Urban farming

Assessing ecosystem services provided by urban farms

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The module is realized in the frame of the project "Enhanced Skills and COmpetences in European Studies for Landscape ARchitects, environmental specialists and managers" (project number: 611545-EPP-1-2019-1-RU-EPPJMO-MODULE), Erasmus+ Jean Monnet Actions.

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One of the major drivers of increase in popularity of urban farming is the perception that producing food locally in cities enhances ecosystem services, reduces environmental impacts of the built-upon systems and increases resilience

The ecosystem services define the services provided to the people by the ecosystems (MEA, on 2005) and are estimated as the services brought to the living in the form of service (profit) or of disservices

Source: Barthel and Isendahl 2013

Urban farming is a domesticated nature, essentially rationalized for the services it can provide to human in the urban ecosystem. There is not always a strict correspondence between services, functions and benefits, as a function can participate to several services and a benefit can result from several services

Service category	Ecosystem service	Function	Usages	Benefits
Provisioning	Local supply	Food supply	Local supply Geographical proximity Proximity producers-consumers Short chain organization	Access to fresh products Social link between farmers and consumers and between consumers
Regulating	Flood risk management	Buffer role Water infiltration	Differentiated management of urban spaces Urban policy (zoning…)	Flooding prevention Impact reduction on populations (security)
Sociocultural	Human health	Structures supporting participatory activities	Active and collaborative participation to production and distribution activities	Physical and psychological well-being of dwellers and farmers

Provisioning services

The provisioning of food, in particular vegetable crops, small fruit, aromatic spices, eggs and poultry, is the most obvious provisioning service of UA

The small scale of UA allows urban farmers to use old or non-commercial varieties and land races, which is beneficial for the conservation of crop genetic resources

Because there are concerns of pollution and infectious diseases (e.g. Salmonella), livestock is much less frequently raised in UA

Source: Galluzzi et al. 2010, Pollock et al. 2012

An average large city in Europe (1 million inhabitants) has an environmental “foodprint” of **83,000** ha

The average annual diet in The Netherlands

18,000 ha for crops

65,000 ha land for fodder for a total of 2.5 million animals

If it would be possible to grow all fresh produce within the city boundaries, the share of UA in urban food security would be only 3% (i.e. 1,000 ha fruit and 1,400 ha vegetables; a total urban production of 2,400 ha)

The current evidence suggests that in industrialized countries UA can only make a limited contribution to improving food self-sufficiency at the city scale. In southern developing countries, the provisioning services of UA seem to be more important

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Source: Stedelijke Foodprint 2012, Ashebir et al. 2007, Clarke et al. 2014

Regulating services

Regulation of air quality, local climate and water

Air quality regulation depends primarily on the ability of plants to absorb or attract particles and pollutants and this increases with increasing leaf-area-index (LAI)
This is a very useful service of urban trees but a rather undesired property of plants parts that are grown to be consumed
Although direct contamination of UF crops by polluted air may be limited because of the limited leaf area index of vegetables, there are also health risks associated to soil pollution, through atmospheric deposition of heavy metals and other toxic compounds

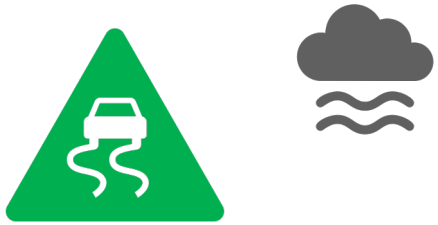
Through increased infiltration and higher evapotranspiration, vegetation cover in the city cools the atmosphere, and reduces blue water flows
Theoretically, UF thus has a positive effect on water and energy flows compared to built-up surfaces
Trees or other plants with high LAI are expected to be much more effective in mitigating the heat island effect of cities or controlling peak water flows
Most crops can only exert temporary effects on their environment

Source: Pugh et al. 2012, Coutts et al. 2012

Global climate regulating services

Global climate regulation through carbon sequestration is limited in crops, when considering that even urban forests have limited carbon mitigation potential

UF may have an impact on global climate through the reduction of “food miles” – the environmental impact of food related to transport
The average food crop is transported long distances (> 2000 km) from farm to consumer, needs packaging and storage, and suffers considerable losses in the supply chain (2-33%)
Reducing such losses and transport steps by producing food locally can reduce overall emissions compared to the conventional food chain



Source: Grewal and Grewal 2011

Additional regulating services

- ✓ Minimum soil disturbance – maintain soil structure, fertility
- ✓ and biotic activity
- ✓ Regulation of pest populations in urban soils
- ✓ UF adhering to organic principles therefore has the potential to reduce indirect emissions (e.g. the emissions of fertilizer and pesticide manufacture) and improve regulating ecosystem services
- ✓ UF can contribute to the conservation of biodiversity and its regulating services in the urban ecosystem

Source: Aerts et al. (2016) – Potential Ecosystem Services of Urban Agriculture

Cultural services

The socio-cultural services of urban agriculture are difficult to quantify but most are related to improved quality of urban life

Community-based forms of UF improve the social interactions between citizens of different age, culture and social background. The practice of growing food and gardening reconnects people with land and nature, releases stress in working people, and contributes to healthier diets, at least for some social groups

Because of the improved interaction between different age groups, UF and in particular community gardening, may also play an important role in transmitting knowledge systems between generations

The socio-cultural services of UA therefore extend by far the apparent aesthetic and recreational values typically associated to green in the city and appear to be more important than their agricultural function

Source: Galluzzi et al. 2010

Classwork

Potential contribution of UF on ecosystem services

Please add one, two or three “+” or ”-” to ecosystem services, which are provided/or not provided by community gardens and community-supported agriculture of UF

“+” – contribute

“++” – medium contribution

“+++” – highly contribute

“-” – no impact

Provisioning services

Food

Fiber

Fuel

Genetic resources

Biochemicals, medicines

Fresh water

Regulating services

Air quality regulation

Climate regulation, local

Climate regulation, global

Water regulation

Erosion regulation

Water purification

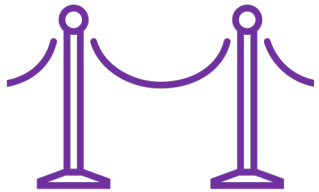
Waste treatment

Human disease regulation

Pest regulation

Pollination

Cultural services



Cultural

Social relations

Knowledge system

Aesthetic values

Education/Recreation

Homework

Potential contribution of UF on ecosystem services

Please add one, two or three “+” or ”-” to ecosystem services, which are provided/or not provided by allotment garden/hydroponic system/edible green roof of UF
“+” – contribute
“++” – medium contribution
“+++” – highly contribute
“-” – no impact

Suggested to read: Aerts et al. (2016) – Potential Ecosystem Services of Urban Agriculture

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