach.

Community gardens: gardens taking place on public, vacant and open land areas in the city (e.g., grounds of community centers, churches and schools). Are usually managed by the gardeners themselves or by a non-profit organization/association. They include: educational gardens, therapeutic gardens and social gardens.

Small-scale commercial farming: it comprises from low-income individuals to high-income entrepreneurs with commercial purposes. It is a semi-intensive production in open fields or in protected conditions (e.g., greenhouse), with a strong tendency for higher-input use and technological innovation.

Large-scale enterprises: large-scale farms contributing to local economic development and urban food security, being able to produce a large part of the city's food needs. They are mainly located in peri-urban areas around the cities. These farms are either driven by traditional farmers or urban investors, being the main objective to generate a high return on capital invested.

Multifunctional farms: Urban agriculture activities that serve manifold urban purposes, in addition to pure food production (e.g., entertainment, educational, health).

Food safety: a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness.

Urban regeneration: social, economic and environmental regeneration of unused land (even only temporarily) or under-utilized areas, also achieved by using UA.

Evaluation section

1. The location of Urban Agriculture is:
 - a. Only in downtown areas
 - b. Only in peri-urban areas
 - c. **Both**
2. Gardens in ancient Egypt had:
 - a. A food production role
 - b. A leisure role
 - c. **A spiritual role**
3. *Hortus conclusus* means:
 - a. Spring garden
 - b. Open garden
 - c. **Fence garden**
4. The first botanical garden in the world was in:
 - a. Paris
 - b. Munich
 - c. **Pisa**
5. Migrant gardens had to:
 - a. **Alleviate poverty**
 - b. Offer a recreational space
 - c. Create a community space
6. By 2050, ... of world population is expected to live in cities:
 - a. 20%
 - b. **80%**
 - c. 50%
7. Micro-farming has a:
 - a. **Household dimension**
 - b. Commercial dimension
 - c. Governmental dimension
8. Allotment gardens are:
 - a. Freely usable by citizens
 - b. Owned by privates
 - c. **Rented by municipality**
9. Community gardens can be:
 - a. Therapeutic gardens
 - b. Social gardens
 - c. **Both**

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10. Urban Farming has:
- A business purpose**
 - A social purpose
 - An educational purpose
11. Multifunctional farms:
- Don't follow a business model
 - Perform food production only
 - None of above**
12. One of the challenges of Urban Agriculture is:
- The financial situation of participants involved**
 - The contribution to urban dwellers well-being
 - The urban micro-climate management
13. Which is not an external force affecting urban Agriculture:
- Instruction**
 - Environmental conditions
 - Market access and competition
14. Urban regeneration is:
- A way for the regeneration of unused land**
 - A way to create a farming business
 - The conversion of green areas into constructed areas
15. The actors involved in Urban agriculture can be:
- Non-professional farmers
 - Professional farmers
 - Both**
16. Civil society involved in Urban Agriculture can include:
- NOGs**
 - Entrepreneurs
 - Governmental Institutions

Activities / Exercises

1. Think to an empty urban area in your city and image the best productive system depending on surrounding social, environmental and economic conditions.
2. Think to an empty urban area in your city and imagine which actors may be involved in order to perform an Urban Agriculture project.
3. Think to an empty urban area in your city and imagine all the opportunities and challenges that may be encountered performing an Urban Agriculture project.

Useful resources for the lesson

[The Urban Agriculture Revolution](#)

[The Berlin urban gardening movement](#)

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