



Food and Agriculture
Organization of the
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Milan Urban Food Policy Pact Monitoring Framework

March 2021 version

Indicator 27: Surface area of (potential) agricultural spaces within the municipal boundary

MUFPP framework of actions' category: Food production

The indicator monitors the surface area of land within the municipal boundary used for agriculture, zoned/destined for agriculture (although possibly not used at this moment) as well as open vacant and built up spaces that could potentially be used for agriculture.

Overview table

MUFPP Work stream	Food production
MUFPP action	<p>Apply an ecosystem approach to guide holistic and integrated land use planning and management in collaboration with both urban and rural authorities and other natural resource managers by combining landscape features, for example with risk-minimizing strategies to enhance opportunities for agroecological production, conservation of biodiversity and farmland, climate change adaptation, tourism, leisure and other ecosystem services.</p> <p>Protect and enable secure access and tenure to land for sustainable food production in urban and peri-urban areas, including land for community gardeners and smallholder producers, for example through land banks or community land trusts; provide access to municipal land for local agricultural production and promote integration with land use and city development plans and programmes.</p>
What the indicator measures	The indicator monitors the surface area of land within the municipal boundaries used for agriculture, zoned/destined for agriculture (although possibly not used at this moment) as well as open vacant and built up spaces that could potentially be used for agriculture. It seeks to spatially locate these areas and use these data for future land use planning, preservation and protecting of agricultural lands from (unplanned) urban growth, while securing user rights for farmers and maintaining important services such as local production, urban water quality and supply, and flood retention (or other reduced climate risks).
Which variables need to be measured / what data are needed	Data on: -Surface areas -Spatial location -Land ownership, accessibility, use, suitability and feasibility.
Unit of measurement (i.e. Percentages, averages, number of people, etc.)	Surface area in m ²
Unit(s) of Analysis (i.e. people under 5 years old, ect.)	<ol style="list-style-type: none"> 1. Land used for agriculture, 2. Land is zoned/destined for agricultural use, although the land may actually not currently be used

	3. Potential agriculture growing spaces
Possible sources of information of such data	-The city department/programme for (urban) agriculture, land use planning, cadastre, parks and gardens department. -Cadastral maps, satellite and aerial images.
Possible methods/tools for data-collection	GIS mapping and field observations
Expertise required	Analysis of satellite and aerial images, GIS, agronomy
Resources required/ estimated costs	
Specific observations	
Examples of application	A 2015 study from the University of Wisconsin in Madison used a combination of ArcGIS mapping and field visits to generate a community garden site suitability index that sorted and inventoried undeveloped land potentially available for community gardens ¹ .

Rationale/evidence

Rapid urbanisation, building up remaining agricultural and open spaces within the city and extending into peri-urban and rural areas, is challenging traditional approaches to food and nutrition security, as well as traditional thinking on how cities are fed. Urban expansion goes hand in hand with an increase in the demand for natural resources (land, water), which provide vital food and ecosystem services to cities, as well as with increased challenges in terms of economic efficiency, land use and land rights. Large scale conversions of agricultural land to non-agricultural uses have caused, and may also cause in the future, problems in cities and rural areas with regards to drainage systems and flood retention, disruption of the drinking water supply, temperature increases, environmental pollution, and increased vulnerability to disruptions in safe and nutritious food availability and supply, especially in areas affected by climate change.

Cities are beginning to realise the importance of preserving and protecting vacant and agricultural areas, and are starting to influence planning policy to protect or enable the use of these areas for localised food production), but also to preserve and protect agricultural areas with views to climate change adaptation (mitigation increasing urban temperatures, enhancing storm water infiltration) and other social and environmental benefits. In many cases, this is coupled with efforts both to enhance the access of (vulnerable) urban consumers to sufficient, healthy, and safe food as well as to improve the livelihoods of urban, peri-urban and rural small-scale and family farmers².

