Food and Agriculture Organization of the United Nations

MILAN URBAN FOOD POLICY PACT

Milan Urban Food Policy Pact Monitoring Framework

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Indicator 33: Annual proportion of urban organic waste collected that is re-used in agricultural production taking place within municipal boundaries

MUFPP framework of actions' category: Food production

The indicator measures the percentage of urban organic waste collected and recycled that is re-used in urban and peri-urban agriculture production

Overview table

MUFFP Work stream	**Food production**
MUFFP action	**Improve waste and (waste)water management and reuse** in agriculture and food production through policies and programmes using participatory approaches
What the indicator measures	The indicator measures the percentage of urban organic waste collected and recycled that is re-used in urban and peri-urban agriculture production
Which variables need to be measured / what data are needed	-The total tonnage of urban organic waste collected in the city -The total tonnage of urban organic waste that is recycled -The total tonnage of recycled organic waste that is used in urban and peri-urban agriculture production (e.g. agriculture taking place within municipal boundaries)
Unit of measurement *(i.e. Percentages, averages, number, etc.)*	Tonnage and percentage of organic waste collected and re-used
Unit(s) of Analysis *(i.e people under 5 years old, etc.)*	The organic components of municipal solid waste
Possible sources of information of such data	Data on formal organic waste collection and management may be available from municipal bodies and/or private contractors. Additional and informal collection data may be available from NGOs and community organisations. Information can be sourced from municipal records, service providers, community profiles and household surveys. UN-Habitat is collecting information on solid waste

	management and discharge in more than 1000 cities that are part of the City Prosperity Initiative[1].
Possible methods/tools for data-collection	Analysis of records and surveys
Expertise required	
Resources required/ estimated costs	
Specific observations	It is recognised that in many cities, solid waste collection and management data are currently incomplete or not available. Cities have varying policies that define appropriate waste management, with different levels of treatment and data collection. Cities that have more advanced systems should be able to report other aspects of waste management such as recycling that can be disaggregated by different components and uses.
Examples of application	New York City (USA) has set a zero-waste target by 2030. In 2016, the NYC Department of Sanitation (DSNY) has collected more than 60,000 tons of organic waste. Most of the organic waste collected in NYC is used to create compost, but as per 2018 part of it will be incinerated for energy production. For those not yet receiving curbside organics pickup, DSNY continues to develop drop-off sites for organic waste. There are now more than 88 drop-off sites in addition to at least 225 community composting sites, which divert an estimated 1,200 tons of organic waste per year. As per 2016, certain New York City businesses were required by law to separate their organic waste for beneficial use (composting, anaerobic digestion or other)[2].

Rationale/evidence

The indicator "Annual proportion of urban organic waste collected that is re-used in urban and peri-urban agricultural production" relates to Sustainable Development Goal 11 (Make cities and human settlements inclusive, safe, resilient and sustainable), Target 11.6: 'By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management'[3]. It also relates to SDG 12 (Ensure sustainable consumption and production patterns), Target 12.5: 'By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse'.

Regardless of the context, managing solid waste is one of the important challenges of urban areas of all sizes. Cities generate enormous amounts of waste from urban households, industries and markets[4]. Large amounts of this Municipal Solid Waste (MSW) mostly end up in non-engineered landfills or polluting the urban environment, especially in low-income countries where sanitation infrastructure is less developed. A shift from waste(water) disposal to Reduce, Recycle and Reuse practices[5], is in many cases, a 'must' as limited water resources increase competition for drinking and irrigation water, while some other resources like phosphorus are non-renewable and especially poorer countries will be the first to feel increasing fertiliser prices.

[1] https://unhabitat.org/urban-initiatives/initiatives-programmes/city-prosperity-initiative/

[2] http://www1.nyc.gov/assets/foodpolicy/downloads/pdf/2017-Food-Metrics-Report-Corrected.pdf

[3] The SDG Indicator 11.6.1 used is: Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities

[4] Pay Drechsel, Bernard Keraita, Olufunke O. Cofie and Josiane Nikiema. Productive and safe use of urban organic wastes and wastewater in urban food production systems in low-income countries. In: De Zeeuw H. and P. Drechcel. Cities and agriculture- Developing Resilient Urban Food Systems, 2015. Earthscan. http://www.ruaf.org/process-and-tools-multistakeholder-planning-urban-agro-food-systems

[5] UNEP, 2011. Towards a green economy: Pathways to sustainable development and poverty eradication. United Nations Environment Programme (UNEP). Available from: www. unep.org/greeneconomy.

In general, the organic fraction is the largest one within domestic waste. Studies indicate that between 28-64% (varying from high to low income countries) of urban solid waste is biodegradable and hence of immediate interest in recycling[6]. Many organic wastes are nutrient-rich and can be productively used in intra- and peri-urban agricultural systems enhancing resource recovery and circular economies as well as the resilience of the urban metabolism.

Benefits of organic waste composting and recycling are to:

- Reduce overall waste volume and transport costs
- Replenish the soil humus layer and enhances soil quality
- Extend existing landfill capacity and landfill lifetime
- Enhance recycling and incineration operations by removing moist organic matter from the waste stream
- Promote environmentally sound practices and reduce the environmental impact of disposal sites, such as the reduction of methane generation at landfills.
- Be flexible for implementation at different levels, from household efforts to large-scale centralised facilities; i.e., can also be started with very little capital and operating costs.
- Address possible health impacts from faecal matter due to the composting (sanitising) process.
- Integrate existing informal sectors involved in the collection, separation and recycling of wastes, and contributes to the 'green economy' of a city.

However, despite these benefits, productive reuse of waste faces a variety of challenges and current MSW management practices show very small proportions of MSW being recycled and/or composted. Challenges range from securing cost recovery for up- and out-scaling successful examples of planned reuse, and the acceptance of safety practices within the informal reuse sector in urban and peri-urban areas. However, the largest concern related to waste reuse are possible sources of contamination (toxic substances like heavy metals, pathogens), especially where waste products are used in food production. Opportunities for addressing the first challenge include more attention to business models which can build on different value propositions beyond normal 'composting', and for the second challenge they include more attention to social marketing options, private-sector engagement and incentive systems for catalysing behaviour change towards the adoption of safety practices.

It should also be noted that productive re-use of organic waste in urban and peri-urban agriculture will only be successful if certain quality and quantity requirements are fulfilled:

Quality: Several cities promote organic waste composting for environmental reasons and may provide compost to farmers for nominal fees. However and in case of commercial composting, urban farmers with a sufficiently high willingness to pay for compost -allowing compost stations to break even- are those producing for the urban market, not subsistence farmers. Also in commercial agriculture production, crops of short rotation like exotic vegetables, need most of all a nitrogen fertiliser, less than an organic soil ameliorant. Where producers have poor tenure security they will also seek a more short-term fertiliser supply than a long-term soil ameliorant (see also Indicator 28 *Proportion of total agricultural population with ownership and secure tenure rights over agricultural land*). There are several technical options to 'boost' the fertiliser value and attractiveness of the MSW compost, including co-composting.

Quantity: Urban waste management is usually only interested in embarking on composting if this can reduce a significant volume of the waste. To start a compost station for saving, for example 3% of its transport volume, is usually not worth the effort. However, most intra- and peri-urban farming systems can hardly absorb any larger amounts of compost. A detailed market assessment by IWMI in Kumasi

[6] See footnote 4

and Accra, Ghana found that, of the organic waste which is collected and not otherwise used, if composted, less than 1% could be absorbed across all intra- and peri-urban farming systems if the willingness to pay should cover compost operational production costs. It was only in smaller cities with less waste generation, like in Tamale (also Ghana), that up to 5% was possible, and higher percentages can be expected from towns. But also in a city like Accra, the percentage can increase up to 20% if, for example, the non-agricultural demand, like from the housing (ornamental gardens) and forestry/park sector is considered[7].

Glossary/concepts/definitions used

Urban waste can be solid, partially solid (e.g., manure, sludge) or liquid (grey water), organic or inorganic, recyclable or non-recyclable. Of interest to agriculture as a source of nutrient and organic matter is the **organic waste**: the organic fraction of municipal solid waste and agro-industrial waste, and as a source of water and nutrients also domestic wastewater. Typical types of organic waste commonly used in urban farming are:

- **Solid waste:** Domestic and market wastes, food waste including vegetable and fruit peelings, and charcoal ash. This also includes waste from institutions and commercial centres.
- **Horticultural and agricultural waste:** Common especially in high-income areas: garden refuse, leaf litter, cut grass, tree cuttings, weeds, animal dung, crop residues, waste from public parks, etc.
- **Agro-industrial waste:** Waste generated by abattoirs, breweries, timber mills, poultry farms, food processing and agro-based industries.
- **Sludge and biosolids:** Human faecal matter from septic tanks and treatment plants.