Calculation of available agricultural surface area within the municipal boundaries requires agricultural land use mapping (through GIS and field observations). Such land use mapping can be undertaken in order to:

1. Identify the locations and surface areas where various types of agricultural activities are undertaken in the municipal area (e.g. **land used for urban and peri-urban agriculture**),
2. Identify the locations and surface areas where **land is zoned/destined for agricultural use**, although the land may actually not currently be used
3. Identify locations and surface area of **potential agriculture growing spaces** in the municipal area (including vacant open spaces, rooftops, parks, road sides) and classification of their accessibility,

¹ Eanes, Francis and Ventura, Stephen J. (2015) "Inventorying Land Availability and Suitability for Community Gardens in Madison, Wisconsin," Cities and the Environment (CATE): Vol. 8: Iss. 2, Article 2.

<http://digitalcommons.lmu.edu/cgi/viewcontent.cgi?article=1166&context=cate>

² Dubbeling M., C. Bucutariu, G. Santini, C. Vogt and K. Eisenbeiß, 2016. City region food systems and food waste management- Linking urban and rural areas for sustainable and resilient development. GIZ, RUAF Foundation and UN FAO. Bonn and Eschborn. <http://www.ruaf.org/publications/city-region-food-systems-and-food-waste-management-2016>

suitability, current use and feasibility for agriculture according to a number of criteria. This will enable to increase the access of the city residents to available and suitable spaces for food production, processing and marketing.

Note that land used or zoned for agriculture or land that can potentially be used for agriculture can be land that is publically owned, or owned by private land owners/institutions. Different land use arrangements may also have been put in place (ownership, lease arrangements). Cities can decide to focus on specific ownership types or other land use categories depending on data availability and political priorities.

Surface areas may be deducted from desk analysis of land registers, maps and images. However, information on location and characteristics of these areas will be needed for further land use planning.

Preferably, information should also be collected and “mapped” on other socio-economic and environmental variables so that different data sets can be studied in relation to each other, for example: poverty/malnutrition rates in specific neighbourhoods, sources of contamination (main roads, industry), areas where wastewater or solid waste is recycled or marketing takes place (to locate agricultural production close to these areas for example), etc.

Ideally, agricultural land use mapping would not only be undertaken by the city but also by communities in their own areas. This would help them look at their surroundings with new eyes and see new possibilities. It may yield information that can be useful to them in their communities. And it will mean that the community context is either already known or easier to find out. Data collected by communities could be aggregated by the city for the entire municipality.

Glossary/concepts/definitions used

Land **zoning** involves the regulation of the use and development of specific areas of land. It concerns the process of dividing land in a municipality into physical districts, or zones, according to the present and potential use of the properties in each zone, and then allows or prohibits certain types of land uses within certain zones (e.g. residential, industrial, agricultural). The type of zone determines whether planning permission for a given development is granted. Zoning may specify a variety of conditional uses of land. It may also indicate the size and dimensions of land area as well as the form and scale of its land use. These guidelines are set in order to guide urban growth and development. Thus, zoning is a technique of land use and urban planning. Legally, a zoning plan is usually enacted as a by-law with the respective procedures.

Zoning can have a variety of impacts on the urban food system. For example, some zoning codes might prohibit commercial agriculture in residential zones, making it impossible to have community gardens or urban farms that seek to sell (part of) their produce in those areas. Zoning rules might also have an impact on the food system by not listing certain activities, such as food sales, as a legal commercial activity in certain zones, which would make selling food, such as at a farm stand, illegal. Zoning rules might also say what kinds of structures are allowed, which could exclude the construction of greenhouses. In addition, zoning might set limits on which animals, such as chickens or bees, can be kept in specific areas³.

Vacant spaces: Open non-built up areas that could potentially be used for agriculture including for example open green spaces like urban parks, roadsides, flood zones, areas below electricity lines and

³ Although comprehensive plans and zoning are the most common forms of land use regulation, cities can use other legal mechanisms that can be used to protect land for food production either within or surrounding the municipality. In addition to planning and zoning, agricultural land may be protected through land trusts and conservation easements. See for some USA examples: https://www.chlpi.org/wp-content/uploads/2013/12/good-food-good-laws_toolkit-10.23.2017.pdf

peri-urban greenbelts.

Built-up spaces: The 'Built-up area' of a city is defined as the contiguous area occupied by buildings and other impervious surfaces. It includes areas already built upon (buildings, hardened surfaces) that could be used for agriculture production using specific production technologies, such as rooftop gardening; use of planting boxes, etc.

Land **accessibility** refers to the agricultural land use possibilities or limitations related to physical and legal/planning access to a specific area of land (ownership, tenure and user rights, land prices, planned land use).

Agricultural land use **suitability** helps to understand if a given area of land allows for agricultural production based on its agronomic characteristics and limitations.

Agricultural land **feasibility** (or **adequacy**) relates to issues like protection from theft, relative location in relation to households, to markets or input supply.

Preparations

A meeting should be organised with all staff that will be involved in this activity in order:

- To familiarise them with land use mapping and these methodological guidelines (why, what, when, how)
- To agree on the objectives of the monitoring exercise and the type of data and information to be collected
- To define the methodology to be applied for data collection and analysis
- To agree on work planning: who will do what, when and how; required and available means,
- How to coordinate these activities.

Counting with the following basic information will help further data collection and analysis:

- City history development, changes and trends in land use (loss of agricultural land and ecologically valuable land as a result of urban expansion in the past 5-10 years; rate of city expansion and direction of urban growth, new urban projects and plans)
- Municipal boundaries, general urban and zoning plan, land use categories and maps, normative and legal framework regarding land tenure and use, soil regulations in different areas (see also Indicator 26. *Presence of municipal policies and regulations that allow and promote urban and peri-urban agriculture production and processing*).
- Location of different neighbourhoods, green, residential and industrial areas, main infrastructure and water sources
- Location of agricultural and vacant land areas that can potentially be used for agriculture.

This information and data is generally available from statistical, cartographic and cadastral data sources available in different municipal departments (Cadastre, Urban Planning, Public Services and Works, Parks and Green Areas, etc.).

Finally, if beyond mere surface areas, spatial, location, land accessibility, suitability, use and feasibility will be assessed, agreement should be reached on concepts used to ensure homogenous analysis by different members of the monitoring team.

Sampling

Data can be collected for the entire city (municipal boundaries) or for specific low-income areas if reaching these target groups is a specific policy priority.

Data collection and data disaggregation

Surface areas of agricultural land used, zoned or potentially available could be calculated from desk research only (analysis of land use registers, maps and zoning plans; analysis of satellite/aerial images). Spatial localisation of agricultural land will however require further GIS mapping.

1. Analysis of land registers, maps and images

Where information on surface areas of agricultural land is not available in land registers (cadastre for example), up-to-date maps, satellite images and aerial photos (available from Google Earth) can be used for data collection and spatial localisation. Take the most up-to-date available set of aerial photographs or satellite images on a scale of 1:2.500- 1:12.500 (if available) to allow for a clear and high resolutions of the images. The team may decide to only identify surface areas larger than 1000 m² because of logistical and technical reasons (difficulty in studying very small areas; smaller areas change use more frequently).

The team should agree on the different land categories to be surveyed:

- (1) Land already used for different types of agriculture (crop production, tree production, livestock, aquaculture),
- (2) Land zoned/destined for agriculture: this includes areas that are destined, but not actually used for agriculture
- (3) Open or vacant land areas that can potentially be used for agriculture
- (3) Built-up areas such as rooftops, park areas, road, railway and water borders where agriculture can be integrated into (multifunctional) land use.

Digitising information collected in GIS maps will allow for further data analysis and future actualisation of information.

2. Field observations

Once the different land categories and areas are mapped, selected areas can be visited for ground verification through field observations as well as to allow for further data collection on land accessibility, suitability, use and feasibility.

Areas can be selected on the basis of the following criteria:

- Large(r) surface areas
- Their representation for the major types of land areas (land already used for agriculture, zoned, open and vacant areas and built-up that that can potentially be used for agriculture)
- Areas that have the best chance to be maintained as agricultural areas in future (refer to zoning, land use and city development plans)
- Vulnerable (farming) households form a major category of households in the area.

Field observations can include collection of further information to validate the cartographic information and describe land use characteristics (surface area, slope). Location and land use of the areas can be verified by visual observations and measurements. GPS (Geographic Positioning System) techniques can be used to check measurements. Using maps in a scale 1:2000, will facilitate community involvement in spatial identification of areas and validation of information concerning ownership of the site, security of tenure, access to water, past and current land use, safety etc (see further below).