Waste collected refers to waste that is routinely collected from specific addresses or designated collection points. Waste collection is conducted directly by municipal authorities or private contractors licensed/commissioned by municipal authorities with a regular schedule of the day of the week and time of collection. In some cases private waste collection companies have contracts with clients individually and provide collection services.

Organic waste recycling involves the recycling of organic wastes into valuable products such as fertiliser, biofuels and animal feed:

- **Animal Feed** –Some types of non-hazardous organic waste, with appropriate amounts of specific nutrients, can be used by certain types of animal farms or feed producers for livestock.
- **Composting** – This is a broad term used to define many methods of breaking down organic matter to be used as fertiliser. Composting is as a biological process that involves aerobic biological decomposition of organic materials to produce stable humus-like product. **Vermicomposting** refers to the production of compost by earthworms. While any organic waste is biodegradable, certain composting methods prove more efficient for different organic waste types.
- **Anaerobic Digestion** – This process involves using anaerobic microbes (those that exist and grow in environments without oxygen) to transform organic waste into energy. This process may produce biogas and rets-products may be used as bio-fertilisers.

Preparations

Data collection and analysis starts from identification of waste collection and management practices in the city and of possible data sources needed for this indicator (see further data collection).

[7] See footnote 4

Sampling

Data collection is best done at the level of the city. Where city wide data are not available, data can be collected from specific agricultural or waste projects or specific waste management and recycling business to get a first insight into waste recuse practices and potential.

Data collection and data disaggregation

In order to generate the annual proportion of urban organic waste collected by the city that is re-used in urban and peri-urban agricultural production, there is a need to define the three components that are core to this indicator:

- The total tonnage of urban organic waste collected in the city. Organic waste may already be separately collected at the source where the waste is generated or waste separation may take place at disposal and/or treatment sites.
- The total tonnage of urban organic waste that is recycled. Out of the total tonnage organic waste collected, the proportion of the organic waste that is recycled should be estimated. If data are available, data can be disaggregated for different products: e.g. recycling in form of animal feed, (vermi)compost or incineration for production of biogas and bio-fertliser.
- The total tonnage of recycled organic waste that is sold or distributed to farmers (e.g. used in urban and peri-urban agriculture).

1. Organic waste collected

The indicator refers to organic waste that is routinely collected directly by municipal authorities or private contractors. If data are available, informal waste collection schemes by waste pickers or community organisations could be included. Waste collected however excludes the proportion of organic waste that was taken and recycled before the waste collection, for example the organic waste composted by individual households, organisations (like schools, industries) and community gardeners. The latter will require other methods of data collection like household, institutional and garden surveys. Impacts of waste collection and composting campaigns targeting households may contribute to reducing amounts of organic waste collected and thus indirectly be monitored by applying this indicator.

2. Organic waste recycled

Secondly the indicator refers to the proportion of the total amount of organic waste collected that is recycled in form of animal feed, humus or compost. Formal recycling is done by municipal services or similar institutions, or by public or private corporations and specialised enterprises. Informal recycling may take place in cities in the Global South in form of landfill scavenging for example.

3. Organic waste re-used in urban and peri-urban agriculture

Finally the indicator tries to single out the proportion of the total amount of organic waste collected, recycled and used in urban and peri-urban agriculture as compared to other uses (by households, industries, in rural agriculture, etc.).

Once data on organic waste recycling are available, cities can use these data for calculating other indicators such as “the reduction of GHG emissions and fossil energy use as a result of (an increase in) the reuse of urban organic wastes as compost in urban and peri-urban agriculture and forestry’’.

Data analysis/calculation of the indicator

The indicator can be computed by:

Annual proportion of urban organic waste collected that is re-used in urban and peri-urban agricultural production= [Total tonnage of organic waste re-used in urban and peri-urban agriculture/Total tonnage of organic waste collected]*100

References and links to reports/tools

Pay Drechsel, Bernard Keraita, Olufunke O. Cofie and Josiane Nikiema. Productive and safe use of urban organic wastes and wastewater in urban food production systems in low-income countries. In: De Zeeuw H. and P. Drechcel. Cities and agriculture- Developing Resilient Urban Food Systems, 2015. Earthscan. http://www.ruaf.org/process-and-tools-multistakeholder-planning-urban-agro-food-systems