Further analysis could involve assessment of **land accessibility**. Questions that can be asked here include:

- Who owns the land?
- What is its current status (freehold, leasehold, etc.)?

- What are the norms and standards for this area of land (public domain, reserved for development, etc.)?
- Are there any project or planning regulations for the future such as a new road, a garbage dump or the extension of a development?
- What are the physical constraints to accessing this area of land such as topographical constraints (slopes) or hazard prone areas such as risk of flooding?

Land **suitability** can be assessed by answering the following questions:

- What are the land qualities for agriculture? For what kind of agriculture?
- Is it suitable for cultivation? For what kind of products?
- Is water available? In terms of quality and quantity.
- What is the level of contamination of the soil and water sources?

Agronomic field observations (quality and texture of the soil, current vegetative growth, availability of organic matter etcetera) may yield further information.

Current and past uses of the land addresses the social dimension of the mapping and are important to consider even if the land is currently not used for agriculture, or only partially cultivated. Questions that can be asked include:

- What is it being used for?
- What was it being used for before?
- How many people/farmers/families are cultivating today? Who are they? Where do they live?
- What are the farming practices?

Land **feasibility** requires assessment beyond accessibility and suitability. One can look more particularly at the following:

- Is this land safe (from thefts and possible crimes), and is there anything to be done to increase the safety?
- Is the area well-located close to where (potential) growers and farmers live? Are there good transportation systems?
- Are inputs supply and market locations favouring supply and market efficiency?

Data analysis/calculation of the indicator

1. GIS mapping

Spatial localisation of current, zoned and potential agriculture areas can be done using Geographic Information System-GIS (GIS MapInfo or ARCVIEW info Software (or other locally available) packages. Information can be interpreted by local specialised government departments or institute. This will also allow for further determining both availability and accessibility of specific resident groups to these areas (see also Indicator 25 *Number of residents in the city with access to an urban agriculture garden*).

The GIS maps will constitute a tool for urban planners and technical staff to facilitate strategic planning of (agricultural) land areas.

Most larger cities already possess GIS systems or cartographic databases on municipal land use. However, in many cases agricultural land use is not officially considered in land use categories defined by the planning departments and cadastre. In that case, new “thematic maps” (the maps or layers that constitute the basic architecture of the GIS) have to be included to incorporate information on actual and prospective agricultural land use, location, soil classification according to their agronomic characteristics etcetera.

2. Elaboration of prospective land use maps with the community and public actors.

Use of currently vacant open and built-up spaces for future (either temporal or permanent) agricultural use can be analysed and plans made on for example:

- The development of agro-silvo-pastoral practices on areas with limited agronomic capacities,
- The cultivation of ornamental plants in health-risk prone areas,
- The cultivation of specific plants that conserve the soils and combat erosion in coastal areas or on river sides,
- The use of flowers or shadow plants to generate aesthetic environments and attract bird and insect life,
- The production of food plants (vegetables, fruits, etc.) in park and communal areas close to urbanisations.

Information collected may be organised in a format similar to the one below:

Area of land		Characteristics	Accessibility			Suitability and feasibility			Prospective land use
			Owner ship	Tenure situation	Planned land use	Quality of the soil	Availability of water	Relative location	
1.Area 1 Location		Surface area Slope Current land use							
2.Area 2 Location									
3.Area 3 Location									
.....									
.....									

3. Action planning

Action planning by organisation of separate or mixed focus group meetings with urban farmers and different local government departments (planning, cadastre, parks and green areas, agriculture, housing) will allow to further identify problems and solutions related to for example insecure land tenure and preservation of agricultural land areas, such as policy measures needed to improve security of user rights, inclusion of agricultural areas in municipal land use and zoning plans, etc.

4. Reporting

The results of agricultural land use mapping can be reported by using:

- (GIS) maps that show trends in city development and growth (and loss of agricultural land)
- (GIS) Land use maps that show the location and characteristics of land used and zoned for different agricultural activities as well as the various types of vacant land areas.
- Opportunities & proposals for the agricultural use of vacant and built-up land areas (prospective land use maps),
- Policy measures needed (bye-laws, ordinances, economic and fiscal incentives) to improve secure access and tenure to agricultural or vacant land,
- Possibilities and proposals for integration of agriculture land use in land use, city development and zoning plans